Cognition of Information System Control as Metalanguage (COINS)

Yngve MONFELT
Department of Computer and Systems Sciences, Stockholm University
Kista, SE-164 40 Sweden

ABSTRACT

Information systems are treated as socio-technical systems for achieving some context relevant and consensual impact or effect through exchange of messages in the global marketplace. Hence, the systems have to be developed and implemented with respect to the spiritual system parts', perception of cultural disparate or contextual content realities. The complex meta-system; i.e., the Internet providers have to know and cognize how to transparently satisfy cultural disparities for what realities are requested by the parts in the virtual market. Internet, as enabling system dependability, is supposed to be the driving factor for global prosperity development. So, the prosperity sustainability complexity language can relay on the language for management of a complex, but not necessarily complicated system; e.g., Internet control as meta-language.

Keywords: Cognition, Information, System, Control, Language, Dependability.

PRESUPPOSITIONS

The Figure 1 socio-technological (SOT) system model is aimed to message an experienced general view on a system of entropy reducing [1]: (Miller, 1978; p. 16) processes being impacted of its environmental events. In particular, the model can represent realizations of "Technology and Industrial Innovation Management" [2]: (TIIM, 2011) proceedings as textbook objectives for sustainability efforts' dependability with respect to [3]: (UN, 1948) Human Rights declaration meaning.

The abbreviations —listed in the final paragraph— are for exemplifying how introduction of a meta-language and generic use of it for strategic 'can be', tactic 'shall be' and operation 'is' challenges questions of real effect of message exchange.

The requisite variety width (RQW) idea is based on the meaning of requisite variety in [4]: (Ashby, 1999). The RQW cognition is achieved per entity (ETY) identity (IDY) function through Bloom's taxonomy application [5]: (IEEE, 2004), [6]:

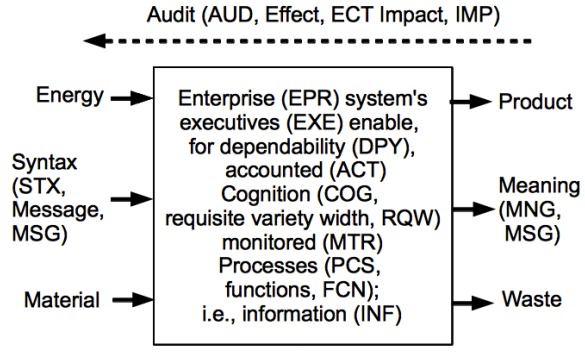
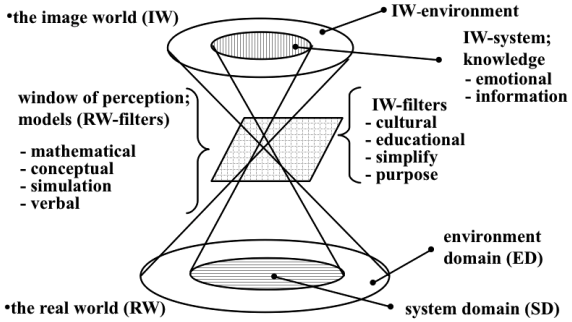


Figure 1. The contextual (CXT) system model concept



Kjellman 2003, pp. 118, fig. 4.2, 4.3, 5.3, 5.4 merged & modified

Fig. 2. Cognition (COG) filters [7, pp. 117-124, adapted]

(IOWA, 2009).

Realizations depend on an enterprise (EPR) executive entity's contextual perception of realities according to Figure 2 [7]: (Kjellman, 2003; pp. 117-124, adapted). Each spiritual, as well as technological (TEL), authentic ETY_IDY has to be authorized with respect to cognized RQW concerning the real world [8]: (IEA, 2007) events and access to dependent abilities as assets.

