**Systems Modelling and Systems Engineering SIG**

**Towards the Unification of Systems Science and Systems Engineering**

***[July 9, 2017]***

# -Workshop Description-

In this workshop on-going efforts to improve the understanding of unifying concepts and paradigms are presented. The workshop will be presented in three Modules.

Module 1 - Unification has been a clear goal of the College Publication Systems Series that involves a cooperative effort involving the BCSSS as well as Stevens Institute of Technology. Highlights of some of the unifying concepts and paradigms that have evolved in the series will be presented.

Module 2 - An important unifying concept is the notion of the “systemist”. Characteristics of how a systemist deals with any situation, problem or opportunity are presented. The systemist approach is based on an innovative “Systems Tree” that identifies an epistemology, ontology and semantics of systems, as well as how to move from thinking to an effective value added action (axiology). In the workshop, highlights of this unifying innovative explanation of the role of the systemist is presented.

Module 3 - The systemist approach to unification will be illustrated by presenting some of the highlights of a new volume in preparation for the Systems Series that addresses biological and medical systems.

# -Workshop Requirements-

## Target audience

There are no special requirements as this workshop will be useful to professionals, faculty and students alike. It is expected that the participants will attend the entire workshop in order to obtain a well-rounded view of concepts, principles and multiple paradigms that will useful in their future activities.

Size of the group

From min 6 to max 40 people. A max of 40 people (5 groups of 8 people) if we do some practice during sessions (particularly session 2)

## Duration – Full day workshop 8 hours as followed

6 hours

+ 90’ break for lunch (who takes in charge the lunch? Each participant or the ISSS organization?)

+ 15’ break in the morning

+ 15’break in the afternoon

## Characteristics for the room for the workshop

* Capacity for 40 people
* **Room flexibility** to move the tables and the chairs as exercises may be run in 5 different small groups

## Tutorial Logistics

**Media**

VGA Projector (HDMI or VGA connectors)

From 2 to 6 Flip-charts (1 for tutorial, 1 for each group- With 40 people, 5 groups of 8 people)

5 sets of markers (4 colours in each set: black, blue, red, green)

A4 paper sheets (10 for each participant)

We will bring 1 PC but we can use a PC already installed, if required.

**Formats**

.ppt, .pdf, .xls

# -Full Description-

| **Module** | **Topic** | **Time** | **Activity Type** | **Presenter** |
| --- | --- | --- | --- | --- |
| **1** | Unifying concepts and paradigms that have evolved from the first 8 volumes of the Systems Series. This presentation will include, amongst others:  -Systems Coupling Diagram  -System of System Concepts  -Thinking - Acting Paradigm  -ISO/IEC/IEEE 15288 Concepts  -Essence of Software and Systems Engineering  -Purpose of Systems Architecting  -Systems Thinking Procedure | 2 hours  Approximately 10-15 minutes per concept or paradigm | Presentation of the concepts and paradigms  Some brief practical exercises | Harold “Bud” Lawson |
| **2** | **The systems thinker in action**  -Storytelling to introduce Systems Thinking  -How to recognize a Systems Thinker?  -Proposal for an integrative, living framework (genesis of the Systems Tree (ST))? Examples/ practice /How to use it.  -Perspective on future research to use the ST in the field of Systems Science. Perspectives for Semantics, Ontology, Epistemology, Axiology | 2 hours  (15’)  (15’)  (90’)  (10’) | Interactive session  Balance between theory, examples and practice  Exercises performed in small groups | Brigitte Daniel Allegro |
| **3** | **Health Disease and Systems Thinking**  -learning from Cancer, the need to be systemic  -different perspectives, meaning and consequences of inflammation  -understanding Sepsis with Systems Thinking  -understanding Pre-eclampsia with Systems Thinking  -architectural parallels between biological and engineered defence and security  - systems thinking to address the frailty healthcare crisis | 2 hours  (20’)  (20’)  (20’)  (20’)  (20’)  (20’) |  | Gary Robert Smith |

