



# Orientation of IT towards Human Being

A new, informationscientific Paradigm

Franz Plochberger  
Information Scientist

<http://www.plbg.at>

... together with universities und researchers worldwide

Vienna, Austria in May 2016

Copyright:

Dieses Material steht unter der Creative-Commons-Lizenz Namensnennung - Weitergabe unter gleichen Bedingungen 3.0 Österreich. Um eine Kopie dieser Lizenz zu sehen, besuchen Sie <http://creativecommons.org/licenses/by-sa/3.0/at/>.



*“Even you see an extremely high mountain before you - for climbing on a difficult way - you start by one step.”*

(wisdom)

For my daughters Clara and Isabelle!



## 1. Abstract

At the beginning of our *Age of Information*, the 21<sup>th</sup> century, the influence of IT (Information Technology) have got so important that all parts of human live and society have been involved. Especially Media Industry started a great hype which is not finished till now. Mobile Media have got a really up to date part of especially young society.

On the level of serious science it has been up to date to use the word Information in all reports and publishing papers. A lot of semantics have been used and some scientists (Prof. FLEISSNER, Prof HOFKIRCHNER, Prof. CAPURRO and the author) tried to abstract this word to a constant scientific term. So for first time the author tried a worldwide unifying definition of the terms Information and Data. It's importance is documented by the topic "*Information Scientific Axioms*".

In second part – based on it – *Clues for generally evidence of Information* are written down. They are a set of informationscientific terms - excerpted out of real nature and society. The way of Information between Object and Subject or involving Human Being in big and complex machine systems (aeroplanes, ships and industrial productions) made it necessary to think additionally about the general usage of Information. As a useful result many relationships to other sciences are possible. They bring the benefit to be unifying and scientifically worldwide structuring.

As next research object general forms of actual Information are investigated.

As final result for future the author asks: „How can we make Information – in all forms – more positive and precious for Human Being? “. This is a new, scientific topic for the future of IT and human society.

## 2. Key Words, Search Items

Information Sciences, Informationscientific Axioms, Information as term, Orientation of IT as paradigm, Theory of Systems, Relation, Relationship, Attachment, Attention, Regard, Vigilance, Alertness, Awareness, Readiness.



### 3. Content

1. Abstract.....	3
2. Key Words, Search Items.....	3
3. Content .....	4
4. Introduction .....	5
5. The new findings are compound to a scientific paradigm .....	5
6. „Axioms“ in Information Sciences .....	6
6.1. Informationscientific Axiom 1 (IA1) .....	6
6.2. Informationscientific Axiom 2 (IA2) .....	6
6.3. Informationscientific Axiom 3 (IA3) .....	7
7. Informationscientific Postulates (IP) .....	8
7.1. IP1: Human Orientation (HO) of IT .....	8
7.2. IP2: Observation of Continuity as property .....	8
7.3. IP3: Usage of word Information in Science.....	8
8. Discussion of Information scientific Axioms and Postulates.....	9
9. Clues in every evidence of Information.....	9
9.1. Biological and mental State of Vigilance, Alertness, Regard or Readiness.....	10
9.2. Attention.....	11
9.3. Awareness, Consciousness and Perception .....	12
9.4. Social Relationship and Attachment.....	13
9.4.1. A Formal Relationship .....	14
9.4.2. Personal Relationship .....	14
9.5. Relationship between Human Being and Machine, Computer or Media (IT-Hardware)	
.....	15
10. Discussion of these Clues .....	16
10.1. Discussion of biological and mental State of Vigilance, Alertness, Regard or Readiness.....	16
10.2. Discussion of Attention.....	17
10.3. Discussion of Awareness, Consciousness and Perception.....	17
10.4. Discussion of Social Relationship and Attachment.....	17
11. General Forms of Information Flow .....	17
11.1. Genuine, subjective Winning of Information .....	18
11.2. Subjective Steering, Control and Using of IT-Applications.....	18
11.3. Communication .....	19
11.4. Cooperation .....	20
12. Discussion of Forms of Information Flow .....	21
12.1. Discussion of genuine subjective winning of Information .....	21
12.2. Discussion of subjective Steering, Control and Usage of IT-Applications .....	22
12.3. Discussion of Communication .....	22
12.4. Discussion of Cooperation .....	22
13. What makes Information precious? .....	23
14. Discussion of „What makes Information precious? “ .....	23
15. Summing Up all as a new paradigm .....	24
16. About Author .....	25
17. Competing Interests .....	26
18. Literature .....	26



## 4. Introduction

A supposed “over strengthening” of public health in common world of work and society is one main reason for this research paper. It’s not exactly proofable that Informatics is a source of such a negative effect, but Information Sciences try to find clues to manage the actual IT (Information Technology) as a positive fact of our society, because IT got inevitably a new real fact of our actual and future human life.

Information Science doesn’t want to give a single pragmatic concept for healing. That’s the area of a new created profession: Ergonom or Specialist in Occupational Physician. Existing diseases in organic or psychical way - caused by wrong usage of IT in office and private - can already be prevented or even healed by them.

In this paper some clues (in scientific form) are given. Beneficiaries of these researches are the purchaser, developer and user of IT systems and media. Bridges to Psychology and Sociology can be made easier. A welcomed method – but here not used - is to make interviews with all involved groups of people. Many existing results are already useful and very remarkable.

A new question is asked: How can we organise IT and Media Technology b y t h e i r o w n or i n t h e i r k e r n e l – to prevent mental or biological damage of Human Beings? Is this possible? The developed paradigm tries to be a general impact for future research and awareness.

The found terms are not new; they all exist already but were in danger to get lost, forgotten or ignored. The terms Data, Information could be defined in the last years nearly unifying for all sciences. Theoretical Physics seem to keep their special mathematically definitions (since SHANNON) – they are here used as special defining of Data.

The new science of Information (= Information Sciences) gets useful. The indispensable involvement of the Human Being in IT has to be condignly highlighted. This science was for first time defined already in 1968 (**BORKO H. (1968)**). A networking of informationscientific results can be useful in a rich amount. Beside Mathematics, Physics, Informatics additionally the sciences Psychology, Sociology, Communication Sciences, Systems Theory and Philosophy can be involved.