The authorization process is de facto accreditation relatively to a, in policy, stated evaluation level. For feedback, each ETY_IDY behavior has to be monitored (MTR) and taken in account (ACT) when auditing (AUD) of the environmental events:
"If a system's negative feed-back discontinues and it is not restored by that system or by another on which it becomes parasitic or symbiotic, it decomposes into multiple components and its supra-system assumes control of them." [1]: (Miller, 1978; p. 110, hypothesis 5.6-1)

Trust as a dependability feature
Dependability (DPY) is a basic for sustainability. It is about reliability in trust as a confidence asset:
"Mutual understanding as 'Trust' between the Agents of Change [communicating parts]:
1. The two parties have faith in each other's recommendations.
2. Each party is sensitive to the motivation, aspirations, and values of the other party.
3. Each party understands its own decision-making process as well as of the opposite side.
4. The "implementer" [imperative implementer as provider, P] is involved in the formulation of [policy, PCY] goals in order that his recommendations and programs bear relationships to the [quality of service, QOS] needs of the recipients [customer as questioner, Q].
5. The recipients [Q] are involved in the preparation of plans and programs so that they bear relation to their own perception

of [RQW cognition] needs and [evaluation level] scale of values.
6. The agent promoting [P] change is capable of placing himself in the position of the recipients [Q] and of "thinking" like them." [9]: (Van Gigch, 1978; p. 401)

Security through certified dependability
A de facto expression for information security is: ISC {confidentiality, integrity and availability}. For the conceptual Figure 1 context, that expression is not enough because any operator entity as authorized dependability has to be protected against not authorized impact and is, according to the strategic policy, certified and accredited with respect to class of: ISC {confidence or secrecy, integrity, dependability including availability, and feedback: (monitored performance, accounted behavior, and audits of environmental effects)}

ARISTOCRACY

In the current context, an Aristocratic [10]: (Adizes, 2006) decision state associates with imperative [11] laissez-faire behavior; i.e., escape from difficulties motivating that some other executive entity than I will do what ought to be done. Perhaps it is because of RQW or access right is not in parity with the actual ETY_IDY's authority: "The effects of steady decline in flexibility, which began in Prime [state], start to become more obvious in Aristocracy. Because it has neglected to pursue long-term opportunities, the company's [enterprise, entity's] focus becomes increasingly short-term. For the most part, its goals are financially oriented and low-risk. With less of the long-term view, the [cultural, ergonomic] climate in an Aristocratic organization is relatively stale." [10]: (Adizes, 2006), [11]

Not authorized (¬ATH), certified and 'robot' or 'chat-bot' like imperative mechanistic meta-language behavior need to be avoided. In general, any application implementation shall be SWOT {Strength, Weakness, Opportunity, and Threat} analyzed in an appropriate evaluation process for authorized adaptation of it with respect to a strategic risk policy.

SWOT RISK

A risk reason may be routines, leading to antibiosis characteristic like behavior, if not reasonably programmed algorithms or rules as mandatory operational action duties. A 'not adapted SWOT analyzed routines' attitude can be interpreted as Adizes' [10] "aristocracy" through delegating technical or bureaucratic functions the role attitude that associates with some of the characteristics:
"As organizations enter Aristocracy they characteristically:
- Are cash rich and have very strong financial statements.
- Have reduced expectations for growth.
- Demonstrate little interest in conquering new markets, technologies, and frontiers.
- Focus on past achievements rather than future visions.
- Are suspicious of change.
- Reward those who do what they are told to do and punish those who do not.
- Are interested in reducing their risks.
- Invest much more on control systems, benefits, and facilities than they do on R & D.
- Form dominates function in the organizational [cultural, CLT] climate.
- More emphasis is placed on how things are done, than what was done.
- Value uniformity, consistency and formality in dress, decorum, and behavior.
- Employ individuals who are concerned about the company's vitality, but are willing to abide by a "don't make waves" operating motto.
- Engender only negligible innovation with internal efforts.
- Acquire other products or companies for new products, markets, and entrepreneurship to feed into their distribution channels and operating systems.
- May be takeover targets themselves." [10]: (Adizes, 2006)

LIVING SYSTEMS

The Figure 1 system model is supposed to inhere with living systems characteristics.

Structure
"H1-1: In general, the more components a system has, the more echelons it has. [1]: (Miller, 1978; p. 92)
H1-2: In general, the more structurally different types of members or components a system has, the more segregation of functions there is." [1]: (Miller, 1978; p. 92),

Process
"H2-1: System components incapable of associating, or lacking experience, which has formed such associations, must function according to rigid programming or highly standardised operating rules. It follows that as turnover of components rises above the rate at which the components develop the associations necessary for operation, rigidity of programming increases. [1]: (Miller, 1978; p. 92)
H2-2: The more rapid reassignment of function from one component to another a long-surviving system has, the more likely are the components to be totipotential [isolated cells', like space stations' maintainability to survive through spare part replacement; rapid turnover of personnel] rather than partipotential [specialized, key function organs]. [1]: (Miller, 1978; p. 92)
H2-3: The more isolated a system is, the more totipotential it must be. [1]: (Miller, 1978; p. 92)
H2-4: A system's processes are affected more by its suprasystem than by its supra-suprasystem or above, and by its subsystems than by its sub-subsystems or below." [1]: (Miller, 1978; p. 92)

