

Systems Work

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How can the Electrotechnical Industry maintain its market leading position by developing products and services based on standards which are central and relevant in such complex domains and scenarios?

What best can the IEC do to incorporate in its work the needs emerging from continuously changing and rapidly evolving scenarios of today's society?

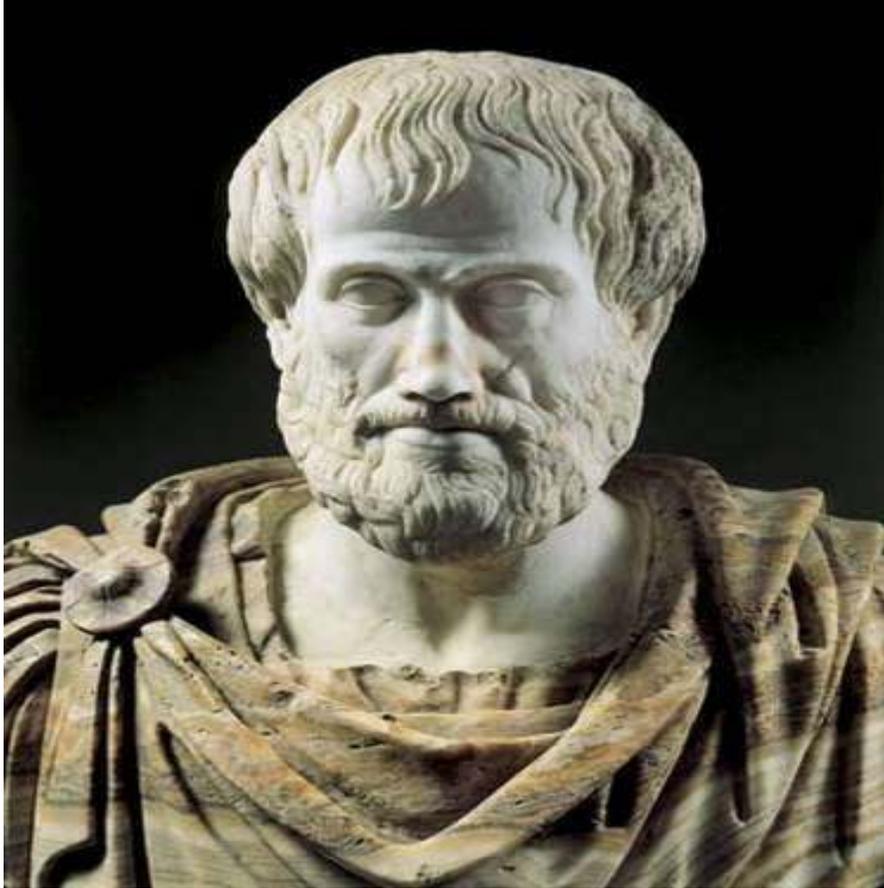
SYSTEMS APPROACH IN STANDARDISATION

Systems and Systems Approach

System: *a group of interacting, interrelated, or interdependent elements forming a purposeful whole of a complexity that requires specific structures and work methods in order to support applications and services relevant to IEC stakeholders. (from <https://www.electropedia.org/>)*

Systems Approach: *a holistic, iterative, discovery process that helps first defining the right problem in complex situations and then in finding elegant, well-designed and working solutions. It incorporates not only engineering, but also logical human and social aspects.*

Systems Approach: Holism



300b.C. , Aristotle:

**“The Whole is
Greater than the
Sum of its Parts”**

Systems Approach: Emergence



**Which property emerges from
the System?**

Rules for Systems Work: Directives and ACs

ISO/IEC Directives apply to Systems Work. The specific part dedicated to Systems Work is: ISO/IEC Directives, IEC Supplement:2020- Annex SP, Systems Work

[AC/17/2018](#) Correction to and replacement of AC/22/2017 Systems Activities

AC/22/2017

[AC/33/2013](#) Systems Activities

[AC/37/2006](#) System approach in IEC standardization - Implementation

[AC/7/2004](#) System approach in IEC standardization

Systems Committees (SyCs) at IEC



1st Established-2014



2014



2016



2017



2018



...since 2020:

Communication Technologies and Architectures of Electrotechnical Systems

SyCs publications, projects & resources

		Publications	Projects	SBP
SyC AAL	Active Assisted Living	6	14	
SyC COMM	Communication Technologies and Architectures		6	
SyC LVDC	Low Voltage Direct Current and Low Voltage Direct Current for Electricity Access		4	
SyC SM	Smart Manufacturing	2	1	
SyC Smart Cities	Electrotechnical aspects of Smart Cities	3	19	
SyC Smart Energy	Smart Energy	13	6	



Systems Work: the full picture

To start and propose:

Standardization Evaluation
Group

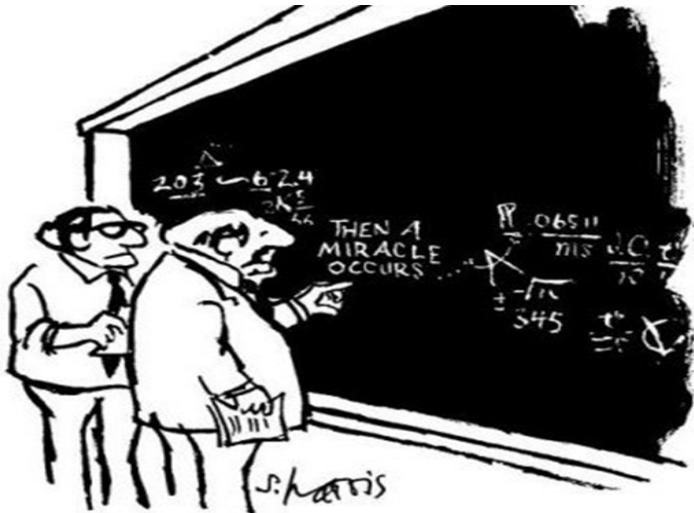
To engage and deliver:

Systems Committees

To define how to work:

Systems Resource Group
SG12 methodology group

Systems and Technical committees

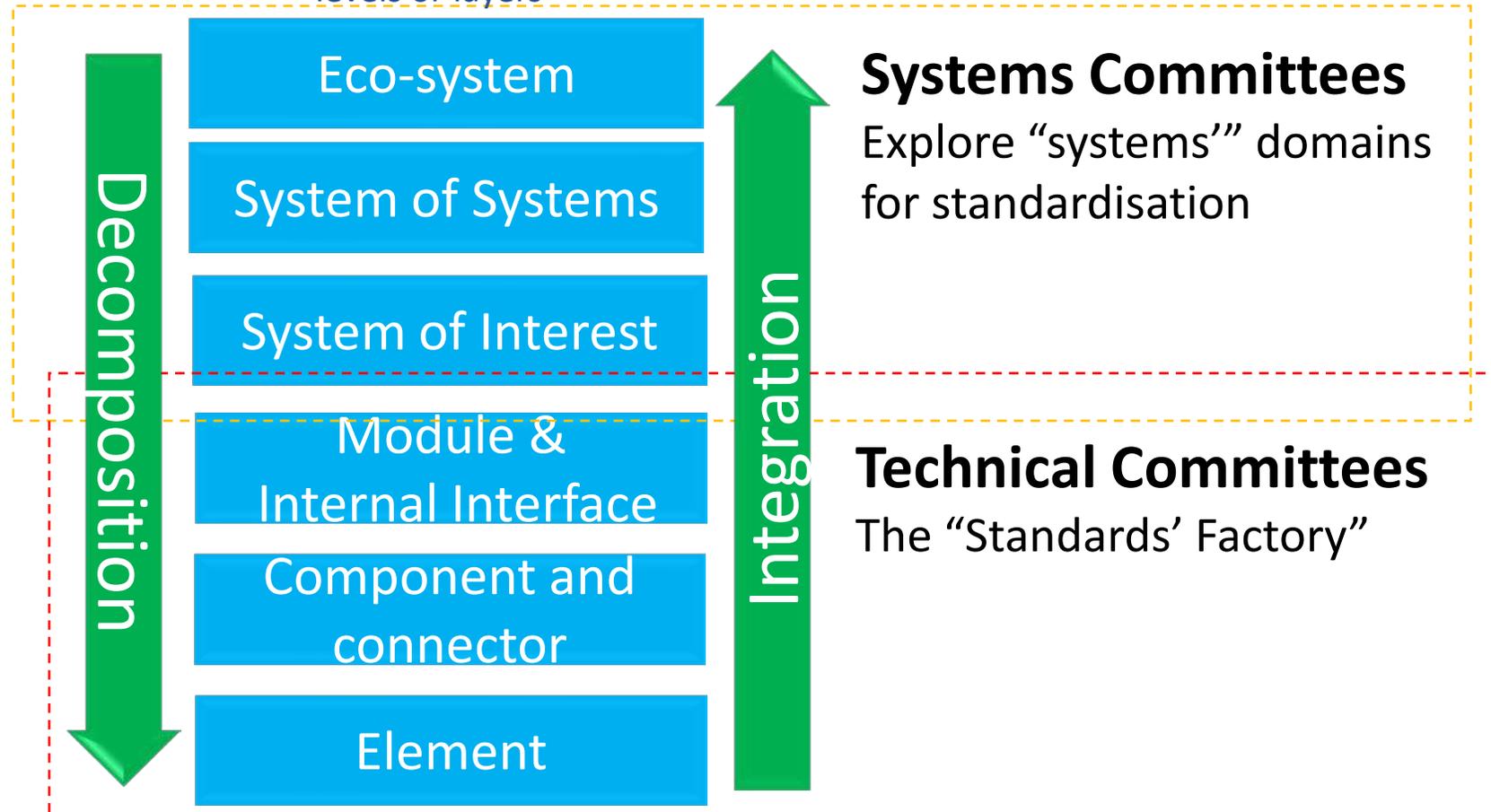


"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Systems Resource Group (SRG)