## 5. The new findings are compound to a scientific paradigm

The paradigm „Orientation of IT towards Human Being“ can be shown in 4 great elements:

- ⇒ The **Axioms in Information Sciences** are an empirically found, fundamental and general entry to Information Sciences.
- ⇒ Selective **Clues for each Information Event** are a unified and direct entry to every Information.
- ⇒ Common **Forms of Information Flows** are a usable overview.
- ⇒ Finally the question is asked: **How gets Information always positive and precious for Human Being?**



## 6. „Axioms“ in Information Sciences

These thoughts lead bottom up from praxis in IT to genuine theory (Philosophy, Information Sciences) for coming decades. The mental cut-set is scientifically founded, even historically. The defined term Axiom is nature scientifically, factually founded. Information Technology (IT) by itself is the source.

A philosophically-logically proof of these single axioms among themselves is not necessary. They are single, “true assertions”. Their contents are in our Age of Information - using the words Information, Data, Subject and Object in very manifold ways – a welcomed structuring and unifying of scientific terms. They are in their form new but not surprising.

### 6.1. *Informationscientific Axiom 1 (IA1)*

Data describe an Object

All Data in common are divided in only two groups:

- a) stored, materially existing, „dead“ Data
- b) „living“ Data, in living data carriers = Organisms.

Only one subset between a) and b) can be defined: the „**1:1-Data**“, named also as „**Data not distinguishable from nature**“ or „**documentations of reality**“ (f. i. documentary films, nature films, original voice storages and videos).

More differentiated structuring does not make sense on this level. It would be too complex because all Data of all existing IT applications or Objects in our time can't be organized in one unifying way.

Acknowledgement: Data themselves can be seen as Objects of our perception (f. i. documentations). That makes sense if no Object is existing - only Data about a fact.

### 6.2. *Informationscientific Axiom 2 (IA2)*

**Information is that content of an Object which is interesting for a Human Being.**

This term „Information“ can be used by this for first time unified – historically and actually. The relationship Information-Human Being is logically definable in form of an Indirect Conclusion:



**If a Human Being is not existent or involved no Information is created.**

Human Being is in this connection a synonym or every living Subject – reduced to his special evolutional level.

Information is so only that what a Human Being can recognize by his senses, what he can think about and what he can send to his surrounding in any way. Information doesn't have to be defined exactly detailed; it is an existing „something“, which is consciously recognized by a Human Being.

First scientific result: Data and Information are exact distinguishable.

### ***6.3. Informationscientific Axiom 3 (IA3)***

**The value of Data is defined by the Information included in them.**

Acknowledgement: Objects alone can be Data too (f. i. if only Objects and not yet Data are existent).

Great advantage of all three axioms is their generally usability in all sciences – even in Physics. SHANNON's Theory of Information gets so to a special mathematically formula for „binary Data numbering“.

For more background read **PLOCHBERGER Franz (2013)**.



Out of all these three axioms follow immediately

## 7. Informationscientific Postulates (IP)

### 7.1. IP1: Human Orientation (HO) of IT

Is a direct sequence to IA2 (necessary relationship to Human Being). User Centred Design (UCD), ISO 9241, Human Computer Interaction (HCI), Ergonomics et al. are existing terms in actual IT, but I think they are not enough general and targeted. Human mind and soul had been “conquered = influenced” by IT. We need therefore a paradigm change in IT. The little steps coming from market are too small. The Human Being in his cognition-evolutional, biological borders has to be centred consciously, - Information scientifically - as most active and living agent and as consciously deciding and creative part in IT. This postulate led intuitive to a wider paradigm as showed in this script.

### 7.2. IP2: Observation of Continuity as property

It comes from human Organisation (in the usage of C. MATURANA) and from human way of agitation. Human nervous systems and blood circuits - as most important carriers of „living Data“ in human organism - are genuine continual. They are flowing life. This property is actually totally missing in Information Sciences, f. i.:

- at *incompatible changes of Hard- and Software*: an additional, great economic expenditure is necessary and rare raw materials are wasted; sometimes even consciously planned obsolescence is done or
- at *long termed storage of electronically Data*: general uncoordinated, technologically new equipments are necessary; they are extensive and incontinuous too or
- at *sociological changes in working world*: they get more important by wrong usage of IT. A bad consequence is that unemployment and growing difference between poor and rich are existing facts of our high technological industrial society. No sociological counteractions are started yet - even as they are easier possible than before IT.

### 7.3. IP3: Usage of word *Information* in Science

Information by itself is „only something new“. The word is not new. But its usage is a sign that something new and unnamed has been found. Using the word Information in scientific connection activates:

- more exactly, new definitions of every new found situation and
- finally a new differentiated scientific term for every new found fact.

A conscious new contribution arises and a deeper mental reasoning can be activated.

Otherwise the new found fact will be forgotten again in short time or another verbal, not yet scientifically exact description will remain as open problem.



## 8. Discussion of Information scientific Axioms and Postulates

The real value of these „Informationscientific Axioms“ can't be evaluated high enough. The first impression is that they are simple but the importance in whole science is great. We are used to complex systems in nature science. These axioms are fundamental and not complex but unifying in most known sciences.

Information and Data get clearly differentiable as they appear in real nature. Information as known term since time of Romans exists continuously in our time too.

SHANNON's Theory of Information is sufficiently pointed out as too narrow. It's a set of genuine mathematical formulas in the theories of transmitting of electronically signals (which can now be pointed out as Data).

The indispensable relationship Human Being - Information (IA2) is a kernel of these axioms. The term axiom is justified by nature scientific evidence in our life today. No proof is necessary - only acceptance of facts.

One group of Data – the living Data – got very extracted but helpful term for understanding Neuro Sciences. Here Data carrier and Human Being is the same. IA2 from above has no importance for defining the term Information. The differentiation between (living) Data and Information can be made by the critical but separating term Consciousness (see following later on). Real Information needs human Consciousness otherwise we speak of living Data.

Latest research of the human brain - Neuro-Biology - can decide clearly between Consciousness and Unconsciousness. Living Data in our brain are the biological basis. The mental moment of first evidence of Consciousness is not definable so exactly – it's a genuine human-mental procedure. So getting Consciousness as human feeling is connected to getting internal Information about something new sensually recognised.

The postulates - following the axioms - are some general first examples for using these axioms. We will use the word Information in future too, but if we use it in scientifically connections we should be stimulated to define "that new-found-something" more exactly.

The terms Information or Data are no terms about their content or semantic. These are too manifold in their structure and not definable in a sufficient unified way.

But what seems important in future is the term "value" (of Data or Information).

## 9. Clues in every evidence of Information

They are genuine empirically found and are control points or topics. The used cognitive method by generating new terms is well known especially in Informatics and useful in every new and complex area.