Frictions
"Among the limited number of adjustment processes which channels in living systems employ as information input rates increase are: omission, error, queuing, filtering, abstracting, multiple channels, escape, and chunking. Each of these processes applies to random and non-random information inputs except chunking, which applies only to non-random inputs with repetitious patterning to a system that can associate (or learn). Each of these processes occurs at multiple levels of living systems. Each of these processes has a cost in some sort of decreased efficiency of information processing." [1]: (Miller, 1978; pp. 103, 124, Hypothesis 5.1-3)

Below Figure 3: "Theoretical curve on logarithmic coordinates based on average performance data of five living systems (cell, organ, organism, group, and organisation) under various rates of pulse-interval coded information [bits/s]." [1] (Miller, 1978; Fig. 5-54. p. 192) is based on Table 1 data (ibid) where a

spiritual ETY's number of organisms in the organization are four, in the group are two, and while the cell is part of an organism.

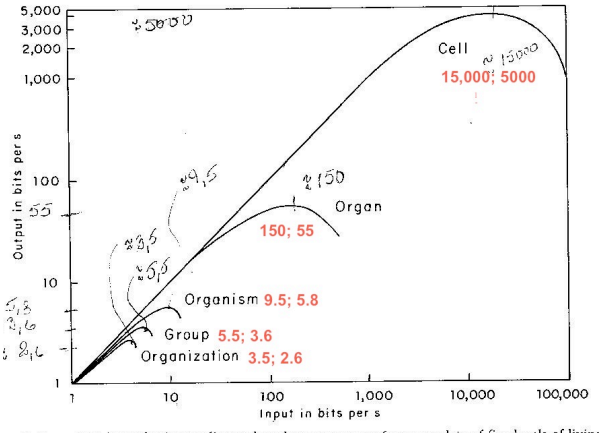


Figure 3. Theoretical curve based on experiments.

Table 1. Bit rate max points. [Miller, 1978, p. 192; adapted]

Max point bits/s	Organi-zation 4 pers.	Group 2 pers.	Organism 1 pers.	Organ [part of organism]	Cell [part of organ]
Out	2.6	3.6	5.8	55	5050
In	3.5	5.5	9.5	150	15000
[Q]	0.74	0.65	0.61	0.37	0.33

Table 1 experiment data for the Figure 3 theory, are expressed as base 2 logarithms in Figure 4.

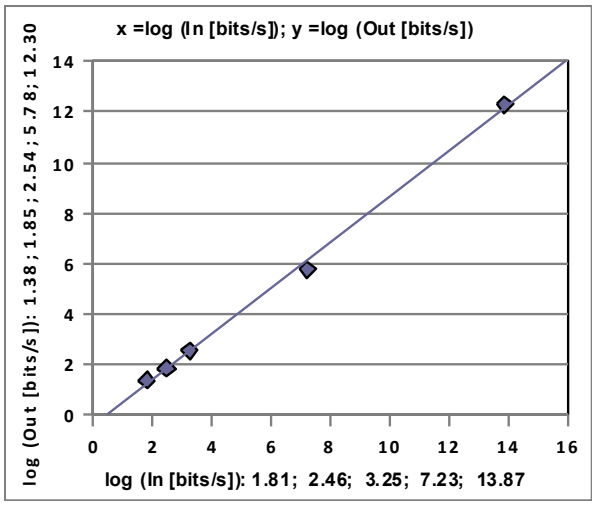


Figure 4. Base 2 logarithms of Table 1 data.

Conclusive audit

A conclusion of the above living systems characteristics may be that an entity with high general knowledge is more replaceable than a context cognized team participating specialist. That ability can, through deeper requisite variety width, participate to the higher organizational Table 1 Q-value.

For Figure 1, the MSG_{out}/MSG_{in} quotient (Q) value in Table 1 may indicate higher efficiency in organizations because of the fact that products; i.e., effects are absorbed uncertainties or entropy; i.e., information as gained knowledge. Waste is redundancy or distorting overload; e.g., contextual inadequacy.

