Title	European network of Cybersecurity centres and competence Hub for innovation and Operations
Acronym	ECHO
Number	830943
Type of instrument	Research and Innovation Action
Topic	SU-ICT-03-2018
Starting date	01/02/2019
Duration	48
Website	www.echonetwork.eu

D3.2 GOVERNANCE ALTERNATIVES

Work package	WP3 ECHO Governance Model
Lead author	Georgi Penchev (IICT)
Contributors	Velizar Shalamanov (IICT), Antoniya Shalamanova (IICT), Yantsislav Yanakiev (BDI), Maya Bozhilova (BDI), Pavel Varbanov (ESI CEE), Ivaylo Gueorguiev (ESI CEE), George Sharkov (ESI CEE), Mirjam Kert (GT), Consuelo Colabuono (RHEA), Alex Butterworth (RHEA), Todor Tagarev (IICT)
Peer reviewers	Matteo Merialdo (RHEA), Todor Tagarev (IICT), Ewa Konieczna (VisionSpace)
Version	V1.0
Due date	31/07/2020
Submission date	31/07/2020

Dissemination level

X	PU: Public
	CO: Confidential, only for members of the consortium (including the Commission)
	EU-RES. Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)
	EU-CON. Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)
	EU-SEC. Classified Information: SECRET UE (Commission Decision 2005/444/EC)

Version history

Revision	Date	Editor	Comments
0.1	28/05/2020	Georgi Penchev (IICT)	Structure of the document and key theses
0.2	04/06/2020	Pavel Varbanov (ESI CEE), Yantsislav Yanakiev (BDI), Consuelo Colabuono (RHEA), Mirjam Kert (GT)	Restructuring and editing sections of Chapter 7
0.3	11/06/2020	Pavel Varbanov (ESI CEE), Yantsislav Yanakiev (BDI), Consuelo Colabuono (RHEA), Mirjam Kert (GT) Georgi Penchev (IICT)	Added Section 7.1 Final version of Chapter 7
0.4	18/06/2020	Pavel Varbanov (ESI CEE), Yantsislav Yanakiev (BDI), Consuelo Colabuono (RHEA), Mirjam Kert (GT), Alex Butterworth (RHEA) Velizar Shalamanov (IICT), Georgi Penchev (IICT)	Agreed and approved Table of Contents of Chapter 9 Methodology and results parts final draft – Chapters 4,5,6 and 8
0.5	25/06/2020	Georgi Penchev (IICT) Maya Bozhilova (BDI)	Final approved version of Chapters 4,5,6 and 8.
0.6	02/07/2020	Alex Butterworth (RHEA), Todor Tagarev (IICT) Velizar Shalamanov (IICT), Georgi Penchev (IICT), Consuelo Colabuono (RHEA), Alex Butterworth (RHEA), Antoniya Shalamanova (IICT), Marco Angelini (LCU)	Final versions of Chapters 2 and 3 Final version of Chapter 9
0.7	09/07/2020	Antoniya Shalamanova (IICT) Velizar Shalamanov (IICT), Alex Butterworth (RHEA)	Language Check T3.3 Internal Review
0.9	14/07/2020	Georgi Penchev (IICT)	Final edit and layout
0.92	22/07/2020	Todor Tagarev (IICT), Ewa Konieczna (VisionSpace)	Internal Review and QA checks
0.95	27/07/2020	Georgi Penchev (IICT), Velizar Shalamanov (IICT), Antoniya Shalamanova (IICT)	Amendment according to the reviewers comments, Language check
1.0	31/07/2020	Ewa Konieczna (VisionSpace), Matteo Merialdo (RHEA)	Minor updates

List of contributors

The list of contributors to this deliverable are presented in the following table:

Section	Author(s)
Executive Summary	Velizar Shalamanov (IICT)
Introduction	Georgi Penchev (IICT)
Chapter 2	Alex Butterworth (RHEA)
Chapter 3	Todor Tagarev (IICT)
Chapter 4	Georgi Penchev (IICT); Maya Bozhilova (BDI)
Chapter 5	Georgi Penchev (IICT)
Chapter 6	Georgi Penchev (IICT)
Chapter7, Sections 7.1, 7.2	Georgi Penchev (IICT)
Chapter7, Section 7.3	Yantsislav Yanakiev (BDI)

Section	Author(s)
Chapter7, Section 7.4	Pavel Varbanov (ESI CEE), Ivaylo Gueorguiev (ESI CEE), George Sharkov (ESI CEE)
Chapter7, Section 7.5	Mirjam Kert (GT)
Chapter7, Section 7.6	Consuelo Colabuono (RHEA)
Chapter 8	Georgi Penchev (IICT)
Chapter 9	Georgi Penchev (IICT), Velizar Shalamanov (IICT), Antoniya Shalamanova (IICT), Consuelo Colabuono (RHEA), Alex Butterworth (RHEA), Marco Angelini (LCU)
Conclusions	Georgi Penchev (IICT)

Keywords

Governance Model, Analytic Hierarchy Process, Governance Model Alternatives Development and Description, Goal and Criteria, Ranking of the Criteria, Assessment of Alternatives

Disclaimer

Executive summary

Deliverable *D3.2: Governance alternatives* is presenting the effort to define the methodology for the development of Governance and Management (GM) model for ECHO as a Collaborative Networked Organisation (CNO) and implementing the second phase of the process – development, assessment and selection of the GM model alternative.

The first phase was focussed on the analysis of the existing GM models, information sharing models (as a core to have on a network of organizations), and stakeholder expectations in order to define the needs and objectives for the GM model as well as to identify the Mission, Vision, Value proposition and Strategy for the ECHO CNO. Third phase is to accomplish a detailed design of the selected GM model and the fourth phase is transition planning, followed by implementation and maturity assessment for Initial Operating Capability (IOC) and Full Operating Capability (FOC), providing a mechanism for continuous improvement.

The focus in this document is the implementation of the Analytic Hierarchy Process (AHP) method for decision making in order to put a structure and discipline in the development of consensus on the GM model for ECHO. So, in addition to the general methodology the effort is on the development of a set of applications to support the process, based on AHP method and to organize set of events to engage large number of people from partner organisations and external stakeholders. The side effect is to build a GM community inside ECHO and among the four pilot projects, engaging European Cyber Security Organisation (ECSO) as well. Inside ECHO, this GM team is a core for the service group on Governance & Management Consulting that has to develop set of services for the ECHO Service (Customer) Catalogue.

Development of the set of applications is to support not just ECHO task *T3.3: Governance models definition* in the development of D3.2, but to set up an environment for development of governance models for CNOs and other organisations.

This D3.2 deliverable builds a bridge to *D3.3: Governance model description* (actually this D3.2 is covering part of the D3.3. scope according to the Description of the Action (DOA)**[GA]**) as these two documents are core of the task T3.3, part of one effort. D3.2 goes further than the scope of DOA in order to support the work of other WPs and the engagement with other pilot projects in the Focus group on Governance before February 2021, when D3.3 will be delivered.

We could identify and defend the following key innovations developed during the preparation of the deliverable to achieve the objectives of T3.3 in D3.2:

1. Definition of the framework for GM model development for a complex CNO in cyber domain;
2. Definition of the goal and criteria for a successful GM model for CNO in case of ECHO;
3. Identification of the prototype GM models for Cyber competence CNO and development of alternatives around these prototypes for ECHO organisation;
4. Transition from the set of assessed and compared alternatives to an umbrella GM model for Cyber CNO;
5. Development of a tool for assessment and ranking of criteria;
6. Development of a tool for assessment and comparison of alternatives;
7. Development of a tool to deal with inconsistencies and sensitivity analysis.

Deliverable D3.2 builds on input from WP1 and WP9 with direct contribution from T3.1 and T3.2 as well as draft annexes to D3.5 on first year Annual Report on GM model for ECHO Project**[D3]** and Partnership book**[D3]**.

Chapter 9 of this deliverable is directly contributing to define the scope of *D3.3: Governance model description*, *D3.4: Governance model implementation plan* and *D3.5: ECHO Operations status report*.

Decision for using open source environment for the applications developed to support the AHP provides opportunity for further improvement of these applications during implementation for D3.2 and its update and

as a result to include them (applications) as part of the tools and services of ECHO organisation in the area of governance and management consulting.

Along the work on D3.2 several workshops were organised in order to build a community and team on governance model development and in particular to agree on methodology, goal and criteria for the governance model.

Work on D3.2. included 3 major workshops – one internal in August 2019, one on 1 October 2019 and last one on 12 May 2020 – they were very useful from educational perspective in establishing the strong governance and management expert team, so we as ECHO Project to be able to engage with other 3 pilots and ECSO in forming a Focus Group on Governance and Management in support to the European Commission.

The deliverable presents the methodology framework for GM model development, AHP method application for ECHO GM model selection, description of goals, criteria and alternatives, their assessment and sensitivity analysis. Last chapter is defining the scope of selected option to develop an "umbrella" alternative for the GM model of ECHO CNO.

There are 6 annexes to support this deliverable – analysis of the group of experts participating in application of the AHP method, detailed description of GM bodies in the proposed 4 (four) alternatives (to be used in the design of the "umbrella" model as defined in Chapter 9), guidance for criteria ranking, guidance for the development of alternatives, and guidance for alternatives assessment.

The main body of the deliverable is supported by Annexes 4,5 and 6 describing guidance given to the development teams and to the group of experts. These annexes served as a basis for creation of Chapters 6,7 and 8.

This deliverable will be further updated, based on experience of using its results in D3.3, D3.4, and D3.5 and according to the feedback of internal and external partners.

Table of contents

List of figures

List of tables

1. Introduction

The development of a Governance and Management (GM) model suitable for a Collaborative Networked Organisation (CNO) is a complex task. The planning of a Governance Model should embrace many aspects of the external and internal environment of the organisation, the participating organisations' organisational structures, processes and culture and last, but not least – the sharing of resources and allocation of benefits.

The effective governance model should balance the decision-making process between the CNO's members through representation and adequate voting rules, a clear chain of accountable management roles, as well as transparency towards its members and stakeholders.

High level of trust and stable, long-term consensus should be assured by relevant procedures, structures and roles on all levels of governance and management.

The continuous improvement and increase of the maturity level of the organisational processes of the CNO is an inevitable requirement for effectiveness of the governance and management. This requirement cannot be met without implementation of specific initiatives for continuous monitoring, evaluation and improvement.

In this regard the complex long-term objective for the ECHO Project (European network of Cybersecurity centres and competence Hub for innovation and Operations) is to transition from a consortium organisation to an established, stand-alone networked organisation and requires a complex approach.

The *Work Package 3 (WP3): ECHO Governance Model* provides a four-year plan for the development and implementation of such a solution. In general, the main phases can be summarized as follows:

1. Analysis of external and internal environment, identification of best practices, stakeholders and potential members, as well as clear definition of the Mission, Vision and Strategy;
2. Analysis of the best practices and initial selection of practices and processes for development and implementation;
3. Development of GM model and CNO's charter and planning for transition and improvement initiatives;
4. Implementation, monitoring and improvement of the GM model.

The execution of those phases and activities is not a stand-alone job for the WP3 team; it is a network activity in ECHO consortium (including external stakeholders) cooperating with other WPs.

1.1 Purpose and scope of the document

The purpose of this document is to present the results achieved during the execution of WP3's *Task 3.3: Governance model definition* (T3.3). The task has an overall goal to define and develop GM model for ECHO and has three deliverables – *D3.2: Governance alternatives* (current document), *D3.3. Governance model description* and *D3.4: Governance model implementation plan*. Implementation of the GM model (T3.4) and building of the network of partners (T3.5) are activities to be reported in a joint deliverable *D3.5: ECHO Operations status report*.

In relation to WP3 planning and phases, the current document is dedicated to analysis of the best practices and possible options and selection of the most suitable one for ECHO GM model development and implementation.

Considering the main phases of GM model development and implementation, described above, the document is based on the results from the analysis of Phase 1 and provides rational selection of processes, procedures and structures as input for detailed development of the GM model in Phase 3. In terms of WP3 tasks and deliverables, the current document should provide stable solution and selection for the GM development and description, planned for Deliverable D3.3.

The work on T3.3's D3.2 started with development of overall Methodological Framework for GM model development. The Framework was approved at the Workshop on Methodology Framework in Sofia, 01 October 2019. The Analytical Hierarchy Process (AHP) was selected as a method for evaluation and selection of possible options for GM model further development.

According to the agreed deliverable contents and list within the Grant Agreement**[GA]** the D3.2 contains the analysis of existing networks and ECHO GM model, as well as the criteria structure for governance model assessment. The full-scale development of alternatives and AHP model application – criteria ranking, alternatives assessment and selection of most suitable solution for ECHO GM model is considered as a part of D3.3.

During the implementation of task T3.3 the WP3 team considers three important aspects of the task's jobs.

First, it is better to have full coherently developed and applied AHP model within the deliverable D3.2, rather to divide it in two parts. The D3.3 itself is a complex job based on several different methodological frameworks and it is better not to add additional complexity by adding the AHP application.

Second, finishing the AHP application and selecting the most suitable option for GM model will provide clear baseline for the detailed GM procedures, roles and structures development for the D3.3. as well as provide timely input to the Focus Group on Governance with the other 3 pilot projects and ECSO, supporting potential development of the White paper on EU Cyber Security Collaborative Network (ECSCON) governance[1].

Finally, the recommendation provided by the General Project Review Consolidated Report (p. 3) suggests for WP3 to apply models in their full scale and logic.

Therefore, the **decision was made** in regard to WP3's T3.3 **to extend the scope of D3.2, taking in advance all activities planned for AHP model application in D3.3**.

Moving the AHP model application to D3.2 **do not deflate the scope of work planned for D3.3**. This decision provides more clarity and space for important analysis of processes, structures and responsibilities in GM model. The description of planned activities is given in Section 9.1 and Figure 37.

The AHP is a multi-criteria method for complex goals' decision-making, based on expert opinion. The method is popular and is useful especially in cases where lack of statistical or other objectively collected and aggregated data is present. The experts' opinion is used as replacement of data by applying, aggregating and analysing the individual evaluations provided by the group of experts.

Application of AHP within the agreed Framework through T3.3 activities passed the following steps:

1. Setting-up goal and criteria hierarchy, on the basis of the results of several analyses provided by other ECHO's tasks, especially WP1;
2. Developing and sending the Criteria Ranking Questionnaire to the selected experts from different WPs as well as to external experts to ECHO;
3. Selection of the short list of alternatives on the basis of analysis provided by D3.1. Governance needs and objectives;
4. Structuring and unifying description of the alternatives;
5. Development of 4 main alternatives around the identified clusters in D3.1;

---

[1] The proposal for ECSCON is presented in Chapter 9.

6. Developing and sending the Alternatives Assessment Questionnaire to the experts;
7. Analysis of the results;
8. Decision on the most suitable GM model for ECHO;
9. Defining the framework for the detailed design of the selected GM model.

The results from steps 1-6 were presented at the Workshop on Governance Model Alternatives Assessment and Selection, 12 May 2020, conducted as a Telco meeting.

The document presents all steps in AHP application as documents and results, as well as their methodological and analytical prospective plus the results of steps from 7 to 9.

The decision approved by the participants in the Workshop on 12th of May, 2020 is to develop an additional Alternative (named Alternative 0) as a combination of other identified alternatives. The new alternative should provide flexible GM model as an "umbrella" for the CNO, consisting of different entities with their own elements of GM.

The alternative and final selection of processes (procedures), structures and initiatives for the detailed development in T3.3's D3.3: Governance model description are also presented in Chapter 9.

1.2 Structure of the document

The document is structured in introduction (as a first chapter), eight chapters, conclusions (as a tenth chapter) and six annexes.

Chapter 2 presents the inputs to the D3.2 in relation to ECHO strategic documents and decisions until development of the deliverable, linking WP3 with WP1.

Chapter 3 provides the relation to important D3.1: Governance needs and objectives document, used as input for analyses of D3.2.

Chapter 4 is dedicated to description of the methodological framework in which the D3.2 is developed. The overall framework of T3.3 and its three deliverables relations (D3.2, D3.3 and D3.4) are described in brief. AHP method is presented in details, as well other methods used.

Chapter 5 presents the logic of AHP goal and criteria set-up, as well as description of the criteria, as they were presented to the group of experts.

Chapter 6 provides results from criteria ranking by the group of experts. The consideration about consistency of answers and consistency improvement are given. Group consensus and existence of sub-groups within the experts are also considered.

Chapter 7 describes the process of short-list selection of prototypes for ECHO governance model and development of ECHO GM model alternatives. Description for each of the four alternatives from the selected short-list is presented in this chapter.

Chapter 8 presents the results and analysis of the AHP alternatives assessment step. The consistency of answers, consensus of the groups and sensitivity of the results are analysed and presented.

Chapter 9 provides the solution chosen after the AHP application according to the decision taken during the Workshop on Governance Model Alternatives Assessment and Selection, on 12 May 2020, Telco meeting. This solution will serve as input for the next activity within T3.3 – D3.3.

1.3 Relation to other work in the project

The current document is developed as a planned activity within the ECHO task T3.3: Governance models definition.

The input to this first T3.3 document – D3.2: Governance alternatives – is provided mainly by the analytical results of D3.1: Governance needs and objectives**[D1]** (developed within the framework of T3.1). Other important inputs are the decisions made regarding ECHO's strategic goals and directions (mostly in WP1 context), and D3.6: ECHO information sharing models**[D5].** In addition, D3.2 benefited from the strategic partnership of ECHO with the three other pilot projects – SPARTA, CONCORDIA and CS4E. In the development of the alternatives, active contribution was provided from WP2, WP5, WP6 working on the key services in the ECHO value proposition and service offer, as well as WP9 on key issues of business planning and innovation management. Very valuable was the input from other tasks of WP3 – namely T3.4. through the First Annual report on ECHO GM model**[D4]** and T3.5 through the Partnership book**[D3]** approved by the GA of ECHO project.

The results of the document will be used as an input for the development of the next T3.3 documents – D3.3: Governance model description and even D3.4: Governance model implementation plan. We expect to define a link to WP4 for the development of a technology roadmap for the Governance Information Management System to support the designed GM model as well as with WP7 and WP8 to demonstrate the GM model along testing of selected scenarios and use cases of demonstrating ECHO services.

The D3.2, D3.3 and D3.4 will also provide important input for and are closely related to the T3.4 and T3.5 and their deliverable D3.5: ECHO Operations status report.

1.4 Applicable and reference documents

The following documents contain requirements applicable to the generation of this document:

Reference	Document Title	Document Reference	Version	Date
[GA]	Grant Agreement 830943 – ECHO	-	1.0	02/04/2019
[PH]	D1.1 Project Handbook	ECHO_D1.1_v1.41	1.41	02/05/2019
[PQP]	D1.3 Project Quality Plan	ECHO_D1.3_v1.1	1.1	31/05/2019
[CA]	Consortium Agreement	-	4.2	31/01/2019

Table 1: Applicable documents

The following documents have been consulted for the generation of this document:

Reference	Document Title	Document Reference	Version	Date
[D1]	D3.1 Governance needs and objectives	ECHO_D3.1 Governance Needs and Objectives_v1.1.pdf	1.1	03/02/2020

Reference	Document Title	Document Reference	Version	Date
[D2]	Regulation of the European Parliament and of the Council establishing the European Cybersecurity Industrial, Technology and Research Competence Centre and the Network of National Coordination Centres	https://ec.europa.eu/digital-single-market/en/news/proposal-regulation-establishing-european-cybersecurity-industrial-technology-and-research		12/09/2018
[D3]	ECHO Partnership Handbook	ECHO Partnership Handbook v1.2 (FINAL).pdf	1.2	03/04/2020
[D4]	ECHO First Annual Report on E-GM	ECHO_First Annual Report on E-GM_v1.0.pdf	1.0	14/04/2020
[D5]	D3.6 ECHO Information sharing models	ECHO_D3.6 ECHO Information Sharing Models v1.0.pdf	1.0	31/10/2019
NOTE:	All references to literature sources used in this document are cited and are given as bibliography in Annex 1 – References.			