Every procedure, flow or evidence of Information is happening between *Subject(s)* und *Object(s)*. *Subject* and *Object* as terms where used already in classical, antique philosophy. An *Object* is any item or matter which is recognized by a *Subject*. An expanding variation is the possibly of permanently, spatial inversion of the direction of Information. Therefore a



Subject is directed to one or more Objects (1:n relation) and an Object can be directed to one or more Subjects (n:1 relation). These relations can be *direct* or *indirect* about stored Data.

Paul WATZLAWICK (1921-2007), an Austrian-American Communication Scientist, Psychotherapist, Sociologist and Philosopher said: „*No (living) Human Being is able to communicate not*“. Used in our Information procedure: The (living) Human Being is permanently part of any procedure with flow of Information.

These clues in an Information event are

- biological and mental state of Vigilance, Alertness, Regard or Readiness,
- Attention,
- Consciousness, Awareness, Perception,
- social relationship and Attachment,
- special relationship between Human Being and IT-Hardware.

### ***9.1. Biological and mental State of Vigilance, Alertness, Regard or Readiness***

We need first *vitality* as basic biological state. It's banal, but genuine Information can be got or given scientifically only by a *living* Human Being (or an evolutionally reduced form of any *living* organism). A dead Human Being is a common dead Object only in a special shape, with defined features and properties and can't accept or treat Information. Simple example: only a living animal is able to recognise f. i. a dead one. Or: A unknown, never found, human corpse is so long no source of Information, because nobody (no living entity) has this Information – of course this change is if someone finds that copse.

Out of Philosophy well known terms can be related here: *the Being* (first time found by ARISTOTELES) or *the Existence* of a living Human Being.

The *biological vigilance or alertness* of a human being is a next step. A *sleeping* Human Being f. i. is reduced in his ability to treat Information; his body and mind is in a biologically resting, refreshing state.

Others, higher and a little bit more active human states are human *wakefulness or mental openness*.

*Mental readiness and mental ability* are other general human states. Human existence is signified by a permanent, biologic-sensual and mental activity – the human brain and the human nervous system transport permanently electro-chemical signals and biological messages tour brain and make it decidable.

Details are consciously not worked out in this paradigm; they are already wide areas in Neuro Sciences, Psychology or Sociology.

That's informationscientifically enough for our paradigm. A deeper differentiation would go beyond the scope and poise the goal.



## 9.2. Attention

A single transport of Information starts by an impact from outside or from inside the human being. The first appearance of an event

- from outside our brain and his recognition by a human sense or
- internal in our brain - every thought, mental activity or will

is named *Attention*.

Not every Attention to a physical object or mental thought evaluates to a conscious, biological result as a biological move-action or conscious report. Attention is certainly an evidence of “living data transport” in our nerves between our senses and brain. It starts mostly unconsciously and can be changed unconsciously by another, more interesting object or thought. It can get consciously by time. It can start consciously in some cases immediately (top-down, voluntarily).

A scientifically deeper going work about these brain-biologically facts can be read in **CHUN, GOLOMB, TURK-BROWNE (2011)**. On p 77 ff he makes a fine difference between External and Internal Attention – similar to the terms Attention in- or outside of our brain.

In another publication similar differentiation can be found: **PINTO Yair, VAN DER LEIJ Andries R, SLIGTE Ilja G., LAMME Victor A. F., SCHOLTE H. Steven (2013)**.

So some other possible, synonym adjectives for *Attention* are used:

- **inside our brain** or internal, endogenous, voluntarily, stimulus driven or top-down and
- **outside our brain** or external, exogenous, salient stimuli, goal oriented or goal directed, (spatial or conspicuously featured) or bottom-up.

Both groups are significant and therefore remarkable. In **PINTO Yair, VAN DER LEIJ Andries R, SLIGTE Ilja G., LAMME Victor A. F., SCHOLTE H. Steven (2013)**, p10 we can read about Dutch research results : “*Tests of a large and representative sample of the Dutch population provide strong evidence that two types of attention, bottom-up and top-down attention, are uncorrelated. This suggests that there are two independent attentional systems controlling these types of attention. We speculate that bottom-up capture is not contingent on top-down settings, and that bottom-up attention and top-down attention are differentially linked to consciousness*“.

The following procedure to these different starting-types of attention is common to both. In both cases the brain acts in the same way - here we can say “living data transport” is the biological background.

The combined state to Attention, the “result” of Attention is a *fix decided selection* of an object by all our senses. A once done selection can even be changed immediately and this can be done consciously or unconsciously.

Now the question is open: When is this selection conscious or unconscious? **LAMME V.A.F. (2004)** published his answer to this question. He and others give a view into actual human brain research and can show fine brain-biological facts differentiating clear the terms *Attention and Awareness or Consciousness*.



### 9.3. Awareness, Consciousness and Perception

LAMME V.A.F. (2004), p 870 could point out some neuro-scientific states in case of visual perception:

- a.) up to 40ms: a **visual input** is given to eyes,
- b.) between 60-80 ms: this input creates a **fed forward (neural excitation)** from eyes to brain; this happens **unconsciously** to Human Being,
- c.) between 100-150 ms: the fed forward reaches the proper extrastriate area in the brain (= visual area) and starts a **recurrent interaction** to eye and other regions (memory, motoric area, area for reasoning); when more than one stimuli are excited the whole neural net gets into the state of "**phenomenal awareness**" of all; to **one stimulus** possibly an **unconscious response** can be given,
- d.) between 200-300 ms: all neurons between **one selected stimulus** and the visual area in the brain are engaged in **higher and synchronic, recurrent interactions**; that **one Object** reaches the state of "**access awareness**"; a **conscious response** can be given to the selected object; all stimuli together remain in the state of "**phenomenal awareness**"
- e.) afterwards the selected stimulus is **stored into Working Memory**; other stimuli are stored in **Retinotopic Iconic Memory (Sensoric Memory)**

According to these precious, scientific results we can give clear differentiations of the terms Attention, Awareness, Consciousness and Perception. This way of thinking is very welcome in Informatics and Information Sciences:

**Attention** is the neuronal state of excitation by one or more objects from first evidence up to the moment of selection. By selection the Attention is finished. Attention can be unconscious or conscious.

**Awareness** is divided by LAMME into

- **phenomenal awareness**: that's an unconscious "sensing" of our neuronal net; it senses different happenings of stimuli for our senses and
- **access awareness**: is the name of the state after deciding, which stimulus has been selected and to which stimulus recurrent interactions are started.