COMPLEXITY METALANGUAGE

A basic method for analyzing complexities in systems is in [12]: (Miles, 1989). Computerization of the efforts gives opportunity to manage analyze of larger systems. To make such analyze understandable there are need of analyzing the output message: "How complexity leads to simplicity." [13]: (Berlow, 2010) Such analyze is actual in: "Systems Engineering [SE] complexity. In real terms, applying SE is often seen as a project risk because of its reputation to be complex.

Statement: 'Complexity can be managed [MGT] if the information [INF, gained knowledge] is managed [for being contextually (CXT) cognized (COG) requisite variety width (RQW)]'.

Information management [i.e., ISC] in the context of SE requires a methodology. For that, [14]: ISO 15926 offers a framework (explicit [ITY], unambiguous [COF], traceable [AUD]) [14]: ISO 15288/ISO 15926" [15]: (V. Ruijven, 2007, p. 5)

Products; i.e., Figure 1 outputs from one EPR_A can be data communications technology (DCT; i.e. TEL) components as material to be adapted (APT) as assets (AST) in another EPR_B's information system (ISY). It is the meaning in Figure 5 [15]: (Ruijven, 2007; p. 12, adapted).

The EPR_B has to communicate (COM) its system specifications ([16]: W3C; [17]: V. Renssen, 2005, 2008); [18]: Lawson, 2010) to EPR_A of which is a process from high uncertainty to lower ditto; i.e. from Table 1 right most column to the left most one.

Furthermore, the EPR_B has for internal COM, to begin with;
- EXE-0 strategic (STY) 'can be/have' auditable (AUD) policy (PCY),
- EXE-1 tactical (TAC) 'shall be' accountable (ACT) ADP or MDP role (ROL) routines or rules (RUL) for
- EXE-2 operative (OPE) 'is/has' monitored (MTR) COM of the EPR QOS mission actions (Act).

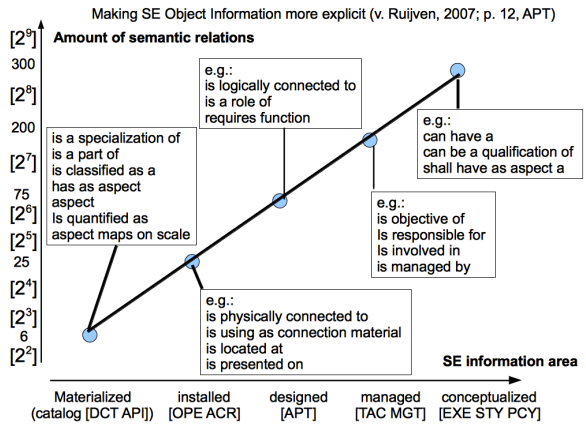


Figure 5. Organization of EPR ECA is entropy reducing

METALANGUAGE REALITY

Abbreviations

One-line meaning (MNG) in below syntaxes, as a contextual [2, G1.3] information system security machine (ISM) draft example, does not, if hit, supersede, but emphasize the MNG in ITU-T recommendations E.800, X.200 or X.800 [20].