Provides methods of work

Complex systems
internal structure as hierarchy of levels or layers

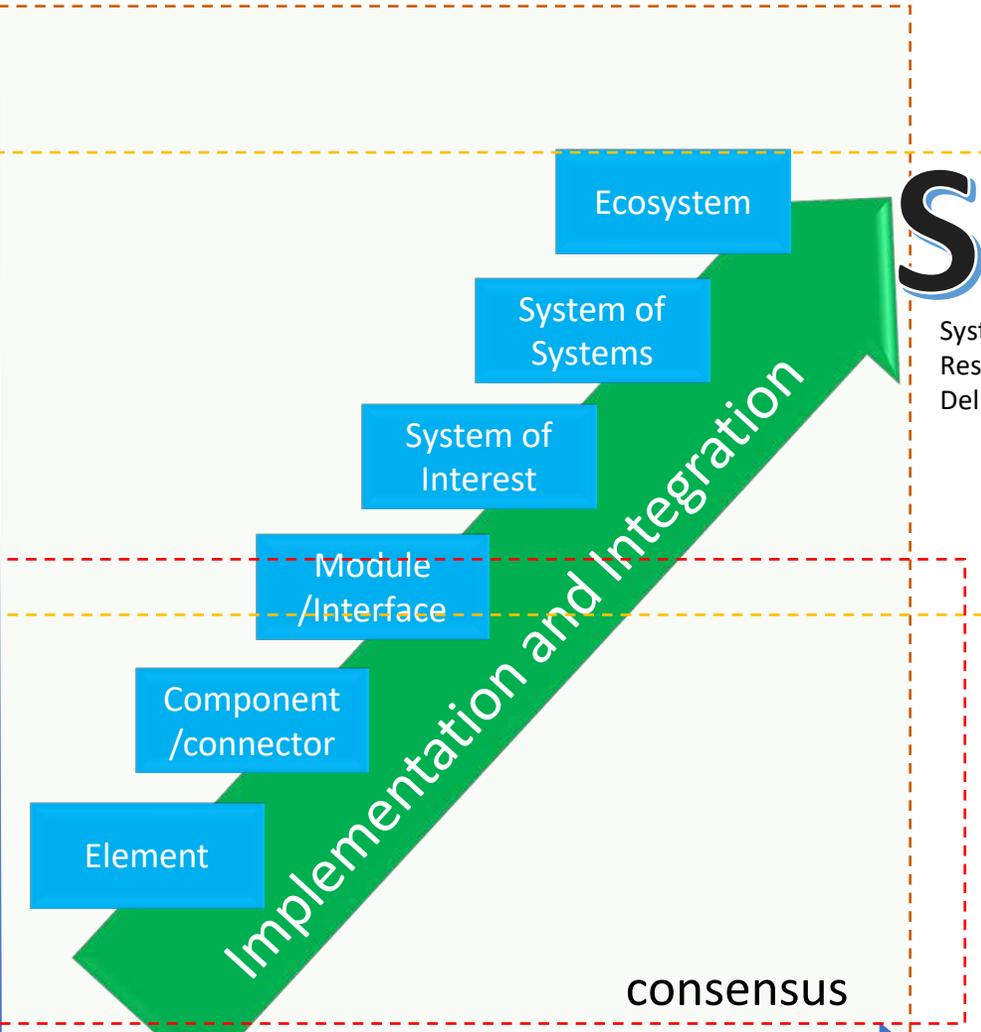
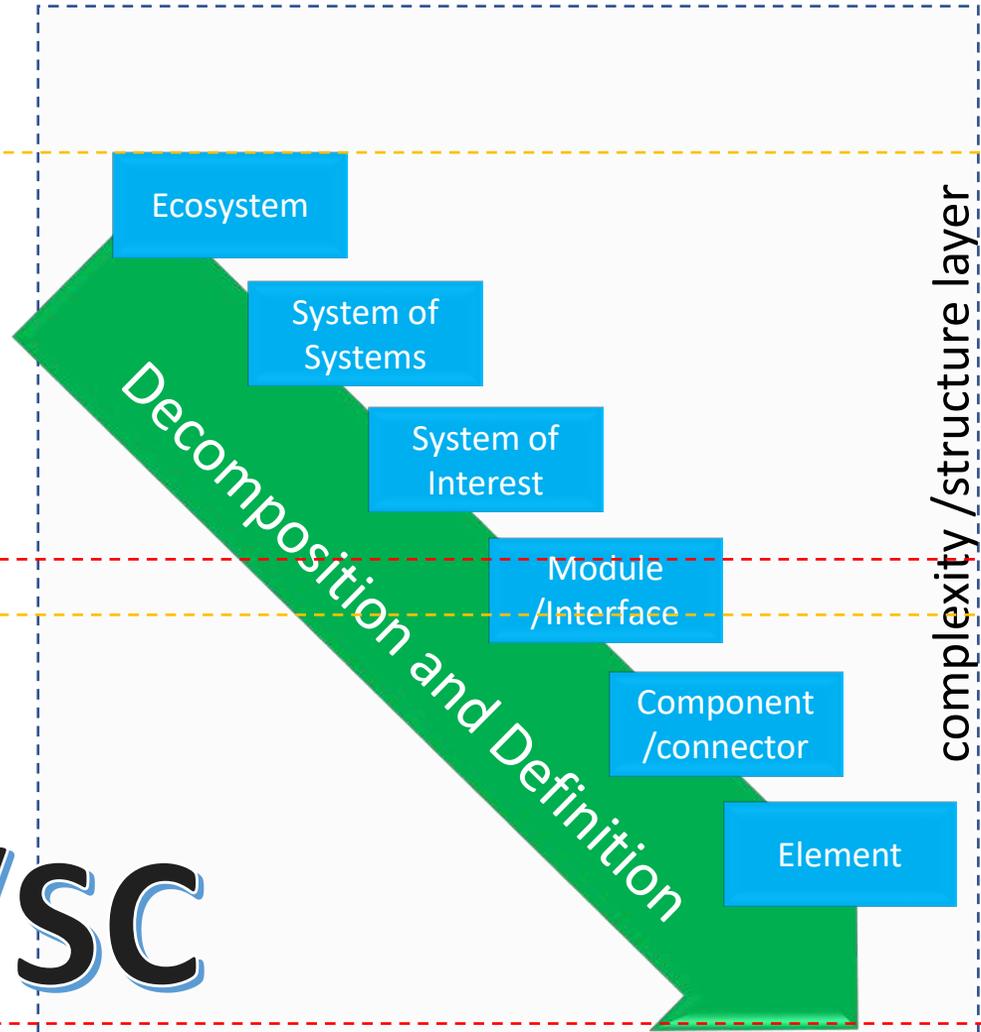


There is no one-size-fits-all approach

The Vee-Model

for standards!