**Consciousness** is starting by LAMME at the neuronal starting of recurrent interactions between brain areas and sensoric organs. Besides this neuronal definition he differentiates *a mental consciousness*. It's remarkable that he separates this genuine human, mental state.

**Perception** is in my point of view the mental recognition, reasoning and storing in Long Time Memory of any fact of our surrounding.

For this paradigm only that real connections and thoughts are valid which evaluate to a **conscious flow of Information**. In the axioms above Information is defined as conscious reaction of a Subject (Human Being) to an Object. All unconscious reactions or impulsions can be categorised in IS (Information Sciences) as *biological or living Data transport* (**PLOCHBERGER Franz (2011), p 9**). This differentiation makes IS very useful.



It's not recommended in IS to call an evidence of Information a "process". This term is too technically or juristically. In IS it's better to use the words: procedure, event, evidence, flow or like LAMME – an interaction. So the living, biological background is better signified.

At all these flows of Information the Human Being has to be seen **as one whole entity consisting of body and mind**, with all his perceptions by all his senses and abilities – or as we say in positive Psychology **by his whole soul**. That's important later following parts of this paradigm.

#### **9.4. Social Relationship and Attachment**

The flow of Information can be divided between more than one sender and receiver. In that case the intensity or amount of Information is split too. Mihály CSIKSZENTMIHALYI (born 1934 in Rijeka, Croatia, living in USA), a well known positivistic Psychologist of our time, could point out, that the human being is able to communicate in best way with one human dialog partner – maximal with two (**CSIKSZENTMIHALYI Mihaly (2004)**, second half).

In IS (Information Sciences) we can take the word "relation" from classical Mathematics where it's taken from Latin "relatio": genuine topologically *2 or more points* in a plane or in a room can have a *relation* between each other. This *relation* exists or doesn't exist.

Here a *relation or relationship* can be seen as sensually, cognisable connection between Subjects or between Subjects and Objects.

Information can't exist without Human Being. In Psychology, Sociology, Communication Sciences or Economy the term *relationship* is well known and has an important, fundamental meaning. That may be sinful in Information Sciences too.

It's realistic in IS to differentiate this term a little bit more in

- social relationship *between Human Beings* and
- relationship between Human Being and machines, computers or media (see next chapter).

In Sociology (**f. i. DÖRING Nicola (2003), p 405**) and Psychology (**f. i. TRIMMEL Michael (2003), p 93-96**) these social relationships – between Subjects – are treated extensively and detailed. This is done in an interesting way in both sciences nearly in the same meaning.

**Social Relationships** (between Subjects) can be differentiated by their *function* into

- **formal (factual)** and
- **personal** relationships

and both again by their *subjective meaning* in

- relationships with **strong (narrow) attachments** and
- relationships with **weak (loose) attachments**.



#### 9.4.1. A Formal Relationship

exists between Subjects which are involved in *Systems of Functions*. These single Subjects have in themselves *preset duties* and *roles* and are supposed under *one main goal* (f. i. political agitation of opinions, economical profit or public administration). All involved Subjects are organised in a preset *hierarchy*. Personal Relationships (f. i. Sympathy or antipathy) are consciously reduced; in Formal Relationships transport of Data, goods and orders is important.

Depending on duration and mental depth of a formal relationship they can have

- **Weak (Loose) Attachment:** f. i. customers, colleagues at work, political party members, state residents or
- **Strong (Narrow) Attachment:** f. i. experienced working colleagues, committed political party members, active state residents, regular customers or physician-patient-relationships

#### 9.4.2. Personal Relationship

*Attachment* - a mentally deeper going term – gets now important. It includes an additional feeling and emotional meaning. It can be genuine psychologically - in a single Human Being or socially - between Human Beings. Variations can be

- genuine on the surface,
- for a short time,
- can go deeper into consciousness,
- can exist for a long time or
- can even stay for whole lifetime.

In these Attachments formal roles and clichés are hindering. The Relationship gets more free, manifold and first of all more human. Counting values are: sympathy, antipathy, trusting. The Relationship by itself is cultivated.

In mental depth we differentiate here too between

- **Weak (Loose) Attachment**  
f. i. neighbours, loose contacts and
- **Strong (Narrow) Attachment**  
f. i. a parent-child Attachment, a personal friendship or a long termed love Attachment.



## 9.5. Relationship between Human Being and Machine, Computer or Media (IT-Hardware)

This *Relationship* has been researched since beginning of Information Technology (IT) in about 1950 by SHANNON, ZUSE, VON NEUMANN or since beginning of IS by finding of worldwide Internet in 1989 (Tim BERNERS-LEE).

It's roots can be found in beginning of US-American industrialisation of human-machine-working processes. **Frederick Winslow TAYLOR (1856-1915)** started to research this working area systematically. The result is named to him as „Taylorism“.

On one step further, during the 1<sup>st</sup> World War, in US-America research of working processes went on. Especially the relationships between soldiers and (weapon-) systems (Human Being - machine relationship) was started to be researched scientifically. The term „**Human Factor**“ (HF) was created. Some medicals and bachelors tried to find new mathematical and systematically rules. The knowledge of engineers building aeroplanes or boats was combined with knowledge of Psychology (f. i. amount of errors, necessity and organisation of professional trainings). See in: **MEISTER David (1999)**.

This way of thinking was continued after 2nd World War in western nations: England, France, Germany and last not least with political attributes in Sowjet Union. They started a continuation in civil working world. So a new science was created: **Ergonomics or Occupational Medicine**. Today even a new profession is created: Ergonom or Occupational Physician (a combination of engineer and physician “medicus”). In most universities this knowledge is taught today.

This present paradigm is a continuation of these researches in IS and IT. So a new general and scientific way into development of future IT and media should be found. The *Orientation towards Human Being* is necessary because the Human Being in his whole biological evolution has a very slow change time. On the other side the technologically cognitive evolution is very fast and gets manifold more and more – with no end.

Every *relationship* between Human Being and machine can be seen as relationship between Human Being and a user-screen. Nearly all complex machines have on her user-surface an electronically user-display.

The involvement *Attachment* in IS is till now not yet researched exactly. It appeared not yet in MCI (Machine Computer Interface) - or UCD (User Centred Design) – research. It's used here for first time in IS.

The relationship between Human Being and machine and especially Human Being and computer and media is definable as *formal relationship* (orientated to a goal or purpose, given by a special Human Being – the owner of a system).