ABY Availability (to asset entities)
ACR Accreditation (certified authorization)
ACS Access (to assets in parity with role authority)
ACT Account (of access)
Act Action (use of access)
ADM Administration (behavioural routines and rules)
ADP Automated (algorithmic) data processing
API Application; OSI layer #7 or equivalent
APT Adaptation; SOL (ACR of COG API/ECA REL)
ARC Archetype (is caricature of a phenomenon)
ASP Aspect (message meaning)
AST Asset (accessible ability)
ATH Authority (RQW and ACT dependent right to ACS)
AUD Audit (of behaviour with respect to EVT, PCY, ACT)
AUT Authentic (not corrupted integrity)
BEH Behaviour (possible authorized state variance)
CLS Class (set of comparable features)
CLT Culture; SOL (context dependent)
COD Coding; OSI layer #6 or equivalent
COF Confidentiality (confidence or secrecy)
COG Cognition of contextual knowledge effect
COM Communication (peer to peer interaction effect)
CQE Consequence (effect of meaning in message)
CTR Control (of STY, TAC, OPE)
CXT Context (in STY, TAC, OPE)
DAT Data (facts to be processed, stored and messaged)
DCT Data communication technology
DPY Dependability (ITU E.800; trusted and reliable ABY)
DSC Data communication security (ITU X.800)
EAL Evaluation level
ECA Enterprise Communication Architecture; SOL
ECT Effect (of EVT or OCU consequent MSG)
EFY Efficiency (economy of effect in a LCP time slot)
EPR Enterprise (QOS mission performance)
ERR Error (is a consequence of reliability fault)
ETH Ethic; SOL
ETY Enabling unit with identity to be authorised for a role
EVT Environmental event or occurrence
EXE Enterprise executive entity
EXE-0 Enterprise executive entity - strategic
EXE-1 Enterprise executive entity - tactic
EXE-2 Enterprise executive entity - operation
FAL Failure (is a consequence of escalating error)
FCN Function (strict relation aspect)
FEB Feedback
FLT Fault (causes reliability breach indicated as error)
HW Physical framework (architecture)
ICI Incident (fault caused error)
IDY Identity (to be authenticated)
Im Imaginary (may be an Re-accompanying attribute)
INF Information (gained knowledge caused by MSG)
ISC Information Security (state of INF certainty)
ISM Information System Security Machine concept
ITU International Telecommunication Union
ITY Integrity (consistent and not corrupted, authentic)
KNW Knowledge (of contextual events or occurrences)
LAW Law or other mandatory rule; SOL
LCP Life cycle period of an entity or process
LNK Link; OSI layer #2
MBY Maintainability (of fault caused erroneous ICI)
MCE Maintenance (of ERR caused QOS or LAW FAL)
MDP Manual data processing; ADM
MEA Measure (is evaluation)
MGT Management; SOL (of STY, TAC, OPE)
MNG Meaning (is message aspect)
MSG Message (is structured transport of data syntaxes)
MTR Monitoring (of performances)
NET Network; OSI layer #3
OCU Occurrence; EVT
OPE Operation; EXE-2 ‘is/has’ relation aspect
OPU Opportunity; SWT
ORG Organization; SOL (of ECA)
OSI Open System Interconnection (ITU-T X.200)
PCS Process (of data or material)
PCY Policy; SOL (strategic EVT and RSK concept)
PEF Performance (of operative mission actions)
PHY Physical medium; OSI layer #1
PRT Protection (of dependability; e.g., a SEC state)
QOS Quality of Service in mission performance
RBY Reliability (fault frequency dependent)
Re Real, tangible effect
REL Relation (may be a function)
ROL Role (an authorized behaviour variance)
RQW Requisite variety width in cognition
RSK Risk (cost of consequences)
RUL Rule (mandatory; e.g., LAW or ADM)
SAF Safety (the condition of being protected)
SEC Security (a state of protected safety; e.g., DPY)
SES Session; OSI layer #5
SGN Signal (perceived meaning in message)
SOE Social engineering (unauthorized BEH in ACR CXT)
SOL Social layer (s)
SOT Socio – technologic layer(s) (SOL, TEL)
STR Strength (low vulnerability)
STX Syntax (message structure)
STY Strategy; EXE-0 ‘can be/have’ relation aspect.
SW Software (definition of API algorithms or rules)
SWT SWOT; strength, weakness, opportunity, threat
TAC Tactic; EXE-1 ‘shall be/have’ relation aspect
TEL Technologic layers; OSI layer (s) #1 to #7
TRP Transport (of MSG); OSI layer #4
TRT Threat (ITU-T X.800)
UN United Nations
VUE Value (of effect or consequence)
WEK Weakness (vulnerable)

The broadband vision as example

Below, abbreviations within square brackets, included as comments to the extract from, [19]: (ITU/UNESCO, 2010; pp., 5f) Broadband Commission — contextual environment event (EVT) — for Digital Development Declaration [DCT; i.e., TTL] vision concerning the 2010 Millennium Development Goals (MDG), are ‘information security machine (ISM)’ aspects (ASP) with respect to [2]: (TIIM, 2011) as text book for open dictionary [11] phenomena to be structured according to system engineering [14, 15] principles. The square bracket comments are aimed as a memento of ‘information security (ISC) management (MGT) system (ISMS)’ general usability and may exemplify a step toward conceptual realization of the vision.