Table 2: Reference documents

1.5 Intellectual Property Rights

Based on the legal framework provided in the ECHO Grant Agreement and the Consortium Agreement, ECHO specific IPR procedures have been followed within this deliverable as established to protect the innovations and knowledge developed in ECHO project.

Key innovations used in the deliverable are:

1. Definition of the framework for GM model development for a CNO in cyber domain;
2. Definition of the goal and criteria for a successful GM model for CNO in case of ECHO;
3. Identification of the prototype GM models based on analysis of existing Cyber competence CNO and development of alternatives around these prototypes for ECHO organisation;
4. Transition from the set of assessed and compared alternatives to an umbrella GM model for Cyber CNO;
5. Development of a tool for assessment and ranking of criteria;
6. Development of a tool for assessment and comparison of alternatives;
7. Development of a tool to deal with inconsistencies and sensitivity analysis.

1.6 Glossary of acronyms

Acronym	Description
A0, A1,…, A4	Alternative 0, Alternative 1, Alternative 2, Alternative 2, Alternative 4
ADKAR	Awareness, Desire, Knowledge, Ability, Reinforcement
AFCEA	Armed Forces Communications and Electronics Association
AHP	Analytic Hierarchy Process
AIJ	Aggregation of the Individual Judgments
AIP	Aggregation of the Individual Priorities
ASG ESC	Assistant Secretary General for Emerging Security Challenges
BPMN	Business Process Management Notation
CDC	NATO Cyber Defense Committee
CI	Consistency Index

Acronym	Description
CMMI	Capability Maturity Model Integration
CNO	Collaborative Networked Organisation
COBIT	Control OBjectives of Information and related Technologies
COM	Current Operating Model
CONCORDIA	Cyber security cOmpeteNce fOr Research anD Innovation (EU Horizon 2020 Cyber security pilot project)
CR	Consistency Ratio
CS4E	Cyber Security for Europe (EU Horizon 2020 Cyber security pilot project)
DCAF	Geneva Centre for Democratic Control of Armed Forces
DOA	Description of the Action (GA Annex)
ECCC	European Cybersecurity Competence Centre
ECSO	European Cyber Security Organisation
ECSCON	EU Cyber Security Collaborative Network
EDA	European Defence Agency
ENISA	European Union Agency for Cybersecurity
E&T	Education and Training
EU MS	EU Military Staff
EUCI	EU Classified Information
FAIR	Findable, Accessible, Interoperable and Re-usable
FANNY	Fuzzy Analysis Clustering
FOC	Full Operating Capability
GA	Grant Agreement
GIMS	Governance Information Management System
GM	Governance and Management
IA	Internal Audit
ICQA	Internal Control Questionnaire and Assessment
ICT	Information and Communication Technology
IFR	Internal Financial Report
IOC	Initial Operating Capability
IPR	Intellectual Property Rights
ITR	Internal Technical Report
MCDM	Multiple Criteria Decision-Making
NCC	National Coordination Centre
NCCC	Network of Cybersecurity Competence Centres
NCIA	NATO Communications and Information Agency
NfP	Non-for-Profit
PCA	Principal Component Analysis
PCM	Pairwise Comparison Matrix
PoC	Point of Contact
PoW	Program of Work
PPP	Public Private Partnership
R&D	Research and Development
R630	Regulation of the European Parliament and of the Council establishing the European Cybersecurity Industrial, Technology and Research Competence Centre and the Network of National Coordination Centres

Acronym	Description
RACI	Responsible, Accountable, Consulted, Informed matrix
RI	Randomness Consistency Matrix Index
SAB	Security Advisory Board
SLA	Services Level Agreement
SME	Small- and Medium-sized Enterprises
SPARTA	Strategic Programs for Advanced Research and Technology in Europe (EU Horizon 2020 Cyber security pilot project)
TOM	Target Operating Model
VBE	Virtual organisations Breeding Environment
VO	Virtual Organisation
WP	Work Package
ECHO Governance Model related acronyms	
ECHO	European network of Cybersecurity centres and competence Hub for innovation and Operations
AC	Audit Committee
DMP	Data Management Plan
DPC	Deputy Project Coordinator
DPO	Data Protection Officer
E-CCS	ECHO Cyber security Certification Scheme
E-CSCS	ECHO Cybersecurity Certification Schemes
E-CSF	ECHO Cybersecurity Skill Framework
E-EWS	ECHO Early Warning System
E-FCR	ECHO Market Place for Cyber Range providers
E-GM	ECHO Governance Model
E-MAF	ECHO Multi Assessment Framework
GA	General Assembly
IA	Internal Audit
MSIEC	Multi-Sector Innovation and Exploitation Committee
PAC	Project Advisory Committee
PC	Project Coordinator
PIC	Project Implementation Coordinator
PM	Project Management
PMB	Project Management Board
PPoC	Partner Point of Contact
PSO	Project Security Officer
QDMC	Quality and Data Management Committee
STC	Scientific and Technical Committee
STMC	Scientific and Technical Management Coordinator
ECHO Work Packages, Tasks and Deliverables related acronyms	
D3.1	Deliverable 3.1 (of T3.1): Governance needs and objectives
D3.2	Deliverable 3.2 (of T3.3): Governance Alternatives
D3.3	Deliverable 3.3 (of T3.3): Governance model description
D3.4	Deliverable 3.4 (of T.3.3): Governance model implementation plan

Acronym	Description
D3.5	Deliverable 3.5 (of T3.4 and T3.5): ECHO Operations status report (repeatedly updated 2020-2024)
D3.6	Deliverable 3.6 (of T3.2): ECHO Information sharing models
FAR	First Annual Report (of T3.4, D3.5, see [D3])
PrH	ECHO Partnership Handbook (of T3.5, see [D4])
T3.1	Task 3.1: Governance needs and objectives
T3.2	Task 3.2: Information sharing models' definition
T3.3	Task 3.3: Governance models definition
T3.4	Task 3.4: Governance Operation
T3.5	Task 3.5: New partner engagements
WP1	Project coordination and management
WP2	Multi-sector needs analysis
WP3	ECHO Governance Model
WP4	Inter-sector Technology Roadmaps
WP5	ECHO Early Warning System
WP6	Federated Cyber Range
WP7	Network-wide integration, installation and test
WP8	Demonstration Cases
WP9	Dissemination, Exploitation, and Innovation Management
WP10	Ethics requirements

Table 3: Glossary of acronyms, initialisms and abbreviations

2. ECHO Mission, Vision and Strategy

This section provides a brief overview of the functions, processes, authorities and responsibilities of the ECHO Project and its governing bodies. The description below presents the work and decision taken during the execution of WP1, WP3 and WP9 tasks related to Governance, Stakeholder engagement, and communication and dissemination of the ECHO Project's activities and results.

This is a snapshot of the current status of the documents and activities related to the ECHO Project Governance Model, it is a living document, and as such will be updated throughout the duration of the project in order to further define, in detail, the future ECHO Group and Network as work on these areas matures.

2.1 Defining strategic goals

The European Commission has, under the H2020 Program, brought together specialist expertise to form four pilot projects with the objective of connecting and sharing knowledge across multiple domains to develop a common cybersecurity strategy for Europe. ECHO (the European network of Cybersecurity centres and competence Hub for innovation and Operations) is one of these four projects. The ECHO consortium consists of 30 partners from different fields and sectors including health, transport, manufacturing, ICT, education, research, telecom, energy, space, healthcare, defence & civil protection.

The main objective of ECHO, as defined in the original proposal, is to strengthen the proactive cyber defence of the European Union, enhancing Europe's technological sovereignty through effective and efficient multi-sector and multi-domain collaboration. The project will develop a European Cybersecurity ecosystem, to support secure cooperation and development of the European market, as well as to protect the citizens of the European Union against cyber threats and incidents.

ECHO's Mission, Vision and Impact statements were developed with both of the above objectives in mind and the EC's stated requirements for securing Europe's digital economy, building a single market for cybersecurity, updating Digital Education Action Plans and providing certifications in mind.

The following statements have been prepared and are prominently displayed on the ECHO website as a commitment from the Project.

Mission

Striving to put innovation, excellence and people at the centre of European cybersecurity efforts by enhancing Europe's technological sovereignty, providing a single market for cybersecurity technological solutions and delivering unique cybersecurity capabilities.

Vision

Establishing a Cybersecurity Competence Network to implement the EU's vision for a more secure European Digital Single Market.

Impact

Developing a robust, resilient and sustainable cybersecurity ecosystem to accelerate the advancement of cybersecurity capabilities and excellence in Europe.

2.2 Main Concepts

The project originally consisted of 5 'pillars' or elements, constituting the core activities, each aimed at addressing a unique problem or requirement. However, as WP3 has progressed, and work on the Governance model has evolved it was identified as a sixth pillar, crucial to the overall success of the project and ambition to evolve from R&D phase to operational entity.

- *ECHO Governance Model* – Management of direction and engagement of partners (current and future);
- *ECHO Multi-sector assessment framework* – Transverse and inter-sector needs assessment and technology R&D roadmaps;
- *ECHO Cyber skills Framework and training curriculum* – Cyber skills reference model and associated curriculum;
- *ECHO Cybersecurity Certification Scheme* – Development of sector specific security certification needs within EU Cybersecurity Certification Framework from ENISA;
- *ECHO Federated Cyber Range* – Advanced cyber simulation environment supporting training, R&D and certification;
- *ECHO Early Warning System* – Secured collaborative information sharing of cyber-relevant information.

ECHO will develop sector-specific and inter-sector demonstration cases for improving security measures within and among organisations. The testing and validation of innovative technologies, operational and decision-making processes enables the identification, specification and development of inter-sector challenges and opportunities, enabling the definition and development of relevant inter-sector technology roadmaps.

The ECHO governance model will define the effective operational management of the future ECHO Group which shall provide an umbrella for the community, consisting of a network of cybersecurity organisations and bodies, interfacing with institutional framework of the EC and MSs as well as with the customers in the cyber security market and cyber partners outside the ECHO network.

2.2.1 Strategic challenges

ECHO intends to raise awareness of the need for cybersecurity amongst EU citizens and better inform them of potential threats and best practises. The project will also provide innovative solutions to Governmental cyber issues, aid detection of cyberattacks, better counter them and improve response times in order to reduce their impact and ensure the safety of democratic decision-making.

Industry will be educated on why and how to protect themselves and their customers against potential loss of data or money, helping to consolidate their reputation and position in the market.

The main challenge faced by ECHO is to create a stable, effective, shared and durable network composed of governments, academic organisations and companies in order to pool the collective cybersecurity skills, resources and knowledge within the European territory, whilst also meeting the needs and structure defined in Regulation 630**[D2]**.

Objectives & Challenges

ECHO targets practical use of outcomes to offer technologies and services having increased cyber-resilience by sector and among inter-dependent partners product evaluations

Use of ECHO Federation of Cyber Ranges (E-FCR) for experimental simulation of cyberattack scenarios, pre-production testing, product evaluations

Combined use of the ECHO Federation of Cyber Ranges (E -FCR) and E-Cybersecurity Certification Scheme (E-CCS) for certified qualification testing of potential technologies required to meet customer specification

Use of ECHO Cybersecurity Certification Scheme (E-CCS as benchmark of cybersecurity) certification to be obtained as a market differentiator

Use of the ECHO Early Warning System (E-EWS) to share early warning of cybersecurity related issues (e.g., vulnerabilities, malware and trends, etc…)

Promotion of improved cyber skills through leveraging diverse education and training options made available by the E -Cybersecurity Skills Framework, particularly as it relates to security - by - design best practices.

Figure 1: Strategic objectives and challenges of the ECHO Project

The visionary aim of ECHO is anchored on the project's name itself: to establish a strong and resounding sustainable network of cybersecurity centres and competence for innovation within European Union, which will facilitate the sharing of knowledge, threats and cyber incidents for improving cybersecurity solutions, raise awareness of security and protection methods and establish best practices to reduce risk exposure.

The relations between Objectives and Challenges, as they had been identified by initial work conducted by WP9, is given in Figure 1.

2.2.2 Relations to the Regulation 2018/630

Regulation 630 (R630)**[D2]** will establish the European Commission's requirements for a European Cybersecurity Industrial, Technology and Research Competence Centre (the 'Competence Centre'), as well as the Network of National Coordination Centres, and lays down rules for the nomination of National Coordination Centres (NCCs) as well as for the establishment of the Cybersecurity Competence Community.

The regulation envisages a Competence Centre which should facilitate and help coordinate the work of the Cybersecurity Competence Network ("the Network"), made up of National Coordination Centres in each Member State. National Coordination Centres should receive direct Union financial support, including grants awarded without a call for proposals, in order to carry out activities related to this Regulation.

Alignment to R630 to ensure ECHO Group is compliant with European Cybersecurity Competence Centre (ECCC) operational model.

The overarching objective of Work Package 3 (WP3) is to define and establish an appropriate governance model of the ECHO network, as by the completion of this Horizon 2020 funding the ECHO project will need to transition from a Consortium to a networked organisation.

In this instance, a collaborative networked organisation is defined as an organisation incorporating independent entities connected (networked) to collaborate towards achieving the main goal of becoming a cybersecurity competence centre, as well as to provide cybersecurity products and services. Towards that purpose, the overarching objective of Work Package 3 (WP3) is to develop a governance model of the future ECHO-based network and a plan to transition (change management plan) from Consortium governance and management to Network governance and management.

With respect to R630, Consortium has focused on the following open points:

- Need to establish a legal entity that will continue to work after the end of the project. Transition is vital to happen before the end of the project – how we should move from ECHO project to some legal entity that is governed under the law of Belgium or else.
- Define what kind of organisation we are and what kind of organisation we would like to be.
- Collaboration with ECSO, ENISA, EDA, NCIA.
- Collaboration and hands on work with other pilots.
- Relations with the future ECCC/Network of NCCs when established (2023).

The initial proposal developed for the ECHO Governance model was envisioned as an instrument to bring together all ECHO partners and to attract new partners (at least 15) to build a network with central hub for development of a portfolio of services in several areas presented in Figure 2.
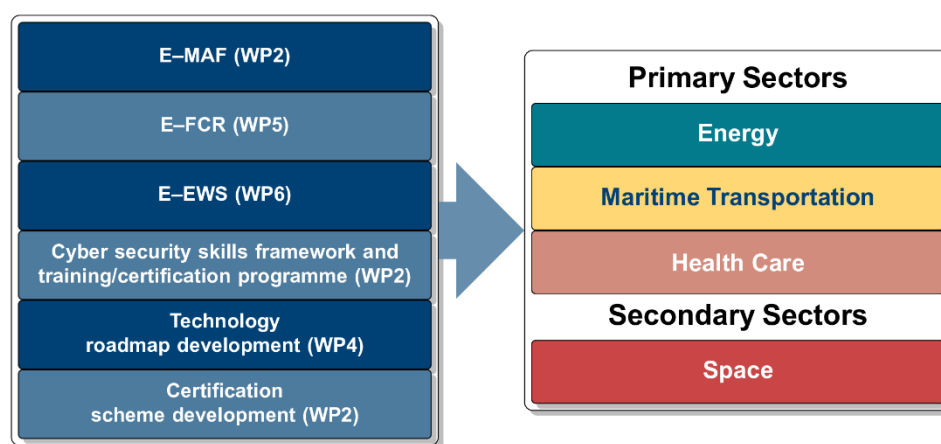
Figure 2: Initial areas and sectors

The ECHO governance model is under development following a study of best practices to identify prototypes and definition of the needs and objectives for ECHO governance, proposing the most suitable Business Model. This phase, to include specific study on information sharing models in cybersecurity domain as a critical service for the network and its customers, finished on 31 January 2020.

There are Options to integrate ECHO project in R630. Based on the option selected by ECHO Project leadership (Project Management (PM), Project Implementation Coordinator (PIC) and Project Management Board (PMB)), Partners in WP3 will align the current grand design of Governance and Management of

ECHO Group and ECHO Network in the period of development during the project and after that for the next 5 years (to cover the period 2021-2027).

2.3 ECHO Group, Network and Membership

The ECHO Group is envisaged to be an operational entity, encompassing pan-European cybersecurity centres and competence hubs to deliver a portfolio of Cyber related services and content, both developed within the frame of the project, and from third party affiliates, to Governmental, Industrial and Academic users.

The future ECHO Group will operate a governance model compliant with that of the European Cybersecurity Competence Centre (ECCC) as defined in Regulation 630, piloting the requirements and identifying improvements and recommendations to support the EC's implementation of the regulation.

The ECHO Group shall be flexible and is expected to merge with other entities and groups as it grows and evolves in order to maximise the number of services offered and meet the growing needs of the envisaged ECCC.

The ECHO Network describes the organisation of all future partners, including those offering services such as the ECHO Market Place for Cyber Range providers (E-FCR); access to the ECHO Early Warning System (E-EWS); skills training; and certifications, in addition to potential consumers of the services on offer. The ECHO Network may consist of existing ECHO Project Partners in addition to new partners engaged throughout the life of the ECHO Project.

The membership of the ECHO Project's R&D Phase according to definitions in the New Partner Handbook is divided in following three categories:

- **ECHO Club Members** are classified as parties interested in the outcomes of the project, but do not contribute in anyway, and as such are not considered beneficiaries. Therefore, they are not bound by the Grant Agreement**[GA]**, Consortium Agreement**[CA]** or New Partner Agreement, nor are they committed to specific tasks. However, there remain a myriad of opportunities to be affiliated with the Project;
- **ECHO Participants** are interested in more actively collaborating in the Project by providing support, effort, feedback and participation in studies and demonstrations, and have the opportunity to gain full access to specific topics (e.g. the ECHO E-EWS). ECHO Participants are not beneficiaries, and are not bound by the Grant Agreement**[GA]**. However, in order to contribute to R&D and Network activities participants shall be bound by a simple New Partner Agreement and the Consortium Agreement;
- **ECHO Partners** are parties interested in becoming fully contributing partners, by providing fresh funding or effort they would be able to influence the project and its activities, such as identifying and developing additional Technology Roadmaps and gain full access to all topics, as such, an amendment to the Grant and Consortium Agreements**[GA,CA]** is needed, requiring a vote of the ECHO General Assembly.

The Governance structure of the future ECHO Group and Network is still under development, however, it is anticipated that the organisation will consist of regional and focus groups (service, product or functional), which at a minimum should have the following membership categories:

- **Accredited member** – certified organisation or individual for cybersecurity competences, benefiting from reputation gained, without any voting rights;

- **Associated member** – member associated to regional chamber with voting rights to the chamber's structures. Commitment of this category of members is related to provision of resources and organisation of regional level events and activities. (The expected level of commitment should be further specified);
- **Full member** – member with full commitment both to the regional level and to network services through focus groups.