The created *System* is a *System of Functions*. Every *Function* has its predefined duty. All *Functions* serve to a *Main Goal* which was preset by the *Owner* or *Purchaser* of a system (f. i. state, bank or trading office). It can be

- closed: Subject uses a programmed and tested IT-Application,
- open: Subject uses WWW or a Social Network (Facebook, Twitter).



The *Attachment of a living Subject (Human Being)* is bordered by human biologically and mentally senses. Treatment of them can get singularly to heavy. That can create *addictive behavior* (**DÖRING Nicola (2003), p 304 ff.**). These and other dangers should be prohibited by IT and Media. Till now we have no solutions. Only commercial factors control the design of new developments. Developed will be what can be sold.

We have to see the Human Being generally (= biologically and mentally)

- on one side as **real creator and user of IT** and
- on the other side as **border of IT and Media**.

Into direction of IT and Media – into physical technologies – no borders can be seen in future.

In the other possible direction – into Human Being – here in a selective and conscious way has been started. There are biologically and mental borders and necessities. That's fixing till now.

## 10. Discussion of these Clues

Using these clues shows that the material of research is very wide and complex. The extraction of clues is per se one of many possible ways of research.

Different ways of thinking between Information Sciences, Informatics and Neuro Sciences, Psychology or Biology get involved by this style.

In Information Sciences – including Informatics - conceptional methods are desired and will be developed. Clear structured systems with well defined relations and terms are the goal. The result is a new created or artificial concept.

In Neuro Sciences, Psychology or Biology we have a complex, pre-given biologically organism – the Human Being. We only can try to describe him or she. So the result is not so clear structured but manifold and complex – as nature of organism and human brain is. We can find empirically some characteristic facts and their conditions for existence; we can't define mathematically clear relations.

So these clues are useful as mental guide. No complete result can be reached. But every single clue is a genuine help in treatment of any evidence of Information.

### 10.1. Discussion of biological and mental State of Vigilance, Alertness, Regard or Readiness

That's an often used clue in Philosophy, Biology, Psychology, Social Sciences or Communication Sciences. It's good to let it in the area of these sciences, because it has been and is researched many times there.

It's important in Information Sciences that a permanent "State of Being of a Human Being" - as individually living Subject in nature – is so signed out. We can say: existence per se is a separate topic.



## 10.2. Discussion of Attention

This can't be seen as a permanent state. It's a *single, mental event or change of situation*. For deeper researches Psychology, Sociology or Communication Sciences are again good guiding on.

In Information Sciences **Attention** is a **point of beginning of temporal or spatial flow of selective Information**. The decision for permanent exchange between two or more **dialog partners** comes from the involved Subjects themselves. They can decide in every moment to start a new - more interesting - dialog. The old one has no importance since that moment. Attention can be started consciously or unconsciously and is finished by a final selection.

## 10.3. Discussion of Awareness, Consciousness and Perception

This area is very new described in upper chapters. Neuro Sciences und Human Brain Research are very much enlarging sciences and are have a very high degree in actual Life Sciences.

What is described may be naturally founded and therefore valid in near future too. But much more differentiations and fact can be expected permanently.

## 10.4. Discussion of Social Relationship and Attachment

Those are most worthy terms in the evidence of an Information event. They come from Psychology and Sociology – in the same importance.

These terms can be better defined in German: Relationship = Beziehung and Attachment = Bindung. The terms in English are not unified – as the author could research it till now. In German they are unified defined.

Remarkable is that these terms existed already before IT. IT has changed the usage of them but they are very important for human mental feeling and health. It's the kernel of this paradigm to remind them and consider IT to take more care on their importance.

# 11. General Forms of Information Flow

Here exchange of genuine Information is treated. Not every started Information procedure can be finished under the same conditions as started. Each of them can be substituted in short mental speed – speed of human consciousness – by a new, more interesting event.

All till now in last chapters described steps (Awareness, Attention and Relationship, Attachment) appear always. They are evident in every flow of Information.

Every genuine Information exchange can be differentiated in

- genuine subjective winning of Information,
- subjective steering, control and using of IT applications,
- communication and
- cooperation.



### 11.1. Genuine, subjective Winning of Information

The Human Being wants to win genuine factual Information. A *flow of Information in direction Human Being* is the goal. The Subject Human Being can analyse found Data or Objects, perhaps reorganise and store them individually. He or she can use Software and Hardware as tools for storage of texts, sounds or pictures. The technological organisation form of WWW (Worldwide Web) is f. i. the largest existing Data pool. By worldwide unified "standard address forms" a not countable amount of storage locations can be tapped.

Between Human Being and computer or media a *formal Relationship* is valid. An *Attachment* of a Human Being is avoided in this case because it arises unconsciously only. It can reduce the human behaviour in an unrecognised way or even dispossess his consciousness of his habit. That can evaluate to a sick addiction (**TRIMMEL Michael (1994)**).

On the other side *organisatoric knowledge* („*Know How*“) can be built up consciously: f. i. how informative Data sources can be reached. The best known example for this is Wikipedia which is organised by Key Words. The **Topic-Thinking or Key Word-Thinking** has got useful and important.

It has got important to organize the used amount of Software and Data by yourself. **Data Mining** has got a new topic in IT. An access of an **unlimited amount of Data** is possible now. **The personal assessment and judgment of the quality of this great amount is a new mental challenge.**

The cognitive treatment of **Knowledge Acquisition** has been changed by IT in a fundamental way. Found Data can be easily reorganised and they are easily restorable in single individual manners. Maintenance of Data **brings motivation to win out of it as much Information as possible**. The won new Information can be carefully stored (in human memory and physically on individual storage media) as worthy **individual knowledge**.

One legacy treatment in Knowledge Acquisition is the **Repetition**. We need enough time for it. Winning of time is not important in this case. We stay Human Beings – with computer or without computer. Our brain can't work faster if we learn new Information out of new Data. A *repeated access* has got easier and faster. But the Human Being has to take consciously time to organise the new Information in his mental **Memory**. **Joy about new learned knowledge** has to be reached. We need the feeling that the heavy work of learning has success. Our new learned knowledge brings this joy if we can represent our new knowledge in our social society.

Arising *stress* must be changed every time in *Eustress*. This has to be intended more consciously if the amount of Data and their complexity is growing. Not caring of these facts brings a mental regression even by using latest IT-Software-Tools for it. Fascination by a technological update is no worthy substitution. Only the felt and experienced joy about new knowledge is the goal.