Forging (Informing) seven forces

For each of the "convergent and interdependent forces [ASP] of policy [PCY], infrastructure, technology [DCT; i.e., TEL], innovation, content [COG MNG] and applications [API], people [spiritual ETY] and government [EXE-0 relatively to MDG as EVT]:

• Fundamentally, this will require government-wide leadership from the very top [CXT, EXE-0], at the level of Prime Minister or Head of State, with a supporting governance mechanism [EXE-0 communication architecture, ECA-0, SOL, QOS];

• A broad-based 'bottom-up' approach is also required [DPY] to build commitment to the concept of broadband [TEL_NET] inclusion for all;

• Raising awareness [KNW] of the economic and social [SoL] benefits of broadband [TEL_NET] should be publicized among policy [PCY]- and decision-makers [EXE-0, PCY, providers, P], as well as the general public [DCT, QOS questioners, Q];

• Most of the investments for broadband [DCT] will come from the private sector [P], so policy-makers [EXE-0, STY] need to engage with industry and investors [EXE-1, TAC] to promote policy [OPE, PCY] objectives [OBJ] more broadly;

• Providing [P] policy [PCY] development skills [COG, AST] to public authorities [EXE-1, agency, AGY] could help abolish some of the existing [BEH, SWT] barriers and [FLT] factors that hinder widespread uptake of broadband [TEL_NET] use in the population [Q];

• For areas where private investments are not feasible, public authorities [EXE-1 agency, AGY] and private entities [EXE-2, EPR, ETY] should find innovative ways of [ECA-2] cooperating to achieve widespread access [DPY ACS] to and use of broadband [TEL_NET];

• Content [MSG, RQW, MNG] and applications [ACR API] development is undergoing profound change. As the creation, funding [AST], sharing and distribution of content [MSG, RQW, MNG] in the digital [SOT] world increases in complexity, a fundamental concern of business [EPR], government and civil society [SOL, EPR] should be the stimulus of local and diversified development-centric applications [ACR, API], in local languages [COG];

• Security [SEC of DPY], authenticity [AUT], and integrity [ITY] issues will become ever more important, particularly with regard to privacy [AST], protection [PRT] and confidentiality [COF], and must be addressed [AUD], otherwise large-scale investment in broadband [DCT] infrastructure is unlikely to fulfil its potential [DPY fail, FAL]." ([19], p. 19)

Content

"As has been witnessed across the ICT [DCT for conveying MSG] world, connectivity [DPY] without content [MSG, RQW, MNG] can make even the most sophisticated technologies [TeL, ACR, API, APT] irrelevant or of limited value [VUE]. In today's virtual world, it is vital that governments [EXE-0] do not neglect [FAL] the importance of content [MSG, RQW, MNG]. Policy-makers [EXE-0] have to emphasize the development of rich and diverse online content [MSG, RQW, MNG] and applications [ACR, API, APT] alongside infrastructure [DCT, EVT] and propose concrete policies [PCY] and practices [COG] for inclusion of new languages [ECA] and tools [API] for the measurement [MEA] of linguistic diversity [COG]. Some of the main issues with regard to content [COG] include making more online [OSI] material accessible [ACS, DPY] in local languages or accessible [ACS] to people with limited functional literacy skills [COG]. The digital divide is a result not only of a lack [FAL] of access [ACS] to connectivity [API, DPY] and infrastructure [DCT], but also of a lack [FAL] of relevant and locally-developed content [COG] which can make a big difference to the [QOS] lives of ordinary people. It is important to recognize that broadcasting also plays an important role [ROL] in the developing world in the creation and dissemination of rich media content [COG]." … ([19], p. 31)

Sustainability

"The MDG on ensuring environmental sustainability [EVT] spans a wide range of targets [OBJ], from the provision of safe [SAF] drinking water and basic sanitation [PHY] facilities to reducing biodiversity loss [FAL] and improving the [QoS] lives of slum-dwellers.

In virtually all these areas, broadband [DCT] networks can make an important contribution. They can swiftly transmit information [MSG] from ground sensors or satellites to monitor [MTR] the effects [ECT] of climate change [EVT] or impending natural disasters [FAL], such as drought or floods. They can provide early [ERR of FLT ICI] warning systems that reduce vulnerability [VUL, WEK] to disasters [FAL]. …

GPS-based applications [API] can also help monitor [MTR] environmental abuses [EVT] (eg, illegal logging or pollution levels) and transmit that information [MSG] to authorities [AGY, ATH]. …

Sharing experiences of what works [COG], learning from others and changing people's expectations of their living [QoS] conditions and livelihoods are all part of the complex challenge of empowering [COG] people to improve their own lives [QOS]." ([19], p. 45f)