2.4 Management structure and procedures

The current status of the ECHO overall management structure is presented in Figure 3.
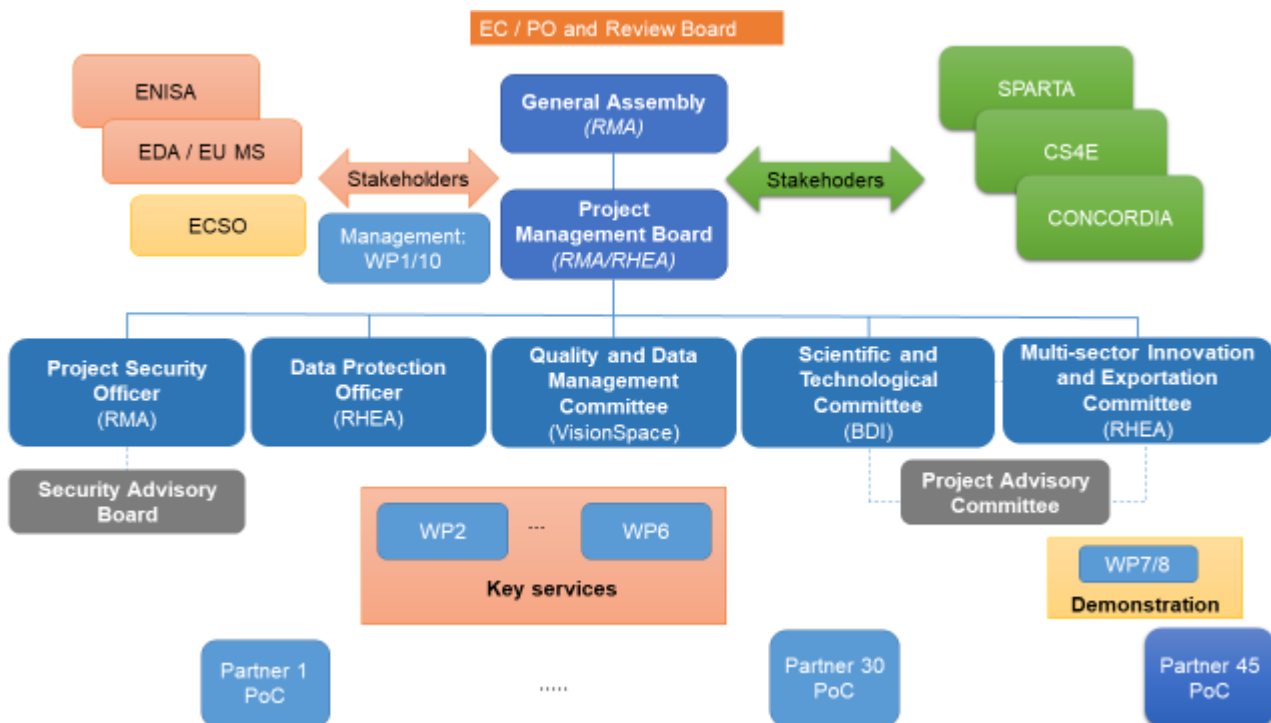
Figure 3: ECHO management structures and procedures

The project bodies and some of their roles and duties are reported below. Detailed descriptions of all the roles and responsibilities of the governing bodies of ECHO can be found in the Grant Agreement**[GA]** and Consortium Agreement**[CA]**.

General Assembly (GA) is the Higher decision body of the Project. GA meets biannual, or upon written request of any contractor in case of emergency, or upon request of the Project Management Board. The GA has the following roles and duties:

- Monitoring of project progresses, achievements and costs. Detailed project monitoring procedures have been agreed at the first meeting of the General Assembly (the Kick-off meeting).
- Solution of problems that have a potential impact on project strategies, resources and achievement of planned objectives, definition of the necessary contingency plans.
- Conflict resolution on issues that have an impact on strategies, medium-long term objectives, resources and the project roll-out strategies.
- Approval of changes in the consortium constitution (entries and withdrawals of partners) and management bodies.

Project Management Board (PMB) is responsible for the achievement of the overall project objectives, ensuring that the required scientific quality is met. The PMB reports to the GA, meets biannually or when needed. The PMB has the following roles and responsibilities:

- Responsibility over for the achievement of the overall project objectives, ensuring that the required scientific quality is met.
- Legal management: managing the Consortium Agreement (CA) among all partners, preparation of all the regulations for intellectual property rights (IPR), exploitation, financial regulations etc., and knowledge and IPR management.
- Contractual management: managing the contract with the European Commission (EC) before the project start and handling the possible amendments during the project execution.
- Project management: overall project plan, coordination and monitoring the implementation of the work alongside work package leaders, including schedule control and deliverable quality control; the risks management plan and the complete time schedule.
- The overall supervision of the work packages and identification of potential problems between them.

Scientific and Technical Committee (STC) coordinates technical activities and ensure the overall common vision of the project. This work contributes to that the technical objectives of the project are met, in support of the PMB*. The STC has its meetings on biannual basis, plus ad-hoc meetings based on needs*.

Multi-Sector Innovation and Exploitation Committee (MSIEC) has the role of fostering continuous improvement and consolidation of cross-sectorial collaboration, through dedicated multi-lateral initiatives, meetings, papers also aimed at enlarging participation of new public and private entities in the scoped sectors. The MSIEC review and approve all new ECHO Participant applications received from stakeholders and has following important responsibilities during the strategic planning processes:

- Identify, prioritise, report to GA the emerging cross-sectorial external trends, public/private opportunities, initiatives and major threats.
- Build and update the overall business exploitation plan for the ECHO consortium, also identifying benefits brought by the project activities to the general EU social/financial/technological landscape.
- Support innovation management from a business-development angle: continuously assess market trends and needs to adjust development of technological roadmaps and support services from the ECHO network accordingly.

The MSIEC reports to the PMB and cooperates closely with STC.

Quality and Data Management Committee (QDMC) meets biannually and report to the PMB. The QDMC has following roles and duties:

- Defining a strategy to balance between openness of data and preservation of IPR, privacy and security.
- Defining priorities, policies, best practices and standards for governing data definition, collection, reporting, and analysis.
- Developing consistent processes for collecting, matching, aggregating, quality assuring, securing and distributing data throughout the Consortium Partners;
- Ensuring that the research data will be findable, accessible, interoperable and re-usable (FAIR) during the project duration and after its completion.
- Defining strategies and procedure for data curation and presentation, according the main available standards.

Security Advisory Board (SAB) meets annually and support the PMB in following activities:

- Ensures the Data Management Plan clearly outlines security procedures to be followed for protection of EU Classified Information (EUCI) in accordance with the EU Council Decision on the

security rules for protecting EU classified information (2013/488/EU) and EC Decision on the security rules for protecting EU classified information (2015/444).

- The Project Security Officer (PSO) and members of the SAB will have at minimum a security clearance at level of EU Confidential. The PSO and SAB shall be composed of security experts and representatives of end-users with a strong background of handling sensitive information.
- Ensures the Data Management Plan (DMP) clearly specifies security procedures according to the following:
- EUCI will not be gathered, stored or processed within the project as these are not critical to the activities of the project.

The first MSIEC meeting has been held in July 2020 and will solidify the Terms of Reference, new Participant/Partner application review process, on-boarding process and to establish the structure and objectives of 4 Partnership committees and sub-committees (one for each of the stakeholder categories: Consumers, Providers, Governors & Influencers).

The practical arrangements of bringing in new partners, and establishing the necessary mechanisms to enable collaboration, such as access to internal databases and SharePoint's etc., permissions and the physical day-to-day practicalities of shared working will be determined on a case-by-case basis, dependent on the level of required access of new parties. As the process is tested with the first few new Participants & Partners it will be formally documented and fine-tuned as part of GM model design in D3.3. and further implementation under T3.4 and T3.5, including development of technology roadmap for Governance Information Management System (GIMS).

3. Needs and Objectives for ECHO Governance Model as a Network Organisation

The current deliverable builds on the results on the study on needs, objectives, and models of governance of collaborative networked organisations, presented in Deliverable 3.1: Governance Needs and Objectives, version 1.0, January 2020**[D1]**. More specifically, we build on the findings on four main issues.

First, in terms of organisation, Collaborative Networked Organisations (CNOs), in contrast to ad-hoc collaboration, are of two main types:[2]

- Demand-driven networked organisations, usually created for a limited period, e.g. Virtual Organisations (VOs) and Virtual Enterprises, established to exploit a particular opportunity, a service or a series of products; and
- Long-term, strategy-driven networked organisations, such as professional organisations and VO Breeding Environments (VBE).

D3.1 provides numerous examples of these types among exiting collaborative networks.

Second, in terms of business models, D3.1 provides good practices and variety of examples depending on the degree of formalization of the collaboration, CNOs' goal and horizon, nature of CNO entities, types of partner organisations, geographic diversity, sectoral diversity, degree of centralisation, levels of membership, process or service orientation. D3.1 provides particular examples of interest, e.g. CNOs with (or without) a broker or a virtual development office. Further, based on the study of existing networks, D3.1 identified clusters depending on funding streams and the degree of coordination among partners on operational and development issues.

Third, as a result of a comprehensive study of norms, stakeholders' views, existing networks, and the academic literature, D3.1 identified two groups of governance issues and positioned them in four tiers (a higher tier indicating potentially a higher priority of the issue) and separated them in two groups.[3]

Group 1 includes those governance issues that can be designated as "objectives" and achieved by devising and effectively implementing sets of normative, organisational, procedural, technical and training measures:

1. Geographical representation or exclusion; Involving external stakeholders; Representation; Decision making; Auditing; Confidentiality and Security; Knowledge management; Standards and methodologies; Long-term perspective on collaboration; Competences; Risk management; Evidence-based decision-making;

---

[2] See also Todor Tagarev and Yantsislav Yanakiev, "Business Models of Collaborative Networked Organisations: Implications for Cybersecurity Collaboration," Proceedings 2020 11th IEEE International Conference on Dependable Systems, Services and Technologies, DESSERT 2020, Kyiv, Ukraine, May 14-18, 2020, pp. 431-438.

[3] See also Todor Tagarev, "Towards the Design of a Collaborative Cybersecurity Networked Organisation: Identification and Prioritisation of Governance Needs and Objectives," *Future Internet* 12, no 4 (2020), 62, https://doi.org/10.3390/fi12040062.

2. Supply chain security; Dispute and conflict management arrangements; Intellectual Property management; Ethics code; Gender policies and representation; Transparency; Accountability; Integrity/anti-corruption policy;
3. Communication and engagement;
4. Green' policies; Slave labour, Labour of minors; Interoperability.

Group 2 includes governance issues that depend on various intangibles and the interplay of numerous factors and contexts, and can be addressed only partially by norms, procedures, training and technical measures. These governance issues are designated as "features of CNOs" and can serve as criteria against which to evaluate alternative governance models:

1. Addictiveness; Cohesion; Trust; Competitiveness;
2. Innovation; Leadership;
3. Organisational culture; Sustainability;
4. Resilience.

Fourth, in terms of governance models, D3.1 conducted a study and identified patterns of governance arrangements in existing networks along two dimensions: representation of partners in the CNO's senior governance bodies and decision-making principles.

These patterns, along with the clusters of business models, served to position the alternative models presented in this report making sure that the space of possible alternatives is properly covered.

4. Methodology Description

This section provides an overview of the methodology framework under which the current document is developed reflecting the process of selection of the most suitable Governance model for ECHO as a Collaborative Networked Organisation (CNO).

The first part is dedicated to the overall framework of the ECHO Governance and Management (GM) model's development as a description of the process.

The second part explains the Analytic Hierarchy Process (AHP) methodology as activities required to accomplish the planned analysis within the D3.2 are based on it.

4.1 The Governance model development Methodology Framework

The structure and logic of the selected Framework are influenced by two main factors as follows:

- variety of possible GM model implementations for newly established organisations, and;
- complexity of the GM model development and implementation.

There are many definitions of the term governance model. Usually in management literature the term is used in a broad meaning of high-level, strategic definition of organisational procedures (processes), structures and positions and the relationships within them. The governance operating model is a narrower and detailed term, which includes also descriptions of the operations, organisational initiatives, resources, and roles, etc.

Some of the typical objectives of the governance operating model are the following:

- To enable the transformation programs;
- To track and control change decisions (across business capabilities, processes, and artefacts) more effectively and collaboratively;
- To provide approach for the review mechanisms, accountability and transparency, thus assuring relationships with key stakeholder groups and steering committees;
- To establish clear roles and responsibilities of the members of main governance bodies and interface to other departments and operations on governance and management level;
- To organise strategic, financial, compliance, operational and program level risk direction and guidance, so that the governance bodies are able to guide the program and follow regulations and organisation's objectives.

The WP3's tasks T3.3, as well as T3.4 and T3.5 have objectives related to development, implementation and assessment of governance operating model.

Development of such a model is a complex task, which requires detailed analyses and planning. It is not easy to change the governance model development, especially if the development process is in its later stages. If the developed model is implemented and significant changes are needed, then a new cycle of development and implementation is required as a new transformation initiative.

Therefore, before the start of the development and implementation (or improvement) phases of GM model a very stable and sound vision of the GM model objectives and preferences should exist. Otherwise, the change initiatives of the model will fail or will lead to loss of trust, resources, customers and human efforts. At the same time in the case of ECHO project there is already initial GM implemented according to the GA and

CA with a goal to develop one to provide sustainability of the network after finalising the project in the context of R630**[D2]** implementation as well as to be open for potential interaction with the other 3 pilot projects and ECSO, operating in the same domain.

The endeavour of GM development and implementation is more complicated in the case of newly established organisations. If the organisation is established and has significant experience, development of a new GM model is relatively easier than for new organisations. The established organisation has its organisational capabilities and can identify the gap and the path toward new, desired future capabilities. The new organisation starts on the plain field with a variety of possible options to implement. Therefore, careful and rational selection of the best option should be conducted before beginning the detailed design and transition plan of the GM model.

The transformation of the ECHO project from its current consortium-based organisation to an effective, and attractive network organisation in the field of Cyber security includes activities that will be performed over a period of four years. Including the development of the Target (future) Operating GM model (TOM), its monitoring, evaluation and improvement updates.

The final result of T3.3 executions will be D3.3, which will provide detailed design of the TOM. Whilst the deliverable D3.4 of T3.3 providing transition plan for implementation, improvement and performance of key change management initiatives that will move the organisation from its current operating model (COM) as described in the first ECHO Annual Report for 2019**[D4]** to the TOM, that will be described in detail in D3.3 – implementation of the plan is under T3.4 and T3.5. with report on the achieved result as D3.5.

Activities leading the development of D3.3 will begin after the submission of D3.2. These activities are structured within the framework of several approaches' application logically structured in the following sequence:

1. Business Process Management analysis with identification of the organisational landscape and detailed process description;
2. The application of parts of COBIT (Control Objectives for Information and Related Technologies) framework for:
    a. Definition of the Design Baseline;
    b. Goals cascade[4];
    c. Development of Responsible, Accountable, Consulted, Informed (RACI) matrices.
3. Process and network analysis, using tools such as Business Process Management Notation (BPMN) and application of social network analysis algorithms.

Several decision-making milestones must be passed in order to approve the results of the analysis. The development of D3.3 will enable the definition of Initial Operating Capability (IOC) in D3.3 to be achieved by the end of 2021, implementing the D3.4 transition plan. Demonstration, updates and reviews will support the transition from IOC to Full Operating Capability (FOC) – end of 2022, as well as the communication and coordination with other WPs will be strengthened and enlarged in order to receive and implement their requirements to the governance and management. Last but not least, the work which will be undertaken during the execution of T3.3 should be used for establishing a governance and management consultation service within WP9.

---

[4] The goals cascade is an important concept in COBIT. It supports the translation of stakeholder needs into actionable strategy. The mechanism is used to translate these needs into customized enterprise goals, IT-related goals, and enabler goals. The goals cascade is a top-down approach.

The activities described above are not sequential and are organised in different tasks and work packages. The main effort for GM model implementation to integrate the results of all other WPs in ECHO is the *Work Package 3: ECHO Governance Model* and its five tasks.

The task *T3.2: Information sharing models***[D5]** definition provides requirements and analysis for partnership relationships, based on multi-sector analysis performed in *WP2: Multi-sector needs analysis*, thus supporting the development of GM model TOM. *T3.3: Governance models' definition* is the task in which the current document is developed. The task *T3.4: Governance operation* is an evaluation, monitoring and improvement task. The task provides also an annual operational status report. The first *Governance annual Report 2019 – D3.5.A1***[D4]** is ready and contains the identification of ECHO COM. The task *T3.5: New partner engagements* is dedicated to the engagement of new partners as consumers, providers, influencers, or governors and targets attracting 15 new partners by 2023. Ongoing engagement is supported by all technical Work Packages (WP) and relates to *WP9: Dissemination, Exploitation, and Innovation Management*.

Figure 4 provides visualisation of the process and more details to be implemented for D3.3. development.
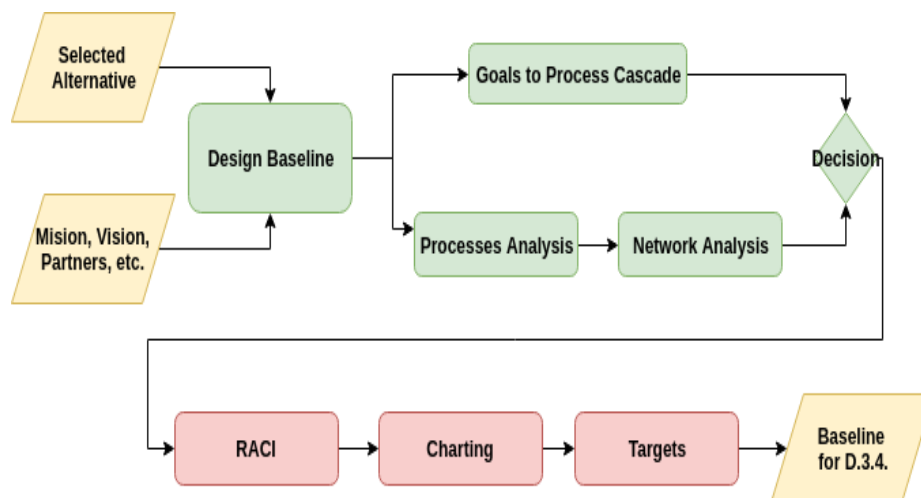
Figure 4: D3.3 Development process

Taking in account the above-mentioned complexity of the GM model development task we have to assure a stable general solution, that meets requirements of the existing partners and stakeholders, and key work packages. Provisioning of such input to D3.3 is the main goal of the current document.

The document is based on the AHP application with two Questionnaires and two groups of experts. The application of the method has following main steps:

A. Setting-up goal and criteria hierarchy, on the basis of the results of several analyses provided by other deliverables, in particular – D3.1;
B. Developing and sending the Criteria Ranking Questionnaire to the experts;
C. Selection of the short list of alternatives on the basis of analysis provided by D3.1. Governance needs and objectives;
D. Structuring and unifying description of the alternatives;
E. Developing and sending the Alternatives with the Assessment Questionnaire to the experts;
F. Analysis of the results and selection of most suitable alternative for further ECHO GM model development in D3.3.
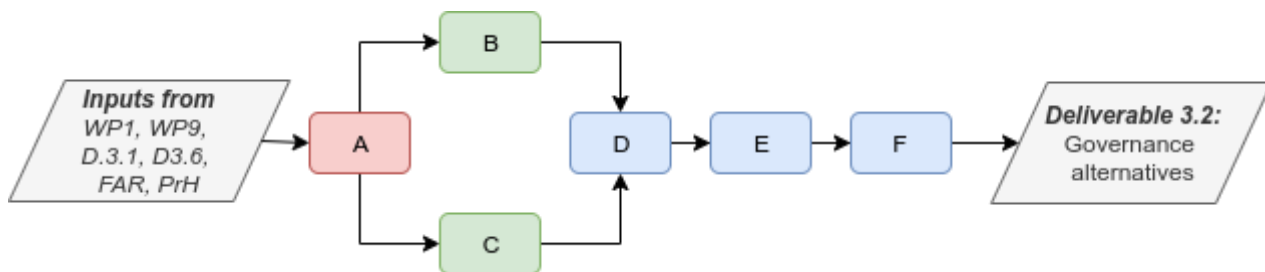
Figure 5: D3.2 Development process (and AHP application)

The visualisation of the AHP application is provided by Figure 5.

Main challenge for development of D3.2 is the variety of possible GM model implementations. To decrease this variability and to identify these existing best practices which are suitable for establishment of the future ECHO CNO, D3.2 uses results from D3.1 to identify four distinct prototypes of the required GM model. Other deliverables, documents and current developments related to coordination of ECHO with other three pilot projects are used as inputs for delivering the final results.

4.2 Overview of the Analytic Hierarchy Process method

The Analytic Hierarchy Process (AHP) is a structured approach for analysing complex, multi-criteria decisions by organizing the decision problem (how to achieve a goal) in a hierarchy of less complex and easier to comprehend sub-problems (objectives and tasks), which can be analysed independently. Thus, providing a framework for representation and qualification of the elements related to the overall goal and assessment of its achievement using set of criteria to assess the identified alternatives. The hierarchy can be considered as related set of criteria and sub-criteria for goal achievement, or as the answer to the main question *"What is important to reach our goal?"*.

The AHP is usually classified as a method belonging to the bigger family of Multi Criteria Decision Analysis (MCDA) approach, also known as Multiple Criteria Decision-Making (MCDM). MCDM is used to support decision-making for management and planning issues that involve multiple criteria (influencing factors) and have no optimal solution. Since first suggested model of MCDA, the application of the approach involves the following steps[5]:

- Intelligence – collecting data and identifying the problem and related important criteria (factors) for the decision-making towards achieving the defined goal;
- Design – generate and develop alternatives for the problem solution;
- Choice (Selection) – evaluate the alternatives against criteria and select best performing alternative.