SyC



SRD

Systems
Resource
Deliverables

TC/SC

IS

consensus

Committee >> Exploration & Analysis >> Solution >> Drafting and Consensus >> Publication

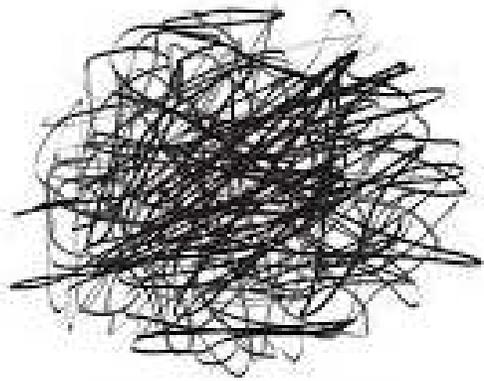
systems approach activities

- **identify** and understand the **relationships** between the potential problems and **opportunities** in a real world situation
- gain a thorough **understanding of the problem** and describe a selected problem or opportunity in the context of its wider system and its environment
- **synthesize** viable system **solutions** to a selected problem or opportunity situation
- **analyze** and **trade off** between **alternative solutions** for a given time/cost/quality version of the problem.
- **measure** and provide evidence of correct **implementation** and **integration**
- deploy, sustain, and apply a solution to help solve the problem (or **exploit the opportunity**)

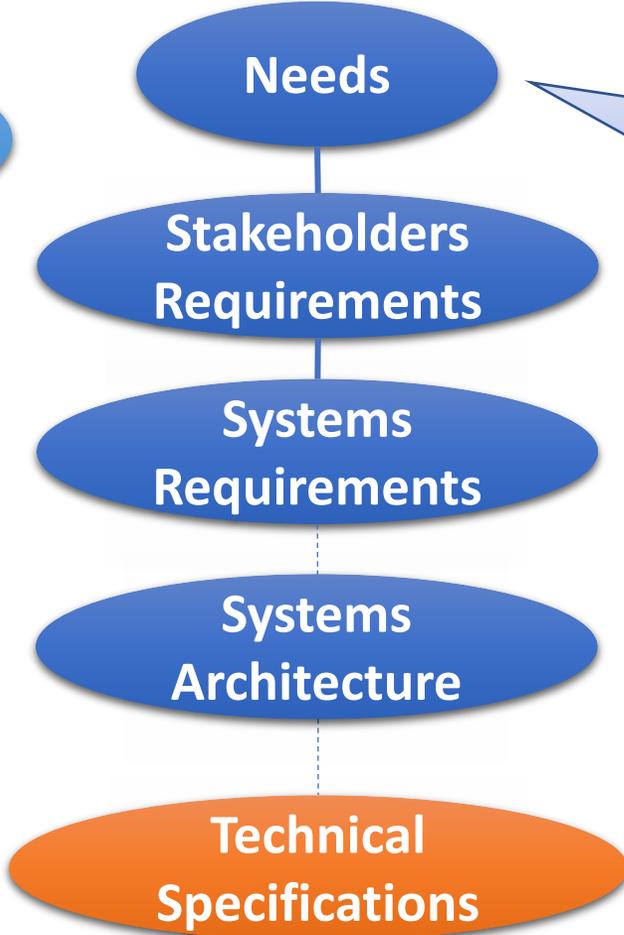
All of the above are considered within a **life cycle** framework which may need **concurrent**, **recursive** and **iterative** applications of some or all of the systems approach.

Shaping the mess...

From here...

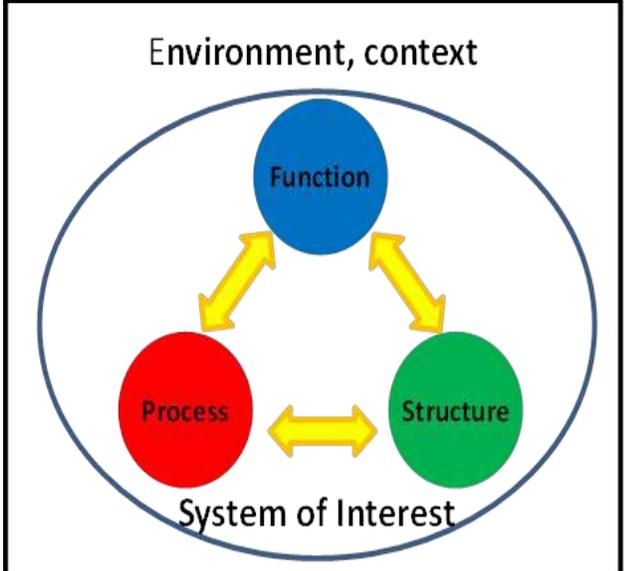


Goals



Values
Relevance
Priorities
...

...to here



Resolution comes through an iterative process!