Society

"Building global commitment to broadband [TEL_NET, EVT] inclusion for all by connecting broadband with the MDGs and knowledge [RQW, KNW] society [SoL] priorities.

a) At the global level [EVT] world leaders at the *2010 MDG Summit* must galvanize the international community [EVT] to act [Act] on a common vision of the power [ATH] of technology [TeL] and innovation, built on broadband [TEL_NET], to accelerate the achievement of the MDGs and other internationally-agreed development goals [OBJ] and key knowledge [KNW, RQW] society [SoL] priorities such as those of the WSIS by 2015, in the context [CXT] of the new digital [DCT] realities and [SWT] opportunities [OPU] of the networked society [SoL, ECA] and economy.

b) At the national level [EXE-0] governments should adopt national broadband [TEL_NET] strategies [STY], recognizing that, in the information [STX, MSG, RQW, MNG, COG, ECT] age, broadband [TEL_NET] – like water, electricity, and roads in the industrial age – is not just a tool [API] for communication [COM], but a social asset [SoL, AST] that provides one of the most cost-effective [ECT] and efficient [EFY] means [AST] for delivering services [QoS] to citizens and comprises a nation's core functions [relations], provides a variety [RQW] of services [QoS], and should be made available [ABY] to all members of society [SOL, RQW], in their own languages.

c) National [CXT, EXE-1] ICT Policies [DCT PCY] should be encouraged to build inclusive knowledge [KNW, RQW] societies [SOL] where all citizens [Qs] have the skills [COG] and confidence [COF] to create, share, and preserve information [MSG] and knowledge [KNW, RQW] to improve their [QOS] lives. Governments [EXE-0] need to promote policies [PCY] in universal access [ACS] and these policies [PCY] should include [DPY] broadband [TEL_NET] access [ACS] as an essential element of universal access [ACS, DPY] and services [QOS].

d) Special consideration should be given to the direct application [ACR, API] of broadband [TEL_NET] solutions to

address the cross-cutting and cross-sectoral aspects [ASP] of the MDG agenda. Specifically, evidence pertaining to impact [IMP], new business and social [Provider/Questioner, P/A] models, and sustainability [DPY] is essential in demonstrating the benefits of broadband [TEL_NET] diffusion for scale-up and replication across all eight MDGs.

e) A mid- and long-term perspective, taking into account [ACT] the requirements [REQ] of diverse communities [SOL, EVT] and stakeholders, is essential in forming a [ECA] consensus for broadband [DCT] investment and uptake. Governments [EXE-0] should play a pivotal role [ROL] in exploring innovative financing mechanisms [ADP, MDP, RUL] and incentive strategies [STY].

f) Advocacy efforts should be prioritized for a global market in broadband devices [TEL_NET, DCT], networks, software [SOW] and solutions that will harness the power [ATH] of network effects [ECT], as well as spill-over effects [ECT] of broadband [TEL_NET] across multiple sectors, while improving framework conditions for interoperability [OSI] between broadband [DCT] products and services [QoS, API].

g) Ultimately, new national [EXE-0] development models based on universal access [ACS] to broadband [DCT, APT] connectivity and multilingual content [COG, MNG] can aspire to the goal of 'digital [DCT] opportunity [OPU]' – that is social [SoL] and economic development made possible via access [ACS] to knowledge [KNW] that can narrow [COG P/A] gaps between rich and poor and among classes and regions.

h) We urge all relevant stakeholders to continue to pose the key questions [Q] of what incentives can be created [COG] by governments [EXE-0] to encourage and enable the private sector to invest." ([19], p. 55f)

REFERENCES

[1] Miller, J. G. (1978), *Living Systems.* McGraw-Hill, Inc. 1978. ISBN 0-07-042015-7.