---

[5] Herbert A Simon, *The New Science of Management Decision.* (New York: Harper, 1960).

The overview of the literature shows that many methods exist and none of these methods provide "good to best" decision recommendations in all cases[6]

The AHP method proposed by Thomas L. Saaty in 1970 was applied to many small and big scale problems and decisions, including the IT domain. The AHP method has been applied to Enterprise Resource Planning (ERP) software selection[7], to IT projects prioritisation[8], as well as to the IT Governance Framework Selection[9].

The popularity of the method can be explained with its relatively clear framework of comparison of the criteria and evaluation of the alternatives, which can be easily comprehended and can be applied by the group of experts.

The AHP relies on the opinion of the group of experts to provide information and inside to the problem in all of the above-mentioned stages of the analysis selection.

In general, after the identification of the requirements within the levels of the hierarchy, each criterion is compared in a pairwise manner to other criteria, in order to find which one is more important than the others. Ranking (or also prioritisation or weighting) of the criteria is done within the scale from 1 (Equal importance) to 9 (Most Important). Then relative weights are calculated for each level of hierarchy. An advantage of the AHP method is the nine-point scale for comparing the criteria at each level. Unlike the binary scales, which only allow determining the preference of one object to another, the nine-point scale provides options for determining the degree (intensity) of this preference.

Alternatives are assessed against each criterion and are pairwise compared, as well. Scores for each alternative are calculated based on criteria values and criteria weights and the alternative with highest scores is suggested for selection and implementation.

The next paragraphs will briefly describe the theoretical base of the Analytic Hierarchy Process.

4.2.1 Comparison and Ranking

In more formal and detailed record, the AHP can be explained as follows.

---

[6] Adel Guitouni and Jean-Marc Martel, "Tentative Guidelines to Help Choosing an Appropriate MCDA Method," *European Journal of Operational Research* 109, no. 2 (1998): 501–21.

[7] Chun-Chin Wei, Chen-Fu Chien, and Mao-Jiun J. Wang, "An AHP-Based Approach to ERP System Selection," *International Journal of Production Economics* 1, no. 96 (2005): 47–62, https://doi.org/10.1016/j.ijpe.2004.03.004.

[8] Adriano José da Silva Neves and Roberto Camanho, "The Use of AHP for IT Project Priorization – A Case Study for Oil & Gas Company," *Procedia Computer Science*, 3rd International Conference on Information Technology and Quantitative Management, ITQM 2015, 55 (January 1, 2015): 1097–1105, https://doi.org/10.1016/j.procs.2015.07.076.

[9] Hakim Bouayad, Loubna Benabbou, and Abdelaziz Berrado, "An Analytic Hierarchy Process Based Approach for Information Technology Governance Framework Selection," in *Proceedings of the 12th International Conference on Intelligent Systems: Theories and Applications*, SITA'18 (New York, NY, USA: ACM, 2018), 15:1–15:6, https://doi.org/10.1145/3289402.3289515.

Let us have a set-up goal with n number of criteria for reaching the goal, identified by the group of experts.

The suggested scale by Saaty for comparison of criteria has levels from 1 to 9. Criteria is compared in order to receive the expert opinion how much more important is the criterion C_1 in comparison to the C_2 (or otherwise) for achieving the goal. The comparison of all criteria is done in pairwise manner for each C_i and C_j, where $i, j \in \{1, 2, \ldots n\}$ and $i \neq j$. The number of pairwise comparisons is:

$$Number\ of\ Pairwise\ Comparison = \frac{n(n-1)}{2} \tag{1}$$

The scale for comparison has the following levels:

- 1 = Equal importance;
- 3 = Weak (slightly more) important;
- 5 = Essential or strong importance;
- 7 = Demonstrated importance (very strong);
- 9 = Absolute importance;
- 2, 4, 5, 8 are intermediate values between the two adjacent judgements.

Having all pairwise comparisons we can establish the square matrix S_k of rank n for each expert k, with $k \in \{1, 2, \ldots, m\}$ and m is the number of experts comparing the criteria.

$$S_k = \begin{pmatrix} a_{11} & a_{12} & \ldots & a_{1n} \\ a_{21} & a_{22} & \ldots & a_{2n} \\ . & . & . & . \\ . & . & a_{ij} & . \\ . & . & . & . \\ a_{n1} & a_{n2} & \ldots & a_{nn} \end{pmatrix}, \tag{2}$$

where a_{ij} represents the judgement of pairwise comparison between the criteria C_i and C_j.

If C_i is more important than C_j at level α of the scale, then $a_{ij} = \alpha$ and $a_{ji} = \frac{1}{\alpha}$, i.e a_{ij} and a_{ji} are the reciprocal.

If for each $i, t, j \in \{1, 2, \ldots n\}$ the Formula 3 can be applied to judgments a_{ij}, a_{it}, a_{jt}, we can assume that the pairwise comparison matrix S_k is *consistent, and a consistent matrix is reciprocal.*

$$a_{it} = a_{ij}a_{jt} \tag{3}$$

Normalisation of the matrix S_k means to divide each of its elements by the sum of elements of respective element's column.

$$normalised\ an_{ij} = \frac{a_{ij}}{\sum_{h=1}^{n} a_{hj}} \tag{4}$$

The normalized principal Eigen vector $W = (w_1, w_2, \ldots, w_n)$ containing the overall weight of each criterion C_i, $i \in \{1 \ldots n\}$ can be calculated approximately in different ways. One possible method is the arithmetic mean of the rows of the normalized matrix, which is calculated by Formula 5.

$$w_i = \frac{\sum_{j=1}^{n} an_{ij}}{n} \tag{5}$$

The other method is to use the geometric mean of the rows of the normalized matrix and is calculated by Formula 6.

$$w_i = \sqrt[n]{\prod_{j=1}^{n} an_{ij}} \tag{6}$$

The Eugen value for the vector W is calculated by the Formula 7.

$$\lambda = \frac{\sum_{i=1}^{n} \left(\frac{S_{ki} W}{w_i} \right)}{n} \tag{7}$$

Thomas L. Saaty proved that the maximum Eigen value for a reciprocal consistent matrix is $\lambda_{max} = n$.

4.2.2 Consistency

The consistency is a measure for randomness of expert's answers. Thomas L. Saaty, in his article "Decision-making with the AHP: Why is the principal eigenvector necessary", gave the following excellent explanation[10]:

"*When providing numerical judgments, an individual attempt to estimate sequentially an underlying ratio scale and its equivalent consistent matrix of ratios.*

Near consistent matrices are essential because when dealing with in-tangibles, human judgment is of necessity inconsistent, and if with new information one is able to improve inconsistency to near consistency, then that could improve the validity of the priorities of a decision.

In addition, judgment is much more sensitive and responsive to large rather than to small perturbations, and hence once near consistency is attained, it becomes uncertain which coefficients should be perturbed by small amounts to transform a near consistent matrix to a consistent one.

If such perturbations were forced, they could be arbitrary and thus distort the validity of the derived priority vector in representing the underlying decision."

The measure for inconsistency can be calculated as Consistency Index (CI) by Formula 8.

---

[10] Thomas L. Saaty, "Decision-Making with the AHP: Why Is the Principal Eigenvector Necessary," *European Journal of Operational Research* 145, no. 1 (February 2003): 85–91, https://doi.org/10.1016/S0377-2217(02)00227-8.

$$CI = \frac{\lambda_{max} - n}{n - 1},$$

(8)

where the λ_{max} is the maximum Eigen value obtained by Formula 7.

	1	2	3	4	5	6	7	8	9	10	11	12
RI	0	0	0,525	0,884	1,11	1,25	1,34	1,41	1,45	1,49	1,51	1,54

Table 4: Random Consistency Index (RI) values

In order to have a comparable measure Saaty proposes the use of an appropriate Randomness Consistency Index (RI). The values of RI are shown in Table 4. The values of RI are calculated by Formula 8, for different numbers of criteria (shown in the first row of the table) for randomly generated reciprocal matrices.

Therefore, the comparable measure of consistency is calculated as a ratio of *CI* and *RI* (Formula 9) and is called Consistency Ratio (*CR*)

$$CR = \frac{CI}{RI}$$

(9)

The AHP allows near inconsistency of the comparison with levels of *CR* < 0.1 (10%). All answers that has *CR* above this level should be reconsidered.

4.2.3 The consistency resolution

It was decided during the Workshop on Governance Model Alternatives Assessment and Selection, that the inconsistency of individual Pairwise Comparison Matrix (PCMs) will be resolved automatically (see Section 6.3). The automatic resolution is done by application of the Harker's method[11], described and used by Saaty in 2003.

In general, without going in mathematical details the method is based on the following procedure:

First, find the error matrix, described with Formula 10

$$\epsilon_{ij} = a_{ij} \frac{w_j}{w_i}$$

(10)

where the a_{ij}, $i, j \in \{1, 2, \dots, n\}$ are the elements of inconsistent matrix with priority vector $w = (w_1, w_2, \dots, w_n)$.

Harker and Saaty, proved that ϵ_{ij} matrix shows the error between inconsistent and consistent matrix with the same priority vector w.

This approach is used when the errors in experts' pairwise comparison are estimated in Section 6.2.

---

[11] P. T. Harker, "Incomplete Pairwise Comparisons in the Analytic Hierarchy Process," *Mathematical Modelling* 9, no. 11 (January 1, 1987): 837–48, https://doi.org/10.1016/0270-0255(87)90503-3.

Second, find the biggest error in ϵ_{ij}. Let's we assume that this error is found in element ϵ_{hm}.

Third, replace the ϵ_{hm} and ϵ_{mh} with 0 and diagonal entries ϵ_{hh} and ϵ_{mm} with 2 to receive new matrix a'_{ij} .

Fourth, compute the new priority vector w' for the matrix a'_{ij}.

Fifth, replace the elements of the a_{hm} and a_{mh} with $\frac{w_m}{w_h}$ and $\frac{w_h}{w_m}$.

Sixth, if the CR of the matrix is still above 10%, iterate again from the first to the fifth step.

Saaty suggested that the expert should be asked whether the experts agree to change their opinion, but suggested that if the family refuses, to use these new values[12].

The application of the Harker's method in the Saaty variant is done by the ahpsurvey R package and its function ahp.harker()[13].

4.2.4 The levels of the hierarchy

When dealing with complex problems we can have several levels of criteria (tasks, sub-problems) that we want to consider for the decision-making process and for the selection. Therefore, we have to identify the sub-criteria for each criterion. Then we have to make a pairwise comparison of importance of the sub-criteria for the related criterion on the upper level.

All analyses and calculations described above for top level criteria applies to the sub-criteria. The weights for sub-criteria are calculated (Formula 5 or 6) against the criterion of the upper level. To find the overall weights of sub-criteria we have to multiply each weight of each sub-criterion with the weight of respective criterion on the upper level.

---

[12] Saaty, "Decision-Making with the AHP.", p. 90

[13] R Documentation, "Ahp.Harker Function," accessed June 17, 2020, https://www.rdocumentation.org/packages/ahpsurvey/versions/0.4.1/topics/ahp.harker.
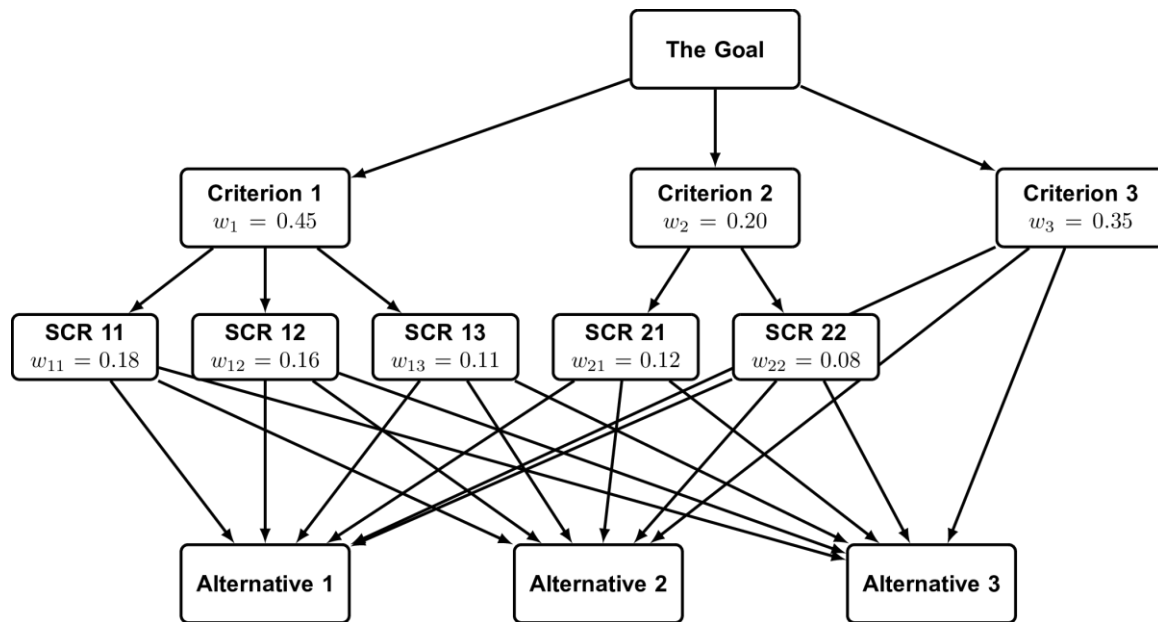
Figure 6: The AHP scheme

The scheme of weights calculation is shown on Figure 6. Criterion 1 has a weight of 0.45 (45%) as the importance of achieving the goal. Calculated weights of the importance of the sub-criteria for achieving the Criterion1 are 0.400, 0.356, 0.244. The relative weights (as the importance of achieving the goal) of SC11, SC12, SC13 to Criterion 2 and Criterion 3 then is calculated as $w_{11} = 0.45 * 0.4 = 0.18$, $w_{12} = 0.45 * 0.356 = 0.16$, $w_{13} = 0.45 * 0.244 = 0.11$.

4.2.5 Assessment of the alternatives

The assessment of the alternatives is done in a similar way as the criteria ranking – within a similar scale and matrixes, but in regard to alternative's quality against each criterion included in the goal hierarchy

The main question here is*: how much better the Alternative 1 performs than Alternative 2 with regards to the criterion*?

The pairwise comparison of the Alternatives is done in a similar scale like the criteria.

   1 = Equal preference;

   3 = Weak (slightly more) preference;

   5 = Essential or strong preference;

   7 = Demonstrated preference (very strong);

   9 = Absolute preference;

   2, 4, 5, 8 are intermediate values between the two adjacent judgements.

The weights of the alternatives' performance against each criteria and sub-criteria are calculated. The overall composite weight for each alternative is calculated by multiplying the weights of criteria to weight of alternative performance (or preference) against each criterion, using Formula 11.

$$OW_p = \sum_{i=1}^{n} w_{ci} w_{pi},$$ (11)

where the OW_p is the overall composite weight of the alternative $p \in \{1, 2, \ldots, l\}$, l is the number of the alternatives, $w_{ci}, i \in \{1, 2, \ldots, n\}$ is the weight of criterion i and w_{pi} is the weighted preference of the $alternavive_p$ against $criterion_i$.

4.2.6 Aggregating the individual expert opinions

There are two basic methods for aggregating the individual opinion and comparisons - Aggregation of the Individual Judgments (AIJ) and Aggregation of the Individual Priorities (AIP). Both methods were discussed and applied in many studies and are widely accepted[14],[15],[16]. Aggregation in AIJ method is done over the individual preferences a_{ij} of each individual Pairwise Comparison Matrix (PCM) and then the vector of group priorities (weights) is calculated. AIP method relies on finding the indicial vector of priorities per each PCM and then aggregating them in one group vector of priorities. Both methods can use two types of aggregation – by the arithmetic or geometric mean, and both methods require complete and consistent individual PCM. Both methods will not violate the Pareto principle[17].

During the expert study, all aggregations are being done by the AIP method with the geometric mean applied by Formula (12).

$$OW_p^G = \sqrt[m]{\prod_{j=1}^{m} OW_p^j},$$ (12)

where OW_P^G refers to the group priority of the *Alternative p*, OW_p^j to expert *i's* priority *Alternative p* and m is the number of experts.

The method of AIP with geometric mean is applied in Prize package of R, which is used for calculation of the study's AHP model.

---

[14] J. Aczél and T. L. Saaty, "Procedures for Synthesizing Ratio Judgements," *Journal of Mathematical Psychology* 27, no. 1 (March 1, 1983): 93–102, https://doi.org/10.1016/0022-2496(83)90028-7.

[15] Ernest Forman and Kirti Peniwati, "Aggregating Individual Judgments and Priorities with the Analytic Hierarchy Process," *European Journal of Operational Research* 108, no. 1 (July 1, 1998): 165–69, https://doi.org/10.1016/S0377-2217(97)00244-0.

[16] Changsheng Lin et al., "Aggregation of the Nearest Consistency Matrices with the Acceptable Consensus in AHP-GDM," *Annals of Operations Research*, March 13, 2020, https://doi.org/10.1007/s10479-020-03572-1.

[17] Forman E., K. Peniwati, Aggregating individual judgments and priorities with the Analytic Hierarchy Process, European Journal of Operational Research, 108 (1998) 165-169

4.2.7 Expert group opinion

For assessment of the experts' agreement the Kendall coefficient of concordance (known also as Kendall W) will be used. The coefficient is applicable for three or more different rankings. It can also be used for evaluating the agreement among multiple expert groups.

$$R_i = \sum_{j=1}^{m} r_{ij}, \tag{13}$$

where the R_i is the sum of ratings for the criteria $r \in \{1,2 \ldots, n\}$ gathered from the expert $j \in \{1,2 \ldots, m\}$ of group consisting of m experts.

$$\bar{R} = \frac{1}{n} \sum_{i=1}^{n} R_i \tag{14}$$

The mean value $\bar{R}$ of R_i is the calculated by the Formula 14 for n criteria.

$$S = \sum_{i=1}^{n} (R_i - \bar{R})^2 \tag{15}$$

The squired sum of deviation S is calculated by Formula 15 and is used to calculate the Kendall coefficient of concordance W defined by Formula 16.

$$W = \frac{12S}{m^3(n^2 - n)} \tag{16}$$

The interpretation of the coefficient values is given in Table 5.

W values	Interpretation
0	No agreement
0.10	Weak agreement
0.30	Moderate agreement
0.60	Strong agreement

Table 5: Kendall W coefficient values and interpretation

The W coefficient also can be used for testing the hypothesis about randomness of the answers in comparison with chi-square test. The coefficient of the concordance is used in AHP related researches as measure for sensitivity of the decision[18].

---

[18] Szabolcs Duleba and Sarbast Moslem, "Sustainable Urban Transport Development with Stakeholder Participation, an AHP-Kendall Model: A Case Study for Mersin," *Sustainability* 10, no. 10 (2018): 1–14.

The alternatives are ranked (ordered) by their overall weights and the highest ranked alternative is proposed to be selected for implementation as most suitable for achieving the overall goal.

4.2.8 Identifying the sub-groups of experts

The analysis of the individual results for Alternatives Assessment shows the possible existence of three distinctive sub-groups, as it is shown in Section 6.7. The design of the Questionnaires includes five questions about the qualification and experience of each expert (see Section 6.7 and Annex 2 – Groups of Experts). The clustering of the experts according to these five answers approves that three sub-groups exist. In this part the methodology used for clustering will be explained.

The clustering of different objects in a sample aims to find similarities or dissimilarities among objects on the basis of their characteristics. The characteristics are described by some common for all objects' variables.

The distances among objects within the sample are calculated as a measure of similarity between values of each two pairs of objects.

The objective function is defined according the clustering approach methodology. The initial number of clusters is defined, usually on the basis of theoretical or other assumptions about the relationships of the objects. Very few clustering algorithms have their own approach for identification of number of clusters.

The initial membership in the clusters is assigned to each object and objective function is calculated. Then the new membership of objects is assigned and new objective function is calculated. These steps are repeated until the objective function reaches its minimum value (or maximum, depending on the approach used).