### 11.2. Subjective Steering, Control and Using of IT-Applications

This form of Relationship between Human Being and computer since the 70<sup>th</sup> of last century has been the original one before Internet. The Human Being creates and steers a Software Application beginning with its ordering and design, till using it and permanent maintenance.



It's characteristically that developing *IT-Specialists* are a lot higher motivated than the IT-Users who get educated in the finished product. Creating of software is much more difficult than using it.

Economic earnings of every IT-System with its Users and its Maintenance Personal come finally by its using.

The won joy after the creating phase is on side of Owner and User. **This joy of creativity changes to a joy of economic profit** (f. i. an Online System of a Bank or an App on a Smartphone).

In all cases flows Information into two directions:

- ⇒ *from Subject Human Being away* in form of steering and control of an IT-Application and storage of Information in Data in Hardware-Media and
- ⇒ *into Subject Human Being* in form of machine-made result-Data containing easy understandable Information (text-forms, sounds, graphics or pictures).

What we need to know is that the Human Being has to be the most important factor – not the machine. Even if we have human-machine systems we should not forget that Human Beings have created them and can organize and change them. Our created machine-systems can have better and faster performance than a Human Being. A Human Being has biologically and mental borders – a machine can be created as dead system as far as we need. The Human Being has to be able to live with the amount of products of such a system and should – again – be glad about these results.

### **11.3. Communication**

is a two sided, interhuman and social event. It's an inborn human ability. The positive impacts between two communicating persons are the greatest mental benefits we can reach in IS. Only a possible negative Information content in this communication is able to demotivate the dialog partners. But in that case the negative value will be tried to get humanlike manageable.

The modern electronically technology has *changed the form of communication*. In parts it has got better, but seen from a human point of view it has got worse.

Improved have been f. i.

- the possible spatial geographically distances between the dialog partners, factually all over the planet Earth and outside of it or
- the easy establishable *small meshed network* between all possible dialog partners.

In parts the informative impact has been reduced by usage of selective speech in Telephone or only letters in Emails. These have been technologically revolutions in their creating time. But today they are much used facts which also decrease the **interhuman dialog quality**. They are used very much; they are even state of the human life.

But the not used human senses in theses dialogs are open for uncoordinated and unrelated impressions. The permanent usage of Telephone and Emails gets so side effects which can possibly reduce the genuine compounding benefit of Information winning.



Smell and taste is not (yet) communicate able.

Combined forms of Data transfer – like Videos – make optically and acoustically communication at same time possible. This communication form is nearer to the naturally, direct interhuman form of communication and therefore richer in human Information. Personal Relationships and deep Attachments can be built up better. They can get maintained and long termed – we say Information gets “human precious”.

By technologically necessary storage in Data form appears some uncertainness in connection to confidence and truth of “*personal Information*”. In most cases a lot of technologically work and costs is appearing by confidential transport of Data. In reality the western states and state-communities have created their own laws for Data protection. They defined person-related Data as signified amounts. But till now not enough laws *between* states are valid and these laws have not yet their power (f. i. between EU and USA or Canada and inside these communities). Our leading western industry society is actually not able or willing to protect person-related Data confidentially.

Last not least we shouldn't forget legacy human character- and intelligence-properties. Every change of media technologies can also be used in a criminal way if the using society can't protect herself against this fact at every time. Deeper going investigations in Ethics, Sociology and Communication Sciences will stay important in future too.

#### **11.4. Cooperation**

is the most complex and rich form of human work together. It needs

- active coordination of whole body (including muscles),
- trained stuff in using equipments (physical world of working, machines, computer),
- Formal or Personal Relationships,
- existing (interhuman) Attachments,
- exchange Objects (in some cases only Data) which fit together and
- subjective abilities and skills which are coordinated.

If these points are observed a useful community of cooperating Subjects can be built. This community is more than a crowd of single individuals. Arising competition intern this organised community – even as sporty ambition – has to be reduced. A cooperative, **unified and positive thinking** is the precious goal. It's a heavy mental work to motivate all members to a good cooperation.

So forms of Relationships on a high level get valid. They include Sociology and Business Management. Despite existing most up to date Media it's difficult to reach a positive cooperation and to keep it for a long time.

Necessary to reach this goal are

- a personal structure of fitting skills and abilities,
- socially trimmed members,
- a subtle leading of them,
- satisfying, correct gratification of single (bodily and mental) efforts and
- building up confidence and trust of all cooperating partners.



The most precious value in such cooperation is **the interactive confidence**. It can be reached over many interhuman dialogs. Much empathy and experience has to be in these human cooperation structures and they have to be cultivated.

IT and Media are today common tools in these structures. It's important that **every member gets individual training and gets carefully upgrading of his individual skills** if new equipments are involved.

More refinements can be found in already existing sciences. This paradigm is an orientation for the future of IT. **Information Sciences** have to get more human in order to stay valuable for a long time. IT and Media will change in very manifold ways. These clues will be valid for ever because they are orientated towards Human Being and are organised for the well-being of all people as long as they exist.

## 12. Discussion of Forms of Information Flow

Information as defined unified in above axioms; it is the value which is investigated by Information Sciences and is treated and stored automatically in form of Data in Information Technology or Informatics.

Only the Human Being is able to accept Information (from a Machine or from another Human Being). Only he is able to reason about this got Information. Only he is able to create new Information and give it to other Human Beings to transform it into Data and store it in Computer or Storage Media.

**Information is a sign of life.** All living creatures are – according to their evolutionary state – involved in Information.

### 12.1. Discussion of genuine subjective winning of Information

The genuine subjective winning of Information is a high aim of every Human Being. Curiosity is a native human property. The more Information can be won the more satisfied is a Human Being.

By actual management of IT and Media we can recognise more Information than we can treat in facts. A reasoning about new Information needs a conscious *Attention*, an exactly recognition, a *comparing* with knowledge in own *memory*. *Ability to assess the worth of Information* has to be a mental property.

The understanding of Information, the ability for arranging of Information is for every Human Being a positive, joy bringing event and is therefore desired ("Eureka Effect" or "Aha Moment").

It has to be explicitly recommended that the amount of stored Data is not finite. **The Human Being has to know what he searches and where he can find it.** By IT the possibility to access Data got very easy. At the same time the Human Being recognizes very soon the borders of his own mental abilities.

IT of future seems to be without borders but not out of order. It's only notable that it must be a benefit for Human Being and shouldn't hurt him or her. Sociology and Ethics stay important.