[2] TIIM 2011: Technology and industrial management innovation conference 28. – 30.6.2011 in Oulu, Finland; e.g., sessions E4.1, E4.2, E4.3, G1.3, G1.4. http://tuta.oulu.fi/Proceedings%20of%20TIIM2011%20Conference%20vol2.pdf/view ACS: Aug./31/11

[3] United Nation, UN (1948). United Nation, UN (1948), *Universal Declaration of Human Rights.* URL: http://www.un.org/events/humanrights/udhr60/hrphotos/declaration%20_eng.pdf ACS: Sep./18/11

[4] Ashby, Ross, W., 1953. An Introduction to Cybernetics. Chapman & Hall Ltd, London 1956. Internet 1999. http://pcspmcl.vub.ac.be/ books/IntroCyb.pdf ACS: Sep./11/18

[5] IEEE Computer Society. Guide to the Software Engineering Body of Knowledge (SWEBOK), 2004. http://www.computer.org/portal/web/swebok/html/appendixd ACS: Sep./16/11

[6] IOWA: Iowa State University. Center for excellence in learning and teaching. A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives, 2009. http://www.celt.iastate.edu/teaching/RevisedBlooms1.html

[7] Kjellman, Arne: Constructive Systems Science – The Only Remaining Alternative. SU & KTH DSV No. 03-014; 2003. ISSN 1101-8526. ISRN SU-KTH/DSV/R—03/14—SE. Doctoral Thesis ISBN 91-7283-531-1. http://www.diva-portal.org/smash/searchlist.jsf?searchId=2 ACS: Sep./16/11

[8] IEA (2007). Mind the Gap, Quantifying Principal – Agent Problems in Energy Efficiency, International Energy Agency (IEA). Head of Communication and Information Office, 9 rue de la Fédération, 75739 Paris Cedex 15, France. © OECD/IEA, 2007 (Theory, Ch. 1--3). http://www.iea.org/textbase/nppdf/free/2007/mind_the_gap.pdf ACS: Apr/8/11

[9] Van Gigch, John P. (1978). Applied systems theory. Harper & Row Publishers, 1978 (1974). ISBN 0-06-046776-2.

[10] Adizes, I, 2006 /1973/. Understanding the corporate life cycle. http://www.adizes.com/corporate_lifecycle.html ACS: Sep./11/18

[11] Open dictionary. http://dictionary.reference.com/browse/open ACS: Sep./19/11

[12] Miles, L. D, (1989), *Techniques of Value Analysis and Engineering*, 3rd ed., Published by Eleanor Miles Walker Executive Director Lawrence D. Miles Value Foundation 1993. http://wendt.library.wisc.edu/miles/milesbook.html ACS: Sep./17/11

[13] Eric Berlow: How complexity leads to simplicity http://www.ted.com/ ACS: Sep./18/11

[14] System Engineering (Life cycle standard ISO/IEC 15288): http://www.ap233.org/ ACS:Sep./19/11
Doing business with the ISO 15926 standard: www.15926.org ACS:Sep./19/11
Dependability: http://www.dependability.org/ ACS:Sep./19/11
Gapfinder for a fact-based world view. http://www.gapminder.org/ ACS: Sep/19/11

[15] Van Ruijven, Leo. Practical use of a Reference Data Library (RDL) like ISO 15926-4 combined with the Gellish language, European plant engineering & design conference, EPEDC 2007. http://www.european-pedc.eu/program.html ACS: Sep./16/11
http://15926.org ACS: Oct. 18, 11.

[16] W3G: Booth, D., Haas, H., McCabe, F., Newcomer, E., Champion, I.M., Ferris, Ch., and Orchard, D. W3Org, (2004). Web Services Architecture. http://www.w3.org/TR/ws-arch/ ACS: Sep./18/11

[17] Van Renssen, A.S.H.P. (2008). Gellish Modeling Method, Part 6, Knowledge and Product Modeling, Edition 5, May 2008. http://sourceforge.net/projects/gellish/files/Gellish%20Documentation/Gellish%20User%20Guides%20-%20Oct2008/Gellish_Modeling_Method_part_6_Creation_of_Facility_and_Product_Models_Jul2008.zip/download ACS: Sep./18/11
Van Renssen, A.S.H.P. (2005). Gellish: A Generic Extensible Ontological Language -- Design and Application of a Universal Data Structure. http://repository.tudelft.nl/view/ir/uuid%3Ade26132b-6f03-41b9-b882-c74b7e34a07d/ ACS: Sep./18/11

[18] Lawson, H.'B.' (2010). A Journey Through the Systems Landscape, College Publications, London, UK, 2010, ISBN 978-1-84890-010-3

[19] ITU/UNESCO, Members of the *Broadband Commission for Digital Development*. A 2010 Imperative: The future built on broadband. http://www.broadbandcommission.org/report1/report1.pdf ACS: Sep./18/11

[20] ITU-T. International telecommunication union, Geneva, Switzerland. http://www.itu.int/pub/T-REC ACS: Oct./21/11