The described algorithm of clusters identification is part of the bigger family of the so-called machine learning unsupervised algorithms. These classification (learning) algorithms are unsupervised, because there is no human interaction and initial or intermediate human approval of the input data and output results.

The quality of the clustering (classification) of objects is checked additionally, here the cluster silhouettes validation will be applied.

Calculating distances in experts' experience answers

The first issue in regard to identification of sub-groups (clustering) of experts' management experience is the type of data. The variables contain categorical type of data and this requires specific distance measure, different from the distances calculated for numerical or ordinal data types. The distance measure used in classification is the "Gower" distance measure, named after the J. C. Gower, who proposed the use coefficient measuring the similarity of categorical (and other types) of data[19].

Each variable is first standardized by dividing each entry by the range of the corresponding variables, after subtracting the minimum value. Thus, the variables are scaled within range from 0 to 1.

---

[19] J. C. Gower, "A General Coefficient of Similarity and Some of Its Properties," *Biometrics* 27, no. 4 (December 1971): 857, https://doi.org/10.2307/2528823.

The observations or objects in the sample have their own row of related values. In the case of group of experts each expert's answer is an observation about his or her experience in the field of governance and management. The Gower distances the dissimilarity between two rows (two objects or observations) which is the weighted mean of the contributions of each variable included in the observations and it is calculated with the following Formula:

$$d_{ij} = d(i,j) = \frac{\sum_{k=1}^{p} w_k\, \delta_{ij}^{(k)}\, d_{ij}^{(k)}}{\sum_{k=1}^{p} w_k\, \delta_{ij}^{(k)}} \tag{17}$$

The distance d_{ij} is a weighted mean of $d_{ij}^{(k)}$ with weights of each variable k. The weight $\delta_{ij}^{(k)}$ is 0 or 1, and $d_{ij}^{(k)}$ is the $k-th$ variable contribution to the total distance. In other words, the $d_{ij}^{(k)}$ is a distance of values between x_{ik} and x_{ik} for each observation x.

The weight $\delta_{ij}^{(k)}$ becomes zero when the variable is missing in either or both rows of observation i and j, or when the variable is asymmetric binary and both values are zero. In all other situations the value of $\delta_{ij}^{(k)}$ is 1.

The contribution $d_{ij}^{(k)}$ of a nominal or binary variable to the total dissimilarity is 0 if both values are equal, 1 otherwise. The contribution of other variables is the absolute difference of both values, divided by the total range of that variable. The "standard scoring" is applied to ordinal variables, i.e., they are replaced by their integer codes from 1 to the $k-$ number of variables.

As the individual contributions $d_{ij}^{(k)}$ are in range 0 to 1, the dissimilarity d_{ij} will remain in this range. If all weights $w_k \delta_{ij}^{(k)}$ are zero, the dissimilarity is set to Not-Available (NA).

In general, Gower's distance (or similarity) first computes distances between pairs of variables over two data sets and then combines those distances to a single value per record-pair. The calculation of expert group's experience distances is done by applying the function *dasy()* from the R package *cluster*[20].

The clustering algorithm

The method FANNY (Fuzzy Analysis Clustering)[21] is applied to the experts' experience data. The application of this method was suggested for clustering of individual assessment in AHP, and initial test for clustering of the experts' opinion within this analysis provided better results than k-mean algorithm – the other popular clustering algorithm.

FANNY is a fuzzy clustering and each observation can "spread out" over the various clusters. The membership of observation i to cluster v is denoted as u_{iv}.

---

[20] Martin Maechler et al., *Cluster: Cluster Analysis Basics and Extensions*, 2019.

[21] Leonard Kaufman and Peter J. Rousseeuw, *Finding Groups in Data: An Introduction to Cluster Analysis*, Wiley Series in Probability and Mathematical Statistics (Hoboken, N.J: Wiley, 2005).

FANNY aims to minimize the following objective function:

$$F = \sum_{v=1}^{k} \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} u_{iv}^{r} u_{ij}^{r} d(i,j)}{2 \sum_{j=1}^{n} u_{ij}^{r}} \qquad (18)$$

where n is the number of observations, k is the number of clusters, r is the membership exponent and $d(i,j)$ is the dissimilarity between observations i and j.

The distance $d(i,j)$ in the case of expert group is calculated as a Gower distance (Formula 17).

The membership exponent r is user defined constant bigger than 1. Clustering in this study is applied with function *fanny()* from the R package *cluster* and the calculations are done with default $r = 2$. The value of r si suggested by the authors of the algorithm. According to their study values above 2 leads very fast to worsening of the clustering results. The algorithm has validation of the results and provides warning if the chosen r leads to complete fuzziness. Function fanny also calculates clusters' silhouette coefficients and clustering quality coefficient. The silhouette coefficient ranges from 0 to 1. The highest values of the coefficient mean better identification of clusters.

4.3 The Questionnaires

In order to receive the experts' opinion, two questionnaires were sent to group of experts as follows:

- Governance Model Criteria Ranking Questionnaire;
- Governance Model Alternatives Assessment Questionnaire.

Both questionnaires were sent online as a self-explanatory application to be used by the experts in interactive mode.

4.3.1 Structure of the questions

In order to fulfil the requirements for AHP application the questionnaires consist of questions for pairwise comparison of criteria and of alternatives.

Criteria Ranking

First, on hierarchy first-level three criteria have to be compared against their importance for the overall goal (see levels of hierarchy in Chapter 5).

Second, each criterion on the lower level of the hierarchy has to be evaluated as importance against the criteria on the upper level.

As an example, the *Level of trust* is compared to the *Number of Network Participants* as an importance for achieving the *Effectiveness* of the Governance Model.

The pairwise comparison of the criteria is done on a scale from 1 – "Equal" to 9 – "Most important", as it is given in the example Table 6 and Table 7.

With respect to achieving the goal to implement *"ECHO Governance Model that will maximise the competitiveness of EU Cyber products and services through support of research, networking activities and partnership"* which is the more important criterion **"Effectiveness"** or **"Network Efficiency"**?																	
Most important								Equal								**Most important**
9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9
C1: Effectiveness																*C2: Network Efficiency*

Table 6: Comparison of the criteria on the first level of the hierarchy

With respect to achieving the *Effectiveness* of *ECHO Governance model* which is the more important criterion **"Level of Trust"** or **"Network Goal Consensus"**?																	
Most important								Equal								**Most important**
9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9
C1: Level of Trust																*C2: Network Goal Consensus*

Table 7: Comparison of the criteria on the second level of the hierarchy

Performing qualitatively the comparison of the criterion C1 with criterion C2, the scale has following meaning:

- 1 = Equal importance;
- 3 = Weak (slightly more) important;
- 5 = Essential or strong importance;
- 7 = Demonstrated importance (very strong);
- 9 = Absolute importance;

2, 4, 5, 8 are intermediate values between the two adjacent judgements.

Each question has to have just one answer. Number of questions for this questionnaire are 13.

Alternatives Assessment

In Alternatives Assessment Questionnaire the same scale as the above was used. The 6 questions for pairwise comparison of the performance of the alternatives are divided in 9 groups according to the number of criteria on the second level of hierarchy (see Chapter 5). The questions are structured as in Table 8.

In regard to achieve higher score for the **Level of Trust**, which of the alternatives are more preferable for you?																	
Most preferable								Equal								**Most preferable**
9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9
A1																*A2*

Table 8: Comparison of alternatives

Questions for comparison are 54 – 9 groups * 6 questions.

4.3.2 On-line questionnaire installation

The questionnaires are installed on IICT server running LimeSurvey[22] application. It is an open source server application, which provides full-range capabilities to conduct on-line surveys – from anonymization of participants to individual e-mail templates. LimeSurvey is developed with strong focus on cyber security and provides flexibility with possibility to add html templates.

Figure 7 presents a screenshot of one question from the on-line installation of the Criteria Ranking Questionnaire application and Figure 8 shows the group of questions in Alternatives Assessment Questionnaire application.

First Level of the Goal Hierarchy

This is the first level of the Goal Hierarchy.

Please, compare the importance of the three main criteria for achieving the goal to:

Implement a Governance Model that will maximise the competitiveness of EU Cyber products and services through support of research, networking activities and partnership within ECHO Network.

✱With respect to achieving the *goal to implement of Governance Model that will maximise the competitiveness of EU Cyber products and services through support of research, networking activities and partnership within ECHO Network*, which is *the more important criterion* **"Effectiveness"** or **"Adaptability"**?

All criteria are described in *Section 3* of the Guidance. You can see the C1 and C2 description for this comparison by clicking on the links below:

Click to see/hide the **C1: Effectiveness** description
Click to see/hide the **C2: Adaptability** description

	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
C1: Effectiveness	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*C2:* Adaptability

❓ Click to see/hide **the Scale values** explanation (from 1 to 9)

Figure 7: On-line question in Criteria Ranking Questionnaire

Guidance for experts were developed for both questionnaires. The guidance documents (integrated in the applications as well) presented as Annex 3 and Annex 5.

---

[22] LimeSurvey Project Team / Carsten Schmitz, *LimeSurvey: An Open Source Survey Tool* (Hamburg, Germany: LimeSurvey Project, 2012), http://www.limesurvey.org.

Comparison against the **Lelvel of Trust**

✷In regard to achieve higher score for the **Level of Trust** , which of the alternatives are more prefferable for you?

Level of Trust Description
See the How-to
See the Full Guidance

| Alternative Description | A1 | A2 | A3 | A4 |
| Alternative Chart | A1 | A2 | A3 | A4 |

	9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9	
A1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A2
A1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A3
A1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A4
A2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A3
A2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A4
A3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A4

❷ **Scale values** description (from 1 to 9)

Figure 8: Group of questions in on-line Alternatives Assessment Questionnaire

The guidance documents were also provided as html help within the LimeSurvey. The links shown on Figure 7 and Figure 8 opens modal windows which contain parts from the guidance.

5. Setting up Goal and Criteria

The Analytic Hierarchy Process (AHP) is a structured technique for analysing complex, multi-criteria decisions by organizing the decision problem (how to achieve goal) in hierarchy of less complex and easier to comprehend sub-problems (objectives and tasks), which can be analysed independently. Thus, providing a framework for representation and qualification of the elements related to the overall goal and assessment of its achievement against identified alternatives. The hierarchy can be considered as related set of criteria and sub-criteria for goal achievement, or as the answer of the main question "What is important to reach our goal?".

5.1 Proposed Hierarchy

In regard to the ECHO Project governance, *the main goal is identified as follows*:

Implementation of Governance Model that will maximise the competitiveness of EU Cyber products and services through support of research, networking activities and partnership within ECHO Network.

Effective governance model can be defined as *a model, that facilitates innovation and collaboration and have such structures and relations that permit fast, decisive and satisfactory resolution of conflicts within the governance and management of the network organisation.*

The **achievement of the goal** can be measured in terms *of effectiveness, efficiency and adaptability of the model.*
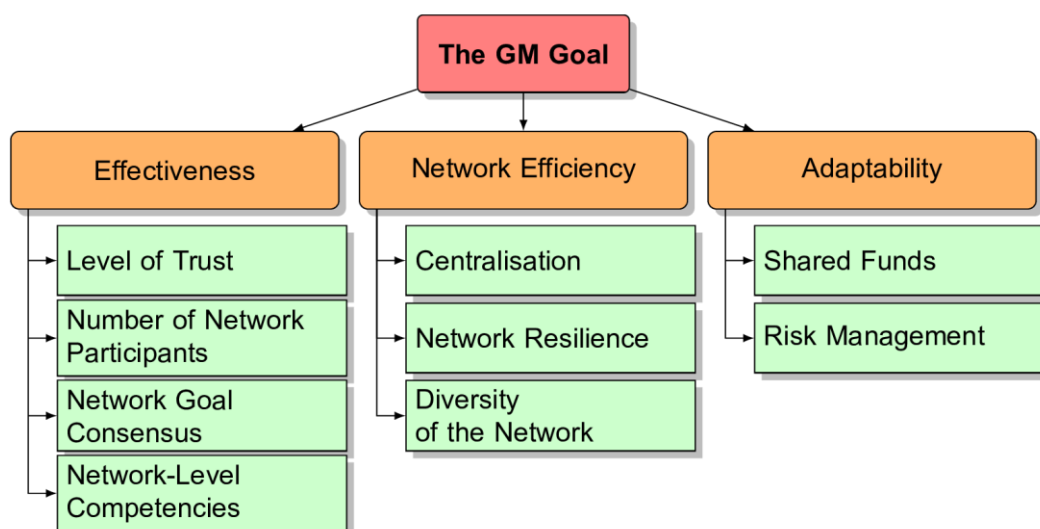
Figure 9: The ECHO goal criteria hierarchy[23]

Three main aspects were considered during the development of the Goal Hierarchy.

---

[23] Agreed on Workshop on Methodology Framework in Sofia, 01 October 2019.

First, the knowledge gained about the governance and management of CNOs' has to be considered as a source for development of the logical structure of the criteria relationship. The literature common view on important factors influencing the networked organisations' governance and management is considered, mainly according to the literature overview of D3.1, *Section 4.3: The academic literature on network governance requirements***[D1, p. 55]**.

Second, the stakeholders and experts' views on important factors for the goal achievement should be considered. The D3.1, Section 4.2 "Interviews with stakeholders" provides analysis of conducted interviews with stakeholders.

Third, the AHP method application specifics and limitations have to be taken in account. There are no limits posed by the methodology itself about the number of criteria. Nevertheless, there is strong recommendation, agreed in the literature on practical application of the AHP, that the number of criteria used in direct assessment of the alternatives should not exceed number of 9 criteria[24],[25].

Finally, the results of the Goal Hierarchy set-up were presented during the Workshop on Methodology Framework in Sofia, 01 October 2019. The Workshop gathered more than 30 experts from ECHO Partners and the Goal Hierarchy was discussed and agreed as it is shown on Figure 9.

It should be noted, that during the Goal Hierarchy development, preliminary results from D3.1 analysis were used. There are no contradictions found in the approved Goal Hierarchy and final result of D3.1.

Taking in account the practical limitations of the AHP method the criteria were combined in three main groups on First Level and nine criteria on the Second Level of the Hierarchy.

The First Level of Hierarchy consists of the following three criteria:

- *Effectiveness* is an important characteristic of the GM model, providing rapid continuous decision-making with successful conflict resolution, well-developed goal consensus and trust among partners, as well as indicating the presence of agreement on minimum partners' contribution – the network-level competences;
- *Network Efficiency* is a criterion related to the structure of the network – its centralisation, resilience and diversity. These three factors show the mode, the levels and type of connections within the network.
- *Adaptability* is related mainly to the innovation capabilities of the CNO considered as possibilities for planning and execution of common budget (and other shared fund management), as well as solid risk management in relation to common innovative project risk management.

The detailed description of criteria on First and Second levels of the Goal Hierarchy is given in following sections, as it was presented to the group of experts.

---

[24] Rosaria de F.S.M. Russo and Roberto Camanho, "Criteria in AHP: A Systematic Review of Literature," *Procedia Computer Science* 55 (2015): 1123–32, https://doi.org/10.1016/j.procs.2015.07.081.

[25] Enrique Mu and Milagros Pereyra-Rojas, *Practical Decision Making*, SpringerBriefs in Operations Research (Cham: Springer International Publishing, 2017), https://doi.org/10.1007/978-3-319-33861-3.

5.2 Description of Criteria

The structure of this section is organised by the level of the hierarchy given on Figure 3.

5.2.1 Effectiveness

The benchmarking of effectiveness is a question of comparison of achieved outputs (services or products) against used inputs (resources). The effectiveness of the governance and management model is related, but not equal to the effectiveness of the organisation. The effective governance model has to provide rapid and continuous decision-making process for set up and achievement of the organisational goals, conflict resolution, adaptability to the environment, and external relations management.

The following four sub-criteria for effectiveness assessment of Collaborative Network Organisations (CNOs) are used:

- Level of Trust;
- Number of Network Participants;
- Network Goal Consensus;
- Network-Level Competencies.

The governance of a Collaborative Network Organisation (CNO) differs from the governance of a single (traditional) organisation. Network organisations are comprised of independent organisations united around the common goal and this inevitably adds complexity to their governance and management models.

In this regard effectiveness also can be considered as stability of the CNO, its attractiveness and positive estimations received from its members, stakeholders and customers.

Level of Trust

Basically, trust can be explained as a relationship aspect that reflects the willingness to accept vulnerability, based on positive expectations about the other's intentions or behaviours.

The measures that assure high level of trust among members of Collaborative Network Organisation (CNO) are usually related to the following procedures and rules:

- *Representation* of CNO members in governance and management bodies, as well as the *participation* in the decision-making processes.

- *Members' acceptance and certification procedure* which is based on network-wide agreement.

- *Well-developed and established contractual relationships*. Contracts are signed between the CNO and each of its members, describing the rights and obligations of the two parties, as well as the procedure for conflict resolution, arbitration and possible sanctions.

- *Monitoring and reporting* rules provided for the activities of CNO governance and management bodies, both on central or regional (sectoral) level, are an important prerequisite for maintaining the trust among CNO's members.

- Establishment of *dissemination and access to information procedures* for the decision-making process is another indication of the CNO's trust enhancement focus.

Trust is considered in both contractual and horizontal types of relations among network partners. It can be measured as level (or number) of contractual and norm-based ties among units of the network organisation.

Number of Network Participants

The number of participating organisations can be considered as a measurement of the attractiveness of the CNO, as well as the ability to resolve conflicts. The duration since establishment and the growth of CNO members, as well as the regional spread, can show the attractiveness of the network.

On one hand, the growing number of participating organisations or individuals is not a mandatory condition for changes in the CNO's Governance model. On the other hand, the regional spread or sectoral diversity of the participants will always add complexity to the governance and management. If the CNO is developing regionally or embracing more ICT (or other) sectors we should expect increased complexity of the governance models – regional or sectoral centres, specific rules, bodies or management positions for stakeholders' relations.

Network Goal Consensus

The consensus has important implications for understanding CNO's behaviour since network members must be responsive to the goals of both their organisation and their network.

The goal consensus can be measured from the point of view of network's goals agreed: developing new network clients, attracting network-wide funding, addressing community needs, or improved client service.

The time horizon of the goals can be short, medium or long-term. The well-established network's goal consensus has to be supported by well-established hierarchy of the goals for different horizons. The short and medium operational level goals and activities have to be logically bounded to the strategic goals. Therefore, the planning and monitoring procedures and related documents of the CNO should require and provide answer to the question How planned activities increment the achievement of the goals? Horizons of the goals and their character define their place in the Strategic Plan, Business plan or Change Management plan for the organisation.

The indication for well-established network goal consensus is the existence of documents, and procedures describing when, how and who can propose goals or document changes.

The existence of provisions for monitoring and control over the progress toward goals is another prerequisite for the maintenance of effective network goal consensus. It means for every goal to have well defined Key Performance Indicators (KPI) and stakeholders to be involved in the assessment.

Network-Level Competencies

The Network-Level Competencies can be considered from the viewpoint of the complexity and technology level of the network's tasks.

The important question in this regard is: How can the competencies required to achieve network-level goals be attained? This is an important issue regarding network governance, because the requirements can be considered as "a burden" for network members to provide these competencies.

The competence level "burden" and measures for their provision can be identified within the CNO Governance model from the following perspective:

- Existence of the competences' assurance bodies on network-wide levels – as an example, the required level of competences is proposed by expert bodies (usually named "Scientific" or "Advisory" councils) to the CNO's legislative or executive bodies and positions – (General Assembly, BoD or CEO);
- Well-established acceptance and certification procedures for members;
- Mandatory standards for members;
- Division of competences through levels of the Network – within the network community, regional or sectoral centres, central network unit.

Measures for assuring the network-competences provides clear statements for candidate-members what are the required efforts for participation, on one hand. On the other hand, the set-up of different competence levels also shows the levels of participation of the members in common network activities, thus providing ground for achieving rights for participation to the respective levels of the governance and management, as well as to the distribution of the CNO's benefits (profit, outcomes, etc.).

5.2.2 Network Efficiency

The network efficiency as a criterion is proposed in order to identify whether the structure of the network is efficient.