## **12.2. Discussion of subjective Steering, Control and Usage of IT-Applications**

*Steering and Control* of IT-Applications in our Computers or APPs on our Smartphones is a human motivating activity. He or she can „use“ something what is useful and the user has no effort by developing it. He gets a ready “tool”.

The *Relationship* Human Being-Computer is genuine *formal* and shouldn't create a subjective *Weak or Strong Attachment*. Usage of a computer for a Human Being should be like a conscious usage of any tool.

The organisatoric Know How in treatment of an application has to be learned at the beginning by training and is real skill. It rises by time of using a system („Learning by Doing“).

*Result-Data* of a Computer or any used electronic instrument should be as human organised as possible. A Computer is no Human Being. Unvarying formats, texts, sound files or videos are useful, easy understandable forms of Data for a Human Being.

A positive human motivation is *creating of these applications*. What is necessary for doing it is a solid based knowledge. In earlier times of IT (1970 and later) this knowledge was trained by companies - today it's trained by Universities and Colleges.

## **12.3. Discussion of Communication**

Interhuman social communication is the most human form of communication.

Today it's important to highlight it because we are already used to Media and IT. A support by electronic instruments includes a restriction of *usage of all our senses at the same time for the same problem*. We should change all electronic Media in that way. Our evolutionary developed abilities base on usage of all senses at the same time. We can't change our evolutionary properties like IT-Hardware. Communication by Handies and Emails f. i. should be substituted soon and simple by Videos.

The useful terms *Relationship* and *Attachment* are impacts to consider our modern Communication. A direct and personal Face-to-face-Communication – as best form - has to be still our goal.

Technical fascination by even highest up to date electronic instruments can't substitute personal human talks. As User of such instruments we shouldn't get headless sufferers of up to date methods of professional advertising. They have as goal the commercial winning only and not the *winning of human quality of life*.

## **12.4. Discussion of Cooperation**

Cooperation comes from Latin *co-operare*, what means „together-work“. In this case our whole body is involved. Every Human Being is challenged fully – with body and mind – and gets so his best success-adventures.

Coordination of many individuals beyond one common aim is a difficult and responsible work of personal leaders. Doing this needs an inborn talent and carefully training.



Interhuman Information exchange has been strongly condensed by new Media. It's much more difficult to hide own or even egoistic benefits. Social enhancements have to be protected against legacy power structures. We need Sociology for organization of a better divided ownership and no more constructive difference between rich and poor. These structures should base as much as possible on **truth and confidence** and be as **long termed** as possible.

Despite these clearly chances for a fairer and more human world the **dangers of misuse** have increased too. The possibility to prohibit Information or to change it is used very much too. We have to fight consciously by *more common technological easing*. Genuine **Information has no borders; it's inborn to Human Being**. So it will be necessary only to enforce the positive Human power. Destroying intentions will be highlighted soon by our new IT-society. But we have to motivate the positive thinking in future too (Ethics). If we can do this by free management without pressure from commercial interests we are on the best possible path (f. i. Open Source, Open Science).

### 13. What makes Information precious?

That question is the final point of this paradigm. It's a big benefit of this investigation that we can answer this question clearly and considerably.

Pure *Formal Relationships* base on Information about goods, money and structures. These relationships have to base on *confident and true Data*. They have to be *complete and consistent*. Then we can speak of *precious Data* which are the base for our *precious Information*.

Pure *Personal Relationships* are precious if they are basis for confident and deep interhuman relationships.

**We can say: Information is precious when a Personal Relationship between Subjects (Human Being or any living entities) can be created, made better and deeper.**

The term *Attachment* gives us *precious answers* too. A preferably *Deep (Strong, Narrow) Attachment* is very precious in a Personal Relationship. If an Attachment is loose a manifold network between - preferably as much as possible loose connected persons - is precious.

But an *Attachment between Machines and Human Being* should be prohibited, because it appears unconsciously. If we recognise it we should reduce it consciously.

What is *precious* in this connection we call *Know How*. This gives positive **on pure knowledge based feeling of self-worth**.

### 14. Discussion of „What makes Information precious? “

The term Information needs per se the Human Being as we know from above. IT as summary of all electronically devices for Data transport and Data storage serves generally this goal „Precious Information“. But IT has human weaknesses we should know.

Information has first of all a direct interhuman value. If it is sourced in a Relationship Human Being – Object it “gets its value” by the Human Being. It's an inborn goal of the Human Being



to get Information and to realize something special and surprising. This can be a pure formal and materialistic value (Information about found treasures, goods, new materials) or pure social interhuman values (Sympathy, Quality of Life, Joy and Trust).

Only the Human Being is able to asses Information. He or she only decides how to act in their surrounding according to his or her knowledge, feeling well and internal goals. That will stay in our Age of Information! Machines and systems are helping equipments for the Human Being and never should be allowed to hurt him or her. We have to consider this consciously and remember it permanently.

These now enlarged Information Sciences have to promote the „Be like a Human Being“. They never are allowed to diminish our human species, kernel and kind. The human species can change his biological properties in evolutional time intervals by whole nature. We have to take care on this fact. The mental abilities (knowledge, memory) can change by own mental energy and will in very shorter time steps.

## 15. Summing Up all as a new paradigm

It's worthwhile to develop a paradigm out of a set of terms which makes great connections in modern sciences for easier understanding of our present time. This new paradigm opens an elegant access to IT on coming decades in style of a new remembered science: Information Sciences.

It can be shown that SHANNON's term of Information out of the 50th of last century has to be enlarged into more sciences today. SHANNON's Information is still valid as mathematically and physically term but has been seen wider today. We see it in Information Sciences as term about the probability of physically Data structures per se and their transport. HARTLEY - living in time of SHANNON has already found this problem and excluded it as „psychological considerations“ (**PLOCHBERGER Franz (2007,2011)**, p 6).

The mathematically and physically Information term has been enlarged in modern Information Sciences by humanistically (biologically, psychologically) and social areas. IT of our time has got so important in our whole world of work and life that we have to investigate more about the relations between Information, Data and the Human Being.

A selected set of old and new terms in Physics, Mathematics, Psychology, Sociology, Philosophy, System Theory, Informatics and Information Sciences is connected. The goal is to compound these terms in this paradigm as scientific base for the future of Information Sciences by fixing and showing of unified and clearing connections. Informatics or Computer Sciences are sciences of structures, Information Sciences research more abstract and wider unified terms which have their sources in Human Being and whole nature.

