Cognition of Information System Control as Metalanguage (COINS)

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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-technical (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]:

![Diagram of Cognition (COG) filters](Image)

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

Figure 1. The contextual (CXT) system model concept

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 reassigment 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.

For Figure 1, the $MSG_{in}/MSG_{out}$ 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 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).

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

<table>
<thead>
<tr>
<th>Max point bits/s</th>
<th>Organization 4 pers.</th>
<th>Group 2 pers.</th>
<th>Organism 1 pers.</th>
<th>Organ (part of organism)</th>
<th>Cell (part of organism)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out</td>
<td>2.6</td>
<td>3.6</td>
<td>5.8</td>
<td>55</td>
<td>5050</td>
</tr>
<tr>
<td>In</td>
<td>3.5</td>
<td>5.5</td>
<td>9.5</td>
<td>150</td>
<td>15000</td>
</tr>
<tr>
<td>[Q]</td>
<td>0.74</td>
<td>0.65</td>
<td>0.61</td>
<td>0.37</td>
<td>0.33</td>
</tr>
</tbody>
</table>

**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.
**METALANGUAGE REALITY**

**Abbreviations**

One-line meaning (MNG) in below syntaxes, as a contextual [2,
G1.3] information system security machine (ISMS) 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 (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)

**CTX** 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., DPTY)

**SES** Session; OSI layer #5

**SGN** Signal (perceived meaning in message)

**SOE** Social engineering (unauthorized BEH in ACR CXT)

**SOC** 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]: (TILM, 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 (ISM)’ 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 [CTX, 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


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 [CTX] 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.


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 [OUP]’ – 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. 555)

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