We use three sub-criteria for Network Efficiency assessment:

- Centralisation;
- Network Resilience;
- Diversity of the Network.

Efficient network structure means that each member can reach and coordinate with each other member, as well as with CNOs' governance and management bodies, thus achieving benefits from participating to the network.

The network efficiency has another important aspect of stability (resilience) against environmental shocks and emergencies.

Centralisation

The level of centralisation describes the extent to which cohesion of ties is organized around particular focal points – centres of the network.

Indications for high level of CNO's Governance model centralisation can be identified by the following aspects:

- Number and scope of decisions made by main bodies (central or regional bodies);
- Number of approvals needed for ad-hoc or horizontal levels (between partners) decisions from the central (or regional) centres;
- Connections that can be established between members without approval from the CNO governance and management bodies;
- Rules for the gathering and dissemination of information about members, CNO's decision and activities.

The centralisation of CNO can provide higher level of standardisation and consensus among members, but can also cause delays in decision-making process if the decision-making chain is too long. The centralised

organisations are prone to the bureaucratisation tendency. Cyber security domain has specific requirements to the level of centralisation to be explored during the development of the GM model alternatives.

Network Resilience

Network Resilience is related to connectivity among the nodes (members) of the network. The networks with a higher level of connectivity can be considered as more resilient against loss of connections during a crisis or shock event. The nodes can be reached through more paths, thus providing flexibility and adaptability to the network.

The term network resilience here is closely related to the graph theory and its network indicators (such as connectivity, betweenness, closeness, etc.), and not to the cyber security use of the term resilience.

In regard to the Governance model, the resilience is related to avoidance of breaks in decision-making processes and in operations of the CNO. These breaks can be avoided by establishing rules and procedures for actions during emergency, thus establishing new ties and connections. Continuity of business operations is one of the key governance arrangements to guarantee management level resilience.

The breaks also can be caused by situation when the consensus required for a decision cannot be reached. The set-up of rules for resolving such situations provides additional resilience to the network governance model.

The COVID-19 pandemics calls for even more serious attention to the resilience of the network.

Diversity of the Network

This criterion is related to the number of types of network nodes, considered as regions or sectors in which the CNO operates. As an example, the network can consist of business, public or academic organisations. The network can also be established from organisations from different industry branches or sub-branches, e.g. software development, system administration, etc.

The diversity is one of the requirements for survival, especially in dynamic environment, but requires additional organisational efforts and causes complexity of the network.

5.2.3 Adaptability

The adaptability criteria are proposed in relation to innovation and technology development within the network and its adaptability to markets and technology changes.

We use two sub-criteria for effectiveness assessment:

- Shared Funds
- Risk Management.

The successful R&D and innovation implementation depends on the availability of risk management processes and risk venture funds. It is of critical importance in cyber domain, where a number of emerging and disruptive technologies are identified.

Shared Funds

Shared funds are these common network funding opportunities that can be used by individual organisations – separately or collectively – from several CNO's members.

Shared funds are also the source for funding the network-wide activities and usually are provided by the following sources:

- membership fees;

- grants for projects awarded to the CNO or to the project consortium established by CNO's members;

- subsidies from sponsoring organisations (including government) for developing or providing specific services or products, maintaining the expertise required.

The governance and management of the shared funds is very important for the CNOs in two aspects. First, their use and distribution can cause conflicts among partners. Second, the shared funds are usually used for R&D and innovations, thus enhancing opportunities and capabilities for all partners. Through these funds, network members acquire access to funds and knowledge, otherwise unattainable for a single organisation.

The well-established procedures for collection, distribution, planning, monitoring and control over the shared network funds is an indication for a good network governance and management.

Risk Management

The governance and management set of norms for risk management can indicate the awareness of the CNO about its environment and related non-controllable external threats. The predictive and rational risk management is a requirement for adaptability of each organisation, and is especially important in R&D activities.

In a network type of organisation, the risk management has another prospective – sharing the risks among network partners for execution of common network tasks.

The good practices implemented in CNO's Governance model in regard to risk management are existence of risk management plans, developed according to agreed methodology and rules for risk sharing within the members. The risk sharing rules can also be implemented as risk sharing clauses in contract agreement among members working on execution of network activity or network related task.

6. Ranking of Criteria toward the Goal

The Governance Model Criteria Ranking Questionnaire application was sent to 34 experts, including 27 experts form ECHO Partners and 7 external experts from ECSO, NATO, CS4E and SPARTA.

The Questionnaire received 24 answers (including 4 from external experts) until the 8th of May 2020.

The answers were analysed individually – per expert, and as a group opinion. In this document we present only group opinion with consideration about individual answers' consistency.

The analysis of Criteria Ranking results is divided by the levels of the Goal Hierarchy with global and local weights and ranks. Global ranks are these ranks related to the all levels of the hierarchy.

The consistency of each individual answer is considered. The inconsistent answers were improved by applying the Harker's method (see Section 4.2.3).

The three sub-groups of experts were identified and the AHP model is applied to each sub-group's opinion. Thus, providing additional sensitivity analysis of the solution.

6.1 Individual answers consistency

The initial set of consistency ratio of all 24 answers is presented in Figure 10. The criterion Adaptability in second level of hierarchy has only two sub-criterions, thus the consistency for the matrix with one row has no meaning and cannot be calculated.
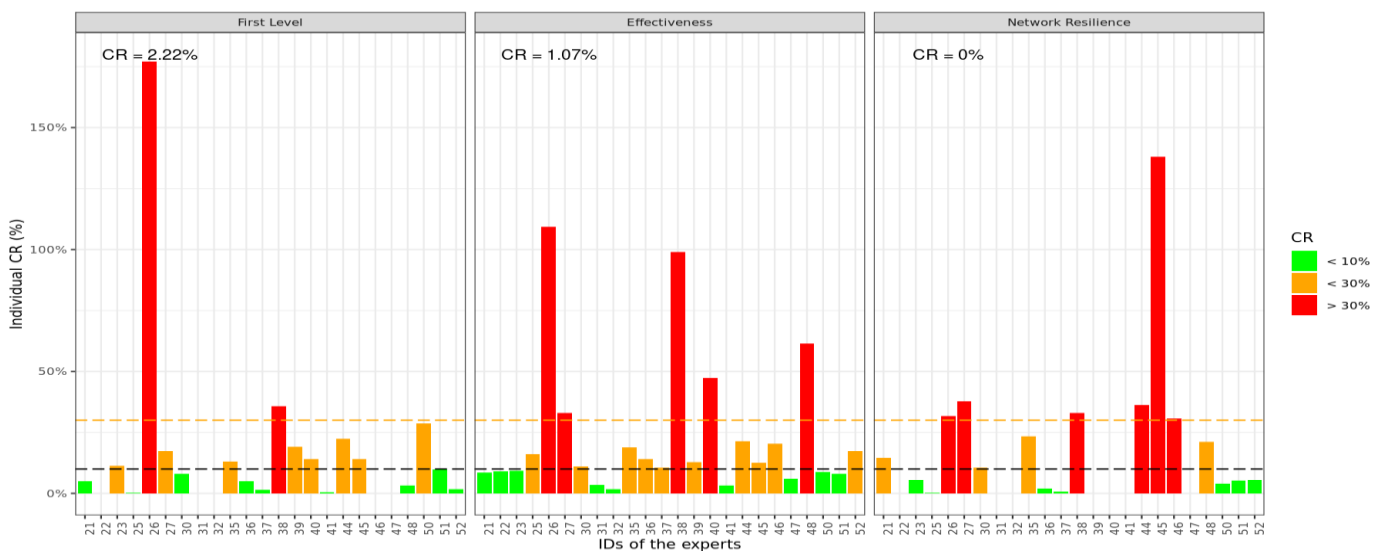
Figure 10: Initial inconsistency of individual matrices

In all levels of the hierarchy we received several answers with extremely high Consistency Ratio (CR). The level of inconsistency (the error) is divided in three groups – consistent – below 10%, middle – 30% and high – over 30%.

6.2 Analysing answers' consistency errors

In order to see which of the comparisons lead to consistency errors we can use the methodology described in Section 4.2.3. We can calculate the consistent matrix with same weights and different comparisons and to compare the error with original inconsistent answers.

The approach for calculating and finding errors is applied in *ahpsurvey* R package and its function *ahp.pwerror()*. The function calculates errors, divides them in three tiers – *top1*, *top2* and *top3* – according to the severity of the errors. These three tiers are presented on the Figure 11 as Rank 1,2 and 3.
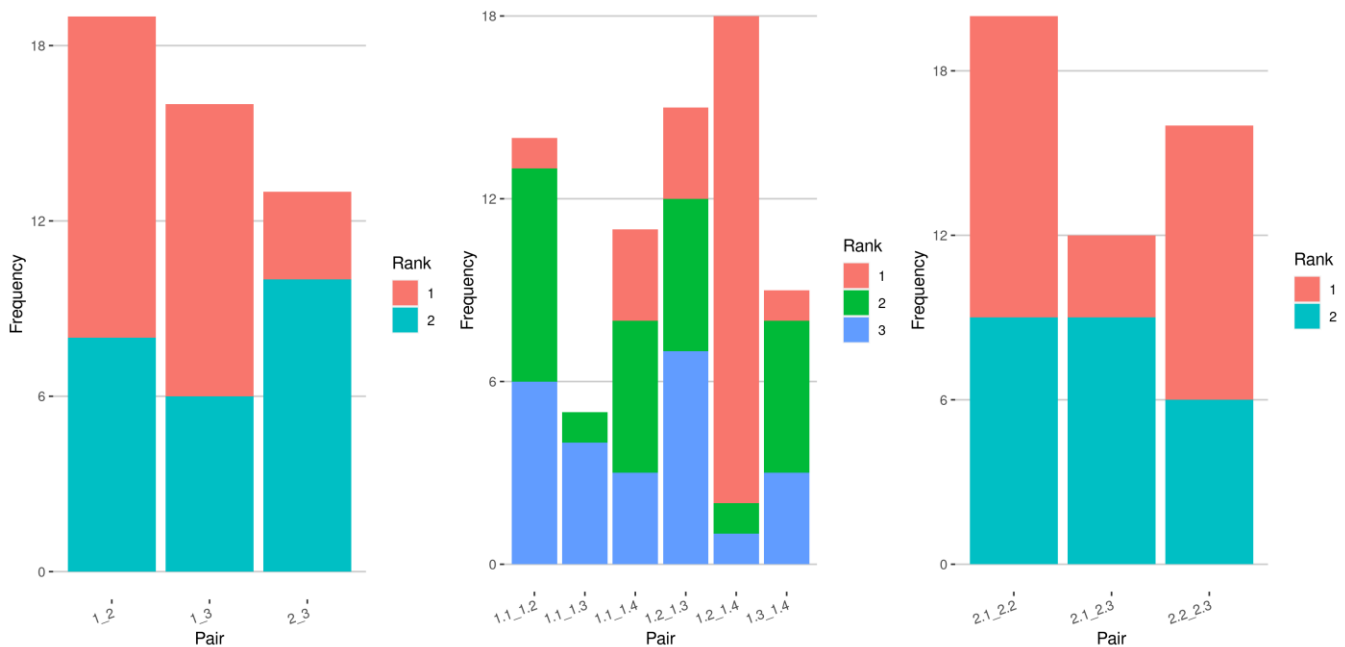
Figure 11: Errors in levels of hierarchy

The Figure 11 shows the combined errors in all levels of the goal hierarchy and has following legend:

1. *Effectiveness*
    1.1. Level of Trust
    1.2. Number of Network Participants
    1.3. Network Goal Consensus
    1.4. Network Level Competencies

2. *Network Efficiency*
    2.1. Centralisation
    2.2. Network Resilience
    2.3. Diversity of the Network

3. *Adaptability*

The top3 tier in comparison of three criteria coincides with the answers without error, thus in First Level of the hierarchy and Network Efficiency second level only tier top1 and top2 are given.

As we can see from the Figure 11, the most significant error in First Level of the hierarchy is the comparison between *Effectiveness* and *Netwotwork Efficiency*, and between Effectiveness and Adaptability.

The inconsistency in second level of criteria *Effectiveness* group is relatively lower in regard of the severity of the errors – mainly tier top2 and top3 with exeption of the comparison between Number of Network Participants and Network Goal Consensus.

In sub-criteria of the *Network Efficiency* the main reasons for consistency errors are the comparisons between

Centralisation and *Network Resilience*, and between Network Resilience and *Diversity of the Network*.

6.3 Resolving the inconsistency

The inconsistency is resolved according to the Harker's method described in Section 4.2.3.

The application of the Harker method results in improved consistency of the individual answers as it is shown in Figure 12.
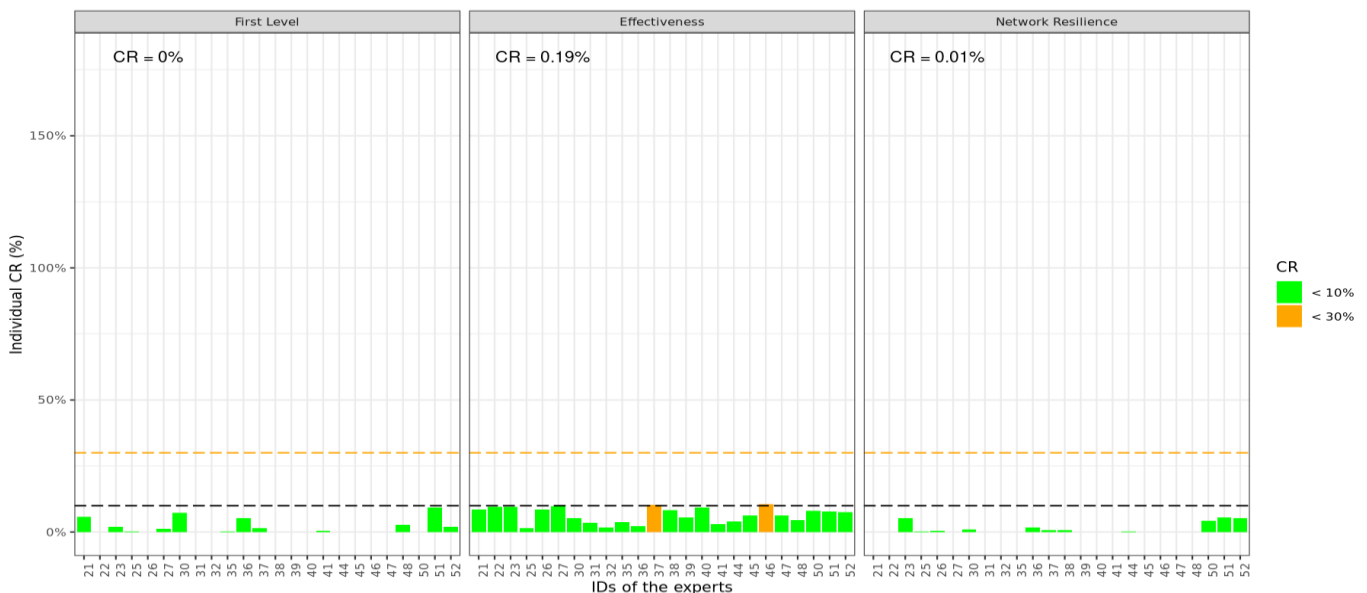
Figure 12: Improved consistency of individual answers

The results show that in all answers consistency was improved and CR become less than 10% except in Effectiveness with two answers of experts with ID number 36 and 47 which has CRs, respectively 10.17% and 10.45%. This deviation is smaller than 0.5%, and can be ignored.

The results from AHP application are given below, according to the changed individual consistent answers. The changes in priorities and criteria ranks related to changes in individual answers are analysed.

6.4 Criteria Ranks

The following tables contain the group aggregated answers from the Criteria Ranking and aggregated consistency of the group answers. The aggregation is done by calculating the aggregated geometric mean of the individual priorities (see AIP method in Section 4.2.6).

First Level

The values for weights and ranks on the first level of the Goal Hierarchy are global for the Hierarchy.

Criteria	Weight	Rank	Consistency
Effectiveness	31.59%	2	**0.00%**
Network Efficiency	22.77%	3	
Adaptability	45.65%	1	

Table 9: First level of goal hierarchy

The results for the first level of the Goal Hierarchy presented on Table 9 show that the most important criteria for the overall goal achievement is the **"Effectiveness"**, followed very closely by the criterion **"Adaptability"**. The "Network Efficiency" has the lowest rank with bigger distance to other criteria.

In Table 9, as well as in all following tables presenting the criteria weights in the column "Consistency" are given the values of aggregated answers consistency. These values are different from the individual answers consistency.

Second Level

The Table 10 shows the local values of weights and ranks for achieving criterion **Effectiveness**.

Criteria	Weight	Rank	Consistency
Level of Trust	28.97%	2	**0.19%**
Number of Network Participants	14.01%	4	
Network Goal Consensus	26.90%	3	
Network Level Competencies	30.13%	1	

Table 10: Effectiveness sub-criteria local weights and ranks

Experts rated as most important the criterion **Level of Trust**, locally for achieving the *Effectiveness*.

The Table 11 shows the local values of weights and ranks for achieving criterion **Network Efficiency**.

Criteria	Weight	Rank	Consistency
Centralisation	17.66%	3	**0.01%**
Network Resilience	37.03%	2	
Diversity of the Network	45.31%	1	

Table 11: Network Efficiency sub-criteria local weights and ranks

Network Resilience is the most important criterion, but it is followed closely by the **Diversity of the Network**.

The Table 12 shows the local values of weights and ranks for achieving criterion **Adaptability**.

Criteria	Weight	Rank	Consistency
Shared Funds	57.48%	1	**Not available**
Risk Management	42.52%	2	

Table 12: Adaptability sub-criteria local weights and ranks

The most important criterion for achieving the *Adaptability* defined by the expert is the **Shared Funds**.

Global Ranks of the Second Level of the Goal Hierarchy

In the Figure 13 are presented the global values of weights and ranks for all sub-criteria.
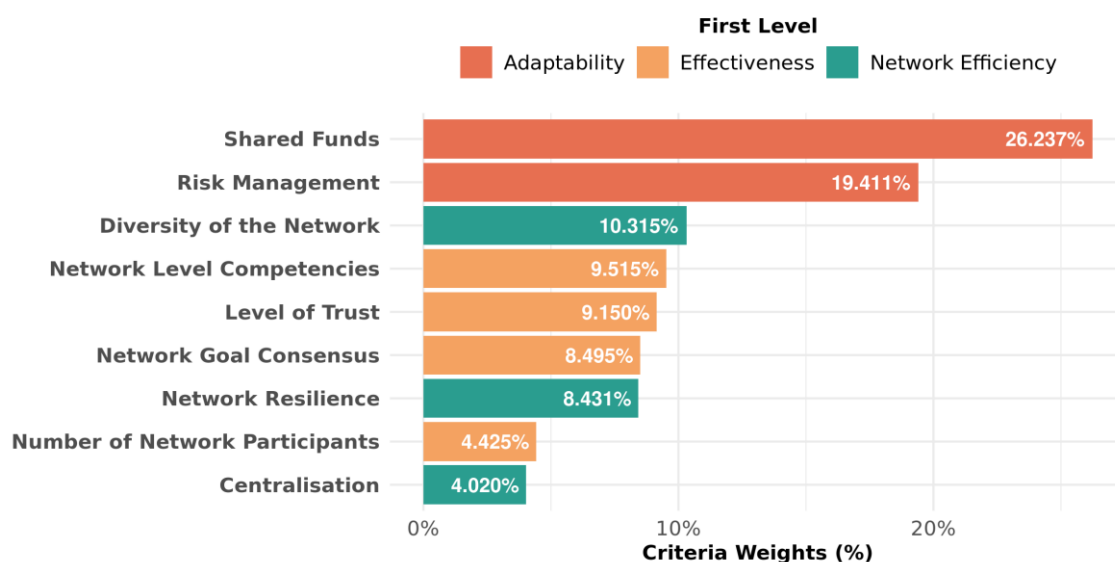
Figure 13: Sub-criteria global weights

6.5 Changes in weights and ranks related to consistency improvement

The AHP model was applied twice – with inconsistent and with consistent (automatically changed) answers.