In the first part of this paradigm consciously provoking „Informationscientific Axioms“ are formulated. The word „Axiom“ was chosen because *no additional mathematically proof* had to be done. Its usage is justified by its factual and real appearance in present time.

The present unclear amount of meanings of the terms Data and Information has got unified and unique now. The value of this paradigm for IT and Information Sciences is not yet recognised by all scientists enough but will come surely.



In second part an „Information Event or Evidence“ is described in some characteristic clues:

- Biologically and mental state of Alertness or Readyness
- Attention or Wakeup Call
- Consciousness, Awareness, Perception
- Relationship (Relation), Attachment
- Relation between human being and IT-hardware

These clues are a worthy amount of terms to get this Information event researchable. They always appear.

In third part general forms of Information flow are pointed out. The aim is to orientate the Information Sciences to kernel and valid elements, which stay important in future too. They are consciously not detailed.

Finally a single question is asked: What makes Information „precious“? In this connection its elementary relationship to the Human Being is shown. Therefore we can ask about the value of real Information. The found answer is useful for future Information Sciences.

## 16. About Author

The education of the author is based on Austrian Humanistic Gymnasium (with Latin, Old Greek and much European Philosophy). A real „challenge“ has been studying of on exact Mathematics and Physics based science at University of Technology in Vienna. The mostly commercial benefit of this has lasted some decades. The mental necessities, educated openness for Quality of Life, finding of sense of life and human values brought soon new questions.

The pure materialistic revenue lost his value. The learned profession as Business Analyst in IT (Information Technology) in connection with great Mainframe Computers was not able to give enough challenge. As the author got older the new educated specialists in modern IT couldn't believe that he was still up to date in his profession. Own learning's got no value; only expensive certifications got important but he didn't want them.

That motivated the author to start a general new level as scientist. Pure scientific interests have not been new for the author. At the end of his study it was recommended by his teachers for science already but the payment was too low. 30 years experience in applied IT-Industry has brought beside a solid base for life a realistic point of view in academic IT work. Finally the mental challenge was not satisfying enough.

A general theory-based, scientific new start brought new motivations. The new found results have been a little bit naive at the beginning but in pure nature science and in these generally new Information Sciences this fact was no bad thing. Now – after about 10 years science work – the publications of the author are read all over the world and his scientific value is slowly rising.

As Information Scientist the author is not yet well known. But his “Orientation” for the future of IT and human society seems to be useful. The real value of this paradigm and other scripts will be decided in future - as it is in every scientific life.



## 17. Competing Interests

The author declares that he has no commercial competing interests.

## 18. Literature

**BORKO H. (1968)**, Information Science: What is it?, American Documentation (pre-1986); Jan 1968, I; ABI/INFORM Global, pg. 3

**CHUN, GOLOMB, TURK-BROWNE (2011)**, A Taxonomy of External and Internal Attention, by Marvin M. CHUN, Julie D. GOLOMB and Nicholas B. TURK-BROWNE, Annual. Rev. Psychol. 2011,62:73-101, 2011

**CSIKSZENTMIHALYI Mihaly (2004)**, What makes a life worth living? , TED-Talks Videos (2004): [http://www.ted.com/talks/mihaly\\_csikszentmihalyi\\_on\\_flow.html](http://www.ted.com/talks/mihaly_csikszentmihalyi_on_flow.html)

**DÖRING Nicola (2003)**, Sozialpsychologie des Internet, 2.Auflage, Verlag Hogrefe Göttingen, 2003, ISBN 3-8017-1466-7

**LAMME V.A.F. (2004)**, Separate neural definitions of visual consciousness and visual attention; a case for phenomenal awareness, Department of Psychology, University of Amsterdam, The Netherlands, 2004, [www.sciencedirect.com](http://www.sciencedirect.com), Neural Networks 17 (2004), pp 861-872

**MEISTER David (1999)**, The history of Human Factors and Ergonomics, 1999, Lawrence Erlbaum Associates, Publishers, Mahwah, NJ 07430, ISBN 0-8058-2769-2

**PINTO Yair, VAN DER LEIJ Andries R, SLIGTE Ilja G., LAMME Victor A. F., SCHOLTE H. Steven (2013)**, Bottom-up and top-down attention are independent, Brain and Cognition, University of Amsterdam, The Netherlands, Journal of Vision (2013) 13(3):16, pp 1–14, <http://www.journalofvision.org/content/13/3/16>

**PLOCHBERGER Franz (2007,2011)**, NYQUIST,HARTLEY,SHANNON, Skriptum, Wien, 2007 und 2011, Eigenverlag, <http://www.plbg.at/Werke/deutsch/NYQUIST,HARTLEY,SHANNON.pdf>

**PLOCHBERGER Franz (2011)**, Neues Paradigma in der Informationswissenschaft, Skriptum, Wien, 2011, Eigenverlag, [http://www.plbg.at/Werke/deutsch/Neues%20Paradigma%20in%20der%20IW%20\(Ausgabe2\).pdf](http://www.plbg.at/Werke/deutsch/Neues%20Paradigma%20in%20der%20IW%20(Ausgabe2).pdf)

**PLOCHBERGER Franz (2013)**, Informationswissenschaftliche Axiome, Onlinepräsentation, Wien, 2013, Eigenverlag, <http://www.plbg.at/Werke/deutsch/Grundlagen%20der%20HO.pdf>

**PLOCHBERGER Franz (2014)**, Neue Begriffe der Human Orientierung (HO) der IT, Online Präsentation, Wien, 2014, Eigenverlag, [http://www.plbg.at/Werke/deutsch/Begriffe%20der%20HO%20\(2014\).pdf](http://www.plbg.at/Werke/deutsch/Begriffe%20der%20HO%20(2014).pdf)



**PLOCHBERGER Franz (2014-1)**, HO of IT: Historical backgrounds, Eigenverlag, Wien, 2014,  
[http://www.plbg.at/Werke/english/HO%20of%20IT%20Historical%20backgrounds%20\(2014\).pdf](http://www.plbg.at/Werke/english/HO%20of%20IT%20Historical%20backgrounds%20(2014).pdf)

**TRIMMEL Michael (1994)**, Computertätigkeit und Realitätsbezug, Seite 224-228 in Psychologische Forschung in Österreich, Universitätsverlag Carinthia Klagenfurth, Hsg. Herbert Janig, 1994, ISBN 3-85378-434-8

**TRIMMEL Michael (2003)**, Angewandte Sozialpsychologie, Manual, Facultas Verlags- und Buchhandels AG, Wien, 2003, ISBN 3-85114-779-0