The Systems Approach Methodology

In the final stage, gaps where standards are missing, or where existing standards need to be modified or added to, are identified based on the knowledge of existing standards, desired system interaction, use cases and other information gathered from the previous stages. This will then initiate the activities for the committees to move forward with new standard development.

In this stage, the focus is on understanding and mapping what relevant standards exist for all the various parts of the system and whether they are contributing or countering the objectives identified in Stage 1. These standards can include IEC and other SDO standards.

Through this stage the systems requirements previously defined are used to develop and define the architecture of the systems, with its structure and behaviour, ie what are its parts and how to they interact with each other.” and continues with modelling and design eventually.



This initial stage, the problem space is closely analysed in conjunction with societal, market, industry trends and needs, in alignment with the IEC Masterplan and Strategy. The outputs of this stage set the foundation, purpose and boundaries of the system of interest.

The second stage extrapolates on the first with a focus on identifying and analyzing stakeholders and defining their needs, concerns, objectives and requirements.

Stage three is focused primarily on identifying use cases and on developing a progressively detailed understanding of the use cases identified and translate them into systems requirements.

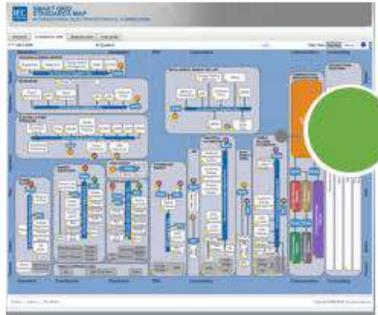
The IEC Systems Approach Methodology

Opportunities for new work



Gaps

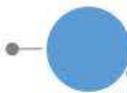
What are the standards that are missing in the system?



Standards

What are the existing standards and SDOs that pertain to the system?

<https://mapping.iec.ch/#/maps>



Architecture

What is the reference architecture of the system and its boundaries?

ISO/IEC/IEEE 42010



Domain



[http:// www.electropedia.org](http://www.electropedia.org)
ISO/IEC/IEEE 24765

What are the market/industry trends and societal needs?

Stakeholders



Engagement through:

- Liaisons
- R-members
- Open Forums

Who are the key stakeholders of the system and what are their needs and objectives?

Use Cases



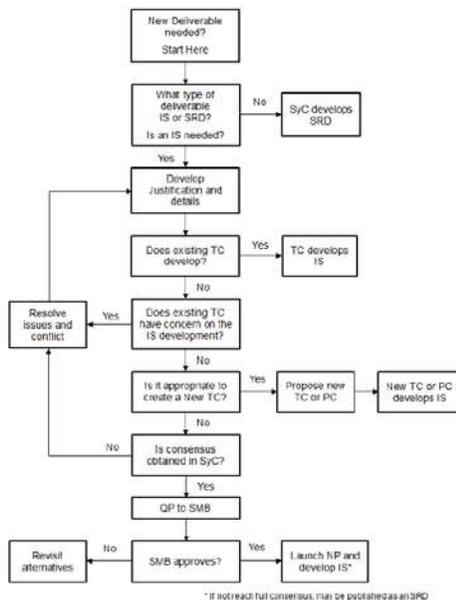
What are the different use cases for the system and how do they interact with the system?

- IEC 62559
- Use Case Management Repository

Every stage adds value in the understanding of complex systems/domains

Value from Published Deliverables

- International Standards IS
- Systems Resource Deliverables SRD (only for SyC and only IEC!!!)
- Technology Reports



Process to start International Standards in SyCs



...in Summary

Systems Engineering is a well developed discipline traditionally used for the engineering of technical systems.

IEC Systems Approach is the application of the systems engineering discipline to standards work.

IEC System Committees apply IEC Systems Approach to identify the *system of standards* needed for large domains:

incorporating multiple interconnected technologies,
needing standards that must interwork, and
which must address new & all stakeholder concerns

IEC SG12 MG (formerly System Resource Group) supports IEC Systems Approach with expertise and tools for systems approach.

Closing loops, cooperation beyond IEC

#worldsmartcity2016
www.worldsmartcity.org



World Smart City Forum 2017

Future cities – Solutions for common challenges



2019: MoU for Joint Task Force on Smart Cities



World Smart City Forum

29 November 2018
Santa Fe, Argentina

#SMARTCITIES



2020: Kick-off of the Joint Task Force on Smart Cities



Thank you!

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