Figure 14 and Figure 15 show the changes in criteria weights after application of Harker's method for automatic inconsistency resolution.

There are no changes in ranks of the criteria on the First Level as we can see in Figure 14. Nevertheless, there are changes in weights. Adaptability gains in importance with more than 7% weight, which leads to decrease of weights in other two criteria with 3-4%.
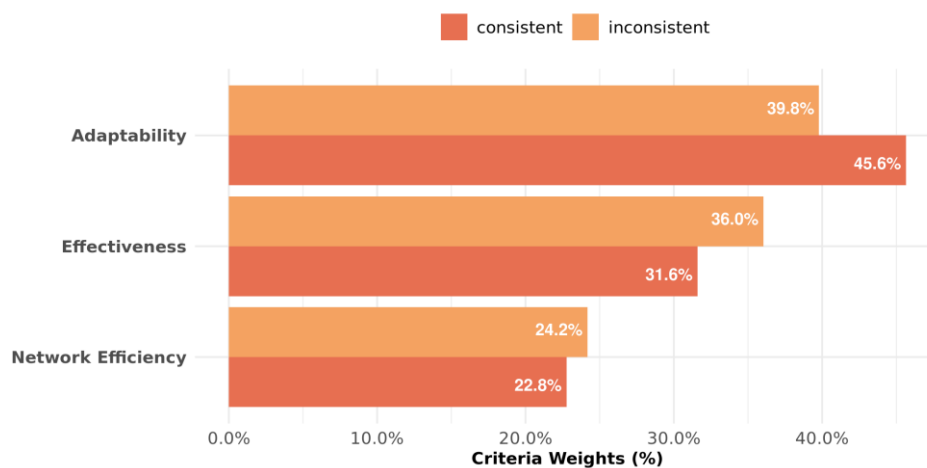
Figure 14: Changes of criteria weights

Figure 15 shows changes in ranking of criteria between Level of Trust, Diversity of the Network between Network Competencies, as well as Network Goal Consensus and Network Resilience. The changes in ranks do not imply big changes in importance – the weights changes are within 2%, except for Level of Trust, which loses about 3.5% of its weight or about 40% of its initial weight. The two leading criteria – Shared Funds and Risk management gain importance with 3-3.5% global weight.
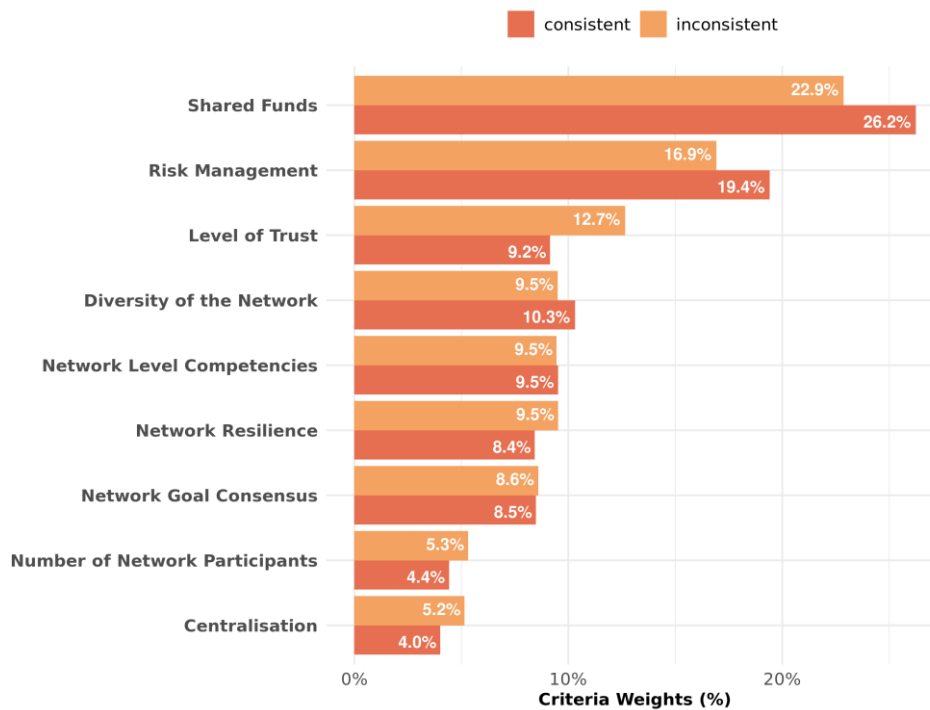
Figure 15: Changes in global weights of sub-criteria

In summary, there are few significant changes in three criteria on the Second Level of the hierarchy, especially in Level of Trust, all other changes are relatively small mainly in regard to the criteria global weights.

6.6 Group Consensus

It is important to know how similar are the answers within the group. There are many approaches to find consensus. We used two of them – first, visualisation presented on Figure 9 and the second aims to identify sub-groups within the group of experts and to analyse the consensus within those sub-groups.

The group consensus for all levels of the hierarchy on Figure 16 presents the application of method for decreasing the complexity, known as Principal Component Analysis (PCA). The PCA allows transformation of variables by creating new uncorrelated components with close to the original variables' variance. The Dim 1 and Dim 2 in Figure 16 are the two components resulting from the PCA application and describing about 80% of the covariance of the variables into the four panels.
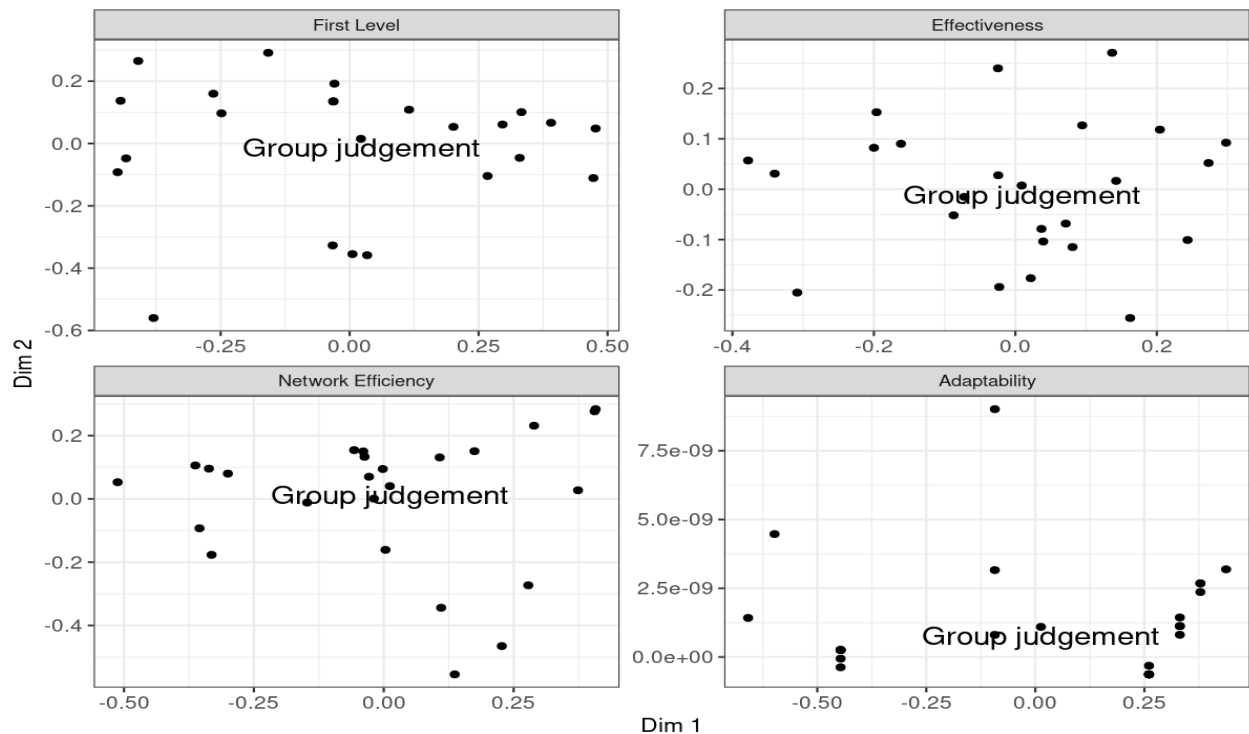
Figure 16: Group opinion spread

The application of the PCA to the set of 24 experts' answers leads to two new components (Dim1 and Dim 2) which values are used for the axes of the graphics[26]. The individual judgments are spread in all four sub-figures on Figure 16, but some sub-groups can be identified. These findings lead to the idea to check for sub-groups (clusters) also in final results.

The results from the clustering of the individual priorities for alternatives' assessment are presented in Figure 17 (all results are given in Annex 2 – Groups of Experts). The figure shows three distinctive sub-groups (clusters) with relatively good silhouettes coefficients.

---

[26] Klaus Goepel, "Implementing the Analytic Hierarchy Process as a Standard Method for Multi-Criteria Decision Making in Corporate Enterprises – a New AHP Excel Template with Multiple Inputs," 2013, https://doi.org/10.13033/isahp.y2013.047.
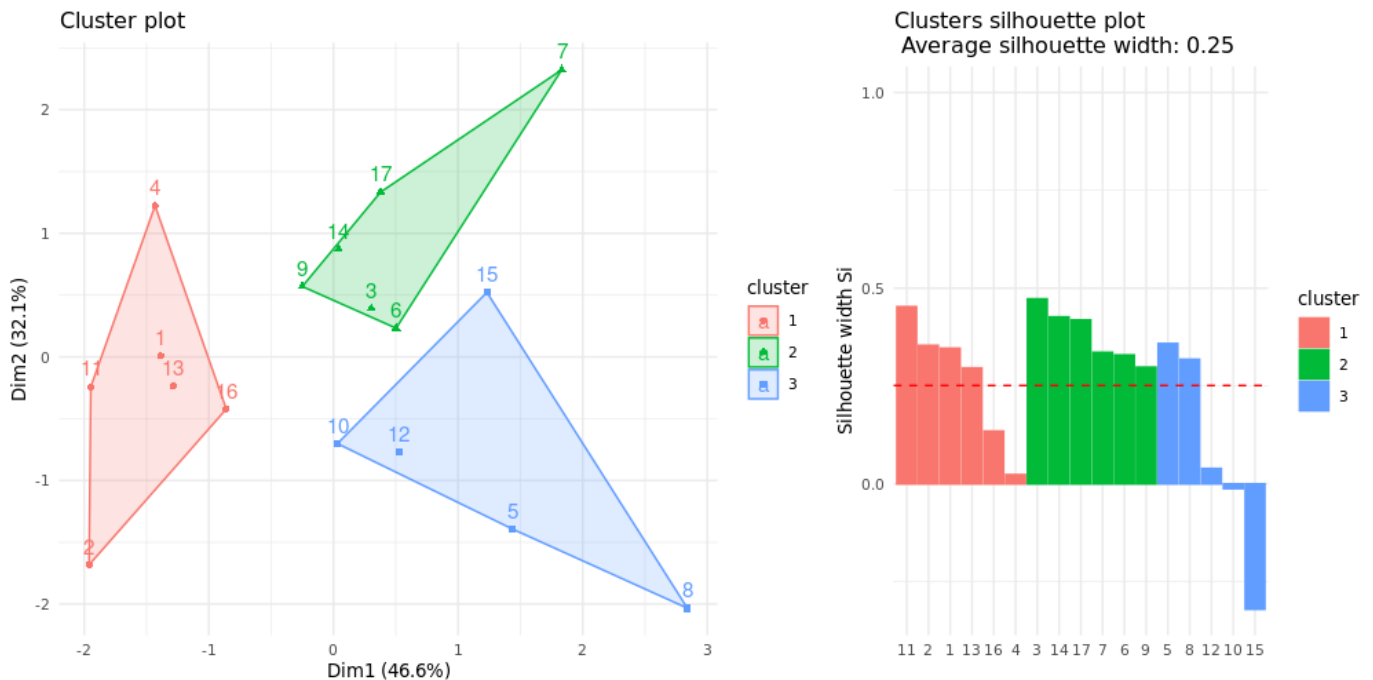
Figure 17: Clusters in the individual priorities of alternatives

The identification of clusters in final results requires analysis of the homogeneity of the group of experts. The identification of sub-groups of experts is provided below, according to the experts' answers about their governance and management experience and positions.

6.7 Sub-groups of experts

First five questions of the Criteria Ranking Questionnaire are related to experts' experience. The group of experts in second questionnaire – on Alternatives Assessment (17 experts) differs from the group answered Criteria Ranking Questionnaire (24 experts). The answers about experience from the first questionnaire are mapped to the group of second questionnaire through the experts' ID numbers. Classification of both groups is provided in this section.

Figure 18 provides the results from clustering the two groups of experts by applying the FANNY classification algorithm, described in Section 0. The figure shows existence of three clusters in groups of the two Questionnaires. The silhouettes validate the quality of the classification. The good level of homogeneity of experts' answers within clusters is another validation of sub-groups identification. The preferences of the three sub-groups (or clusters) of experts can be summarized as follows:

- **Group1** consists of highly experienced experts with **more than ten years** in governance and management position. These experts have **some experience in CNOs** and executed functions mainly in **general management or IT management**. All experts work **in private for-profit organisations**. The most variations are found in type of organisational level of management – they hold positions in central, regional or tactical levels of the organisation.
- **Group2** is formed again from highly experienced experts with **more than ten years in governance and management positions in central level** of their organisations. These experts have **experience in CNOs** management and executed functions mainly in **general management**. Almost all experts work **in public non-for-profit organisations**.

- **Group3** consists of experts with **1 to 5 years of experience** in governance and management position. These experts have **some experience in CNOs** and executed functions mainly in **Cyber security related areas**. Experts have mixed profile in regard of the legal status of the organisation - mainly **private for-profit organisations with some experts working in private and public for-profit organisations**. Almost all experts hold positions in CNO member organisations.
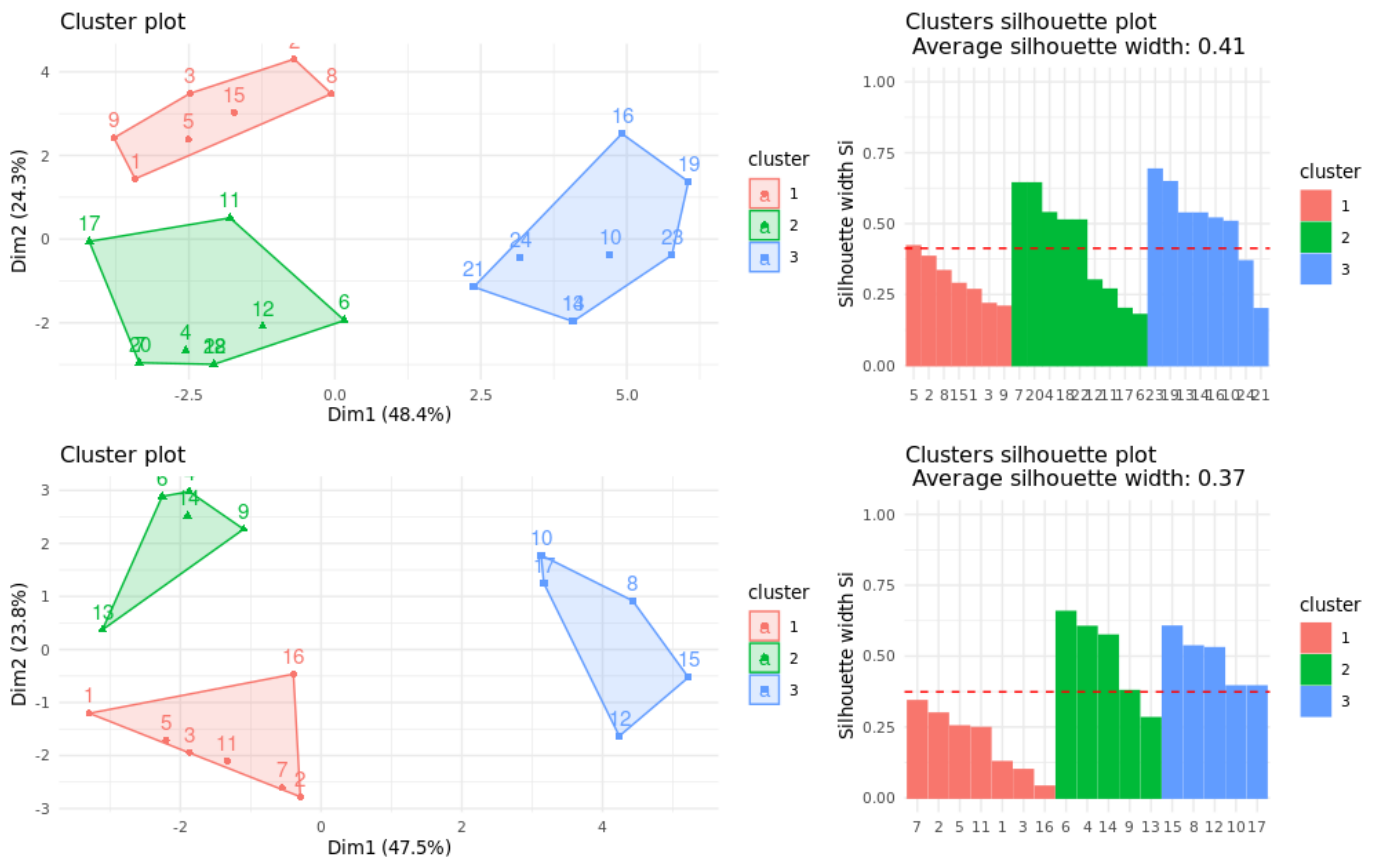
Figure 18: Clustering the experts according to data from two Questionnaires

The three sub-groups have identical characteristics in both groups of experts participating in the two Questionnaires. The full answers of experts can be found in Annex 2 – Groups of Experts.

6.8 Criteria Ranking and groups

The AHP model was applied and calculated for all three sub-groups. Table 13 presents the results from the analysis.

Criteria	Group1	Group2	Group3	Kendall W
First Level of Criteria				
Effectiveness	1	3	3	
Network Efficiency	3	1	1	**0.11**
Adaptability	2	2	2	

Criteria	Group1	Group2	Group3	Kendall W
Effectiveness				
Level of Trust	4	1	3	
Number of Network Participants	1	4	4	0.11
Network Goal Consensus	3	3	1	
Network Level Competencies	2	2	2	
Network Efficiency				
Centralisation	3	2	3	
Network Resilience	2	3	2	0.78
Diversity of the Network	1	1	1	

Table 13: Sub-groups criteria ranks

The Kendall coefficient of concordance (W) for first two groups of criteria shows weak level of consensus among three sub-groups of experts. The experts strongly agree on Network Efficiency criterion.