# -Workshop Learning Outcome(s)-

After completing this workshop, participants:

* will be able to observe and to recognize the specific attitudes of systemist and will have the opportunity to practice Systems Thinking
* will be aware of potential gaps between intended action and effective acts
* will be familiar with useful unifying concepts and paradigms including a proposal of an integrative systemist approach using the “Systems Tree”.
* be introduced to the application of the systemist approach in biological and medical systems

**-Workshop Instructor(s) Bio(s)-**

**Brigitte Daniel Allegro** *Senior Expert Adviser in Systems Thinking and Dependability* - *Design & Art teacherIndependent consultant and author (art books and systems thinking books) and also… grandmother*

Brigitte built her experience on dependability concerns, systems engineering (SE) and systems thinking in nuclear industry (EDF) and aeronautics (Airbus). She introduced at Airbus design office systems engineering and the value of human experience in the early 1990's. She has designed and managed for 10 years an in house training course on aeronautical system design to promote the human capital of the organisations. She deployed SE for supporting new Airbus development programs as well as organizational transformation projects. She focused on managerial approaches able to synchronize silo organizations while piloting transversal activities. Today, she takes advantage of her own experience in energy and transportation to coach System Architect Engineers and to promote systems thinking in academic and industrial fields. In 2012 she has written for AFIS (INCOSE French Chapter) an “*Introduction to Systems Thinking*”. On that occasion, she developed a conceptual model of *Systems Thinker attitudes with underpinning systems concepts* which form a consistent basis for her Systems Thinking courses. She has been practising this conceptual model for five years. Translating into French the first book of Harold ‘Bud’ Lawson “A journey through the Systems Landscape” (“Parcours au pays des Systèmes) developed a specific awareness about concepts representations in different cultures. Being engineer and textile artist, she is interested in the relationships between creative thinking and systems thinking as well as artistic design and industrial design. She contributes to the INCOSE Systems Science WG as well as the INCOSE Healthcare WG.

*She enjoys textile art, dance, music, cultures and family life*

**Harold “Bud” Lawson** is the coordinating editor of the College Publications Systems Series. He has been active in the computing and systems arena since 1958 and has broad international experience in private and public organizations as well as academic environments. Bud contributed to several pioneering efforts in hardware, software and computer-based system technologies. He has held professorial appointments at several universities in the USA, Europe and the Far East. He is a Fellow of the ACM, IEEE and INCOSE. He was head of the Swedish Delegation to ISO/IEC JTC1 SC7 WG7 (1996-2004) and the elected architect of the ISO/IEC 15288 standard. In 2000, he received the prestigious IEEE Computer Pioneer Charles Babbage medal award for his 1964 invention of the pointer variable concept for programming languages. In 2016 he was recognized as an INCOSE Systems Engineering Pioneer for his life long contributions to the unification of Software and Systems Engineering. Harold “Bud” Lawson is an independent consultant operating his own company Lawson Konsult AB and is, as well, a consulting partner of Syntell AB, Stockholm.

**Gary Robert Smith** is a senior expert systems engineer at Airbus Defence and Space. He is currently their lead systems architect for engineering processes across the division and has had a number of senior systems engineering roles in systems of systems integration programmes. In 2004, “just for fun”, he undertook the Open University course S807 Molecules in Medicine and as a direct result of the course published “Cancer, Inflammation and the AT1 and AT2 receptors in the BMC Journal of Inflammation. This was featured in the UK national press, “Open University Student publishes new theory of inflammation”. The paper has over 100 citations, including one in Nature Review Oncology. His more recent paper “Angiotensin and Systems Thinking: Wrapping your mind around the big picture” describes a mental model for understanding disease. He is an INCOSE ESEP, an active contributor to the INCOSE/ISSS systems science working group and the healthcare working group where he participates as the outreach director for the EMEA region and is an INCOSE Healthcare Ambassador