Sub-groups 1 and 2 show bigger similarity in rankings to each other than to Group 3.
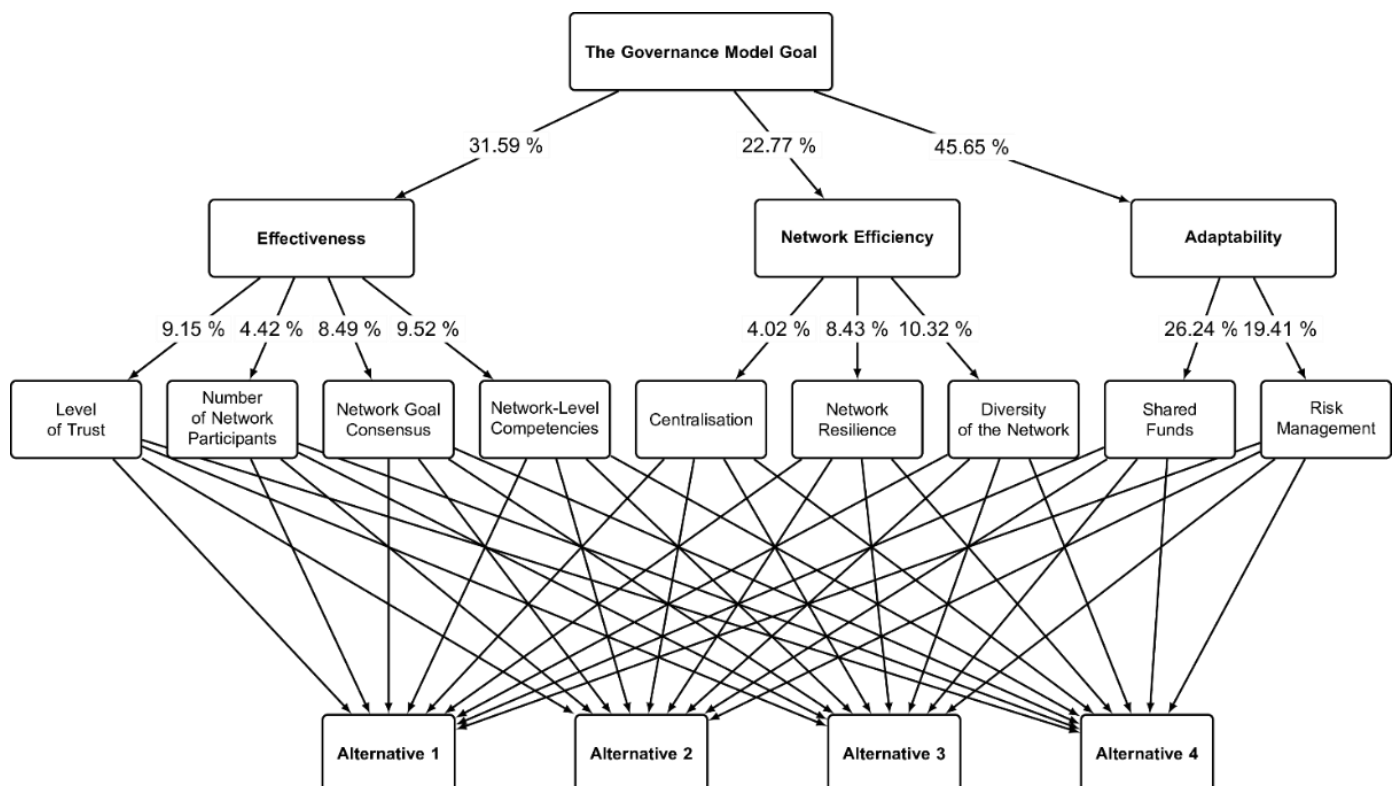
Figure 19: The AHP model before Alternatives Assessment

Finally, the model with all sub-groups rankings of the criteria can be visualised as on Figure 19.

7. Selection of prototypes and description of alternatives

The goal of the Alternative Development procedure is to develop and to describe four alternatives based on the analysis of existing relatively similar networks from four clusters with identified prototypes. Developed alternatives should be described in a unified way in order to be compatible with the Goal Hierarchy and to be comparable to one another.

The comparability is important, because each alternative should be evaluated as a performance against each criterion included into the second level of the Goal Hierarchy.

The comparability of the alternatives is a condition needed to evaluate the performance of the alternatives. If the alternatives are not comparable, then evaluators could not be able to give their preferences for the alternatives.

The Alternatives Development procedure had three main steps.

First, analysis and identification of a short list of the existing CNOs' as a basis and example for alternatives development was made.

Second, four groups of experts from ECHO Partners were tasked to develop one alternative each, based on provided list of prototypes and guidance for alternative description.

Finally, unification of the style and presentation of the alternatives' description as a material ready to be used by the group of experts during the Alternatives Assessment phase of the AHP model application was implemented.

The following sections provide description of these three steps.

7.1 Short list of alternatives selection – prototypes in four clusters

The selection procedure is based on classification of 92 networks analysed in D3.1: Governance needs and objectives. The main question in regard to the Alternatives Development in particular and in regard to the AHP application, in general is: *How the analysed 92 CNOs can be separated in groups with relatively different implementations of Governance and Business Model, which can be used as prototypes for the ECHO Governance Model alternatives?*

Therefore, measures for similarity among the CNOs GM models should be found and most prominent of them to be selected to form a short list of four prototypes for four ECHO GM model alternatives.

Two types of measures are used in the D3.1 analysis in order to classify the CNOs in two dimensions. First, classification is done according to the type of the business models and, second, according to the governance model representation and voting rights. The aggregated final results of the analysis are given in Section 3.3. (pp. 30-35) of D3.1**[D1]**. The current analysis is based on detailed classification data, provided by the D3.1.

The first measure – business model classification – positions each network within two dimensions – the type of funding sources and the degree of centralisation.

According to the detailed D3.1 data, the first dimension has 9 categories as it is shown in . Second dimension has 17 degrees, presented in Table 15.

Dimension 1. Profit and funding streams	
1	Non-for-profit Exclusively /entirely/ public funding
2	Non-for-profit Primarily public funding
3	Non-for-profit Balanced funding streams
4	Non-for-profit Exclusively commercial funding
5	For-profit Exclusively /entirely/ public funding
6	For-profit Primarily public funding
7	For-profit Balanced funding streams
8	For-profit Exclusively commercial funding
9	Profit and funding streams – data not available

Table 14: D3.1. data about profit orientation and funding stream classifications

Dimension 2. Degree of Coordination	
1	Single process Single centralised point
2	Single process One Point of Contact (PoC) for each main product/service
3	Single process Several PoCs for product/service
4	Single process Through each CNO member
5	Coordination on main issues Single centralised point
6	Coordination on main issues One PoC for each main product/service
7	Coordination on main issues Several PoCs for product/service
8	Coordination on main issues Through each CNO member
9	Ad-hoc coordination Single centralised point
10	Ad-hoc coordination One PoC for each main product/service
11	Ad-hoc coordination Several PoCs for product/service
12	Ad-hoc coordination Through each CNO member
13	No coordination Single centralised point
14	No coordination One PoC for each main product/service
15	No coordination Several PoCs for product/service
16	No coordination Through each CNO member
17	Degree of coordination – data not available

Table 15: D3.1 data about degree of coordination

The results from the classification in D3.1 (Figure 5, pp. 33**[D1]**) show existence of the following two predominant categories:

1. Non-for-profit Exclusively (entirely) public funding – with 19 CNOs participating in this category;
2. Non-for-profit Balanced funding streams – 22 CNOs.

The same distribution is shown in the category For-profit organisations, but with lesser number of participants – only 7 networks (D3.1 Figure 5, pp. 33**[D1]**).

Taking into account that both non-for profit and for-profit networks have a predominant two categories "exclusively public or commercial" and "balanced" streaming sources we can assume that these are two preferred types of financing of the existing analysed networks. The preference in the data sample is almost equal –19 CNOs for category (exclusive) and 22 CNOs for category 3 (balanced).

Looking at the second dimension – the degree of centralisation – strong predominance of high degree of centralisation can be found. In , category 1 has 23 participants.

The most of the other networks participate in categories from 2 to 4 – various centralised processes – according to service or to Point of Contact (PoC).

The categories related to more loose organisations, like coordination or ad-hoc processes (categories from 5 to 16) are present in only 11 (about 12% from 92) networks. In summary, we can assume that there are two predominant categories as follows:

1. Single process and Single centralised point;
2. Various types of Single processes for contacts and service delivery.

The governance model classification in D3.1 also has two dimensions – (1) rules for representation and (2) rules for voting. The categories of the two dimensions are given in and .

Dimension 1. Representation in the senior governance bodies	
1	Only few core members are represented
2	Selective representation, e.g. of founding members or members above a certain 'size' or with certain roles
3	Broad representation, e.g. a representative of any organisation may be elected through a vote open to all CNO member organisations
4	All CNO member organisations are represented

Table 16: D3.1 data about rules for representation

Analysis of the first dimension shows that the groups with broad or full representation (categories 3 and 4) have the most members in the sample.

The analysis of the second dimension shows that most preferred rule for voting is the simple majority (categories 1 and 3).

Dimension 2. Decision making principles (of CNO bodies)
Decision are taken:
1. by simple majority, i.e. over 1/2 of the weighted votes of CNO members
2. by qualified majority (e.g. over 2/3), of the weighted votes of CNO members
3. by simple majority (i.e. over 1/2 of the votes), with equal weight of the vote of each CNO member
4. by qualified majority (e.g. 2/3 of the votes), with equal weight of the vote of each CNO member
5. by consensus

Table 17: D3.1 data about decision making principles

Summarising the considerations of most predominant forms of business and governance models we can assume that the CNOs that should be selected as a short list for further analysis have to be placed within the following categories:

1. High degree of funding centralisation and business and governance decision centralisation (HH);
2. High degree of funding centralisation and middle business and governance centralisation (HM);
3. Balanced funding and high degree of business and governance centralisation (BH);
4. Balanced funding and middle degree of business and governance centralisation (BM);

Additional preference for selection is the representation and voting rules. They should be relatively similar within each alternative – broad or full representation with simple majority voting rule. This preference is not mandatory, but preferable.

Code	Short Name	Type of funding	Decision Type	Profit Orientation	Representation	Voting
1. Alternative's short name: HH Research and Development – Public, International						
Cyb002	STO	1	1	Not-for-Profit	4	5
Oth001	GEANT	1	1	Not-for-Profit	4	3
Oth006	ESDC	1	1	For Profit	3	0
2. Alternative's short name: BM Education & Training Networks						
Cyb013	ICS2	3	17	Not-for-Profit	4	1
Cyb032	ISACA	3	7	Not-for-Profit	4	4
Oth017	IAPP	3	2	Not-for-Profit	4	3

3. Alternative's short name: HM Innovation and Incubators						
Code	*Short Name*	*Type of funding*	*Decision Type*	*Profit Orientation*	*Representation*	*Voting*
nc005	EIT-Digital	1	5	Not-for-Profit	4	5
Cyb043	AUSTCyber	1	17	Not-for-Profit	3	0
Inc008	ICE71	1	12	Not-for-Profit	0	0
4. Alternative's short name: BH Early Warning Systems						
Code	ShortName	Type of funding	Decision Type	Profit Orientation	Representation	Voting
Cyb017	FIRST	3	1	Not-for-Profit	4	4
Cyb019	APWG	3	1	Not-for-Profit	4	0
Cyb033	ISAlliance	3	1	Not-for-Profit	3	0

Table 18: Short list of CNOs and prototypes

Final preference for network selection is the presence both of the central governance network body (hub) and regional (or sectoral) centres. This preference is mandatory and is related to required structure outlined in R630.

Each of the four categories (**HH, HM, BH, BM**) have to contain three selected networks which will be analysed as a group of prototypes for further alternative development by description and summarisation of the CNOs' governance model characteristics.

 presents the short list of CNOs selection within the four categories, as well as their characteristics according to the D3.1 analysis.

After initial selection alternatives **HH** and **BH** have more than 5 members with no missing data and they have similarity in objectives and types of networks. Additional selection based on governance dimensions and R630 preference (see preferences above) is applied in order to shorten participants to 3 members.

The alternatives are named additionally according to the objectives and scope of their CNOs members as follows:

- **HH –** Research and Development – Public, International
- **BH** – Early Warning Systems
- **HM** – Innovation and Incubators
- **BM** – Education & Training Networks

Requirements of second dimension for the alternatives **HM** have to be relaxed, because there is only one CNO which can be selected (EIT-Digital). The search for any kind of centralisation lower than the most centralised type of business decision (Single process Single centralised point – see) resulted in more than

10 networks within balanced funding streams. Applying the preferences about representation, voting and R630 the participants of the prototypes were shortened to 3 members. These prototypes were also clustered around objectives.

7.2 Tasks and Guidance for alternatives development

The following ECHO Partners teams were tasked to develop the four alternatives:

- **Alternative 1** – BDI, team leader: Yantsislav Yanakiev;
- **Alternative 2** – ESI CEE, team leader: Pavel Varbanov;
- **Alternative 3** – GT, team leader: Mirjam Kert;
- **Alternative 4** – *RHEA*, team leader: *Consuelo Colabuono*.

The main target of Alternatives Development activities was to aggregate features of the identified prototype CNOs for each alternative as a structured, logically consistent and relatively short document (8-10 pages) following the identified criteria and providing the required information.

The Guidance for Alternatives Development was provided by the IICT team – WP3 Leader Velizar Shalamanov (IICT) and T3.3 Leader – Georgi Penchev (IICT). The Guidance includes structure, explanation of each item and rules for avoiding bias when developing the alternative. An example of Alternative description was also added. Guidance for Alternatives Description is presented as Annex 4 of this deliverable.

The descriptions of the four alternatives were developed, discussed and approved. Finally, the descriptions were included in Alternatives Assessment Questionnaire application that was spread to a pre-selected group of experts[27].

7.3 Alternative 1

The first section presents the acronyms used in alternatives description, its organisational chart and scope identified during the alternative development. The following sections presents the description of the Alternative 1 and full description of the roles and activities of the governance and management bodies are given in Annex 3 – Alternatives' Structures, Alternative 1.

7.3.1 Acronyms, scope and chart

Acronym	Description
ASB	Advisory Scientific Board
CNB	Central Network Body
CNH	Central Network Hub
CNH	Central Network Hub

---

[27] The list of sources used for descriptions of alternatives in sections below is given in Annex 1.1 - Sources for alternatives' prototypes.

Acronym	Description
CoE	Centre of Excellence
CPoW	Collaborative Program of Work
CSREC	Cybersecurity Research and Education Connections
E&T	Education and Training
EC	Permanent Executive Committee
ET	Exploratory Team
FR	Financial Regulations
GA	General Assembly
IETF	Internet Engineering Task Force
MSs	EU Member States
NNPoCs	Network of National Points of Contacts
NR&EN	National Research and Education Networks
OGF	Open Grid Forum
OPs	Operating Procedures
R&D	Research and Development
RS	Research Symposia
RSM	Research Specialist Meeting
RTC	Research Training Course
RTGs	Research Task Group
RWS	Research Workshop
S&T	Science and Technology
SB	Steering Board

Table 19: Alternative 1 acronyms and abbreviations
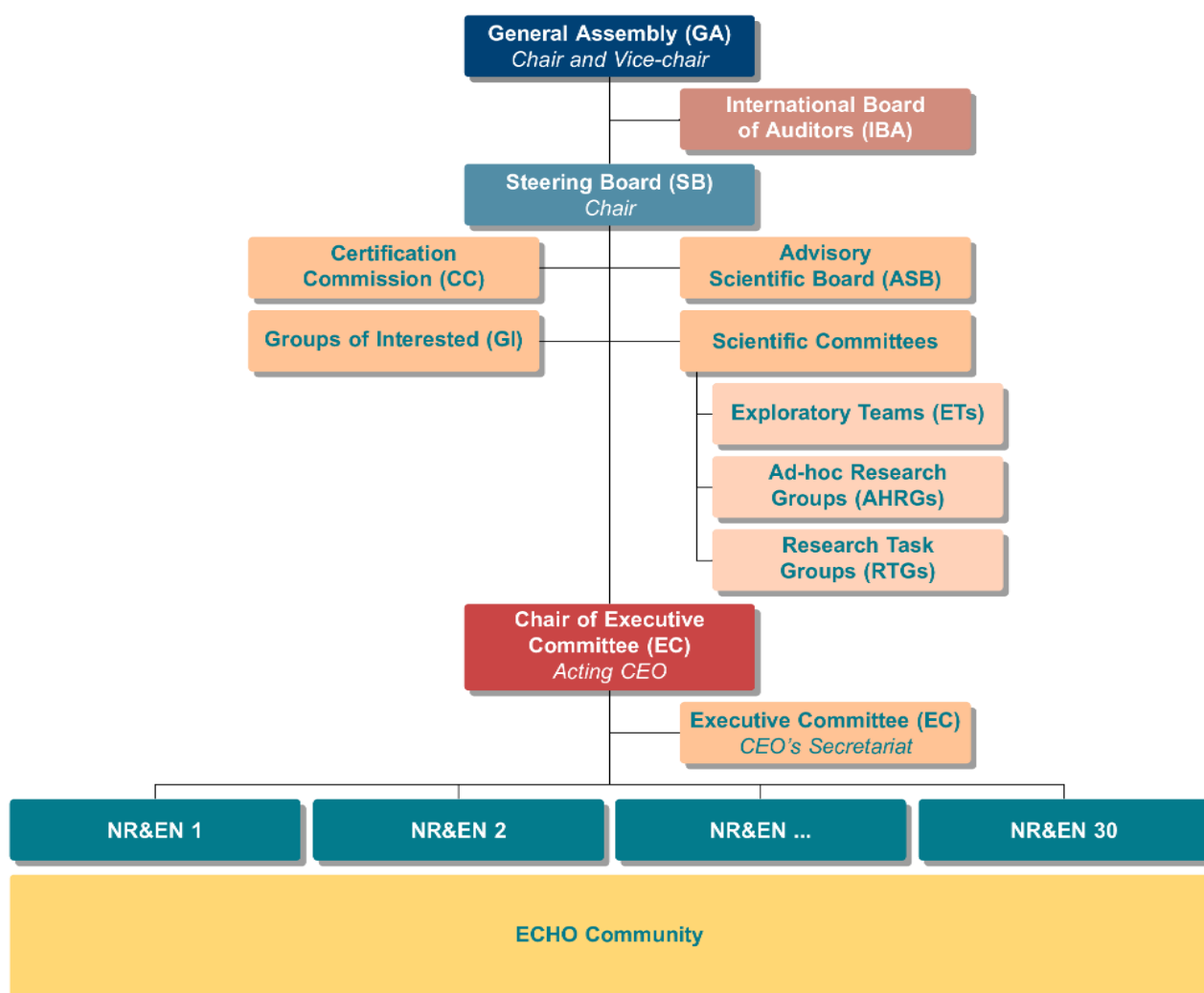
Figure 20: Alternative 1 Organisational chart
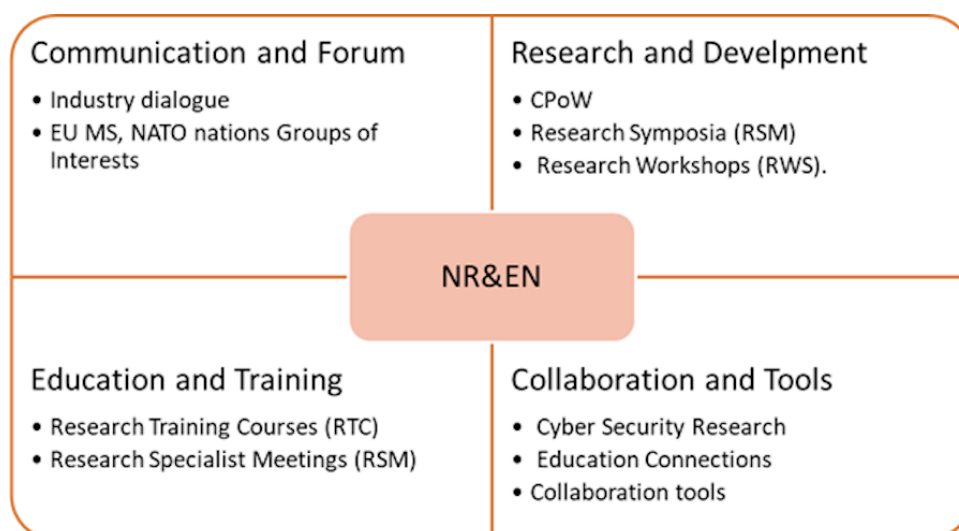
Figure 21: Scope and main areas of the Alternative 1

7.3.2 Scope, diversity and management of complexity

The ECHO CNO has a legal status of **Public International Research and Development (R&D) and Education and Training (E&T) organisation**.

The ECHO CNO is a significant player in its sector and level of operation. It aims at bringing together representatives from the EU Member States (MS), NATO Nations and the Partners of the two Alliances.

The **ECHO CNO is geographically spread** and covers the whole of Europe. This is a pan-European network for R&D and E&T of cybersecurity scientists and practitioners. It interconnects National Research and Education Networks (NR&ENs) and Centres of Excellence (CoE) across Europe. In addition to the European partners, the ECHO CNO is opened for cooperation with other similar networks all over the world based on common interests and opportunities to share resources.

The ECHO CNO's mission is to enable collaboration in cybersecurity activities in the Science & Technology (S&T), as well as E&T domains to support the EU Member States (MS), NATO and Partners in their efforts to improve cybersecurity capabilities.

The **Governance Model (GM) of ECHO CNO is centralised, non-for-profit and is funded mainly by public sources**.

The main governance model that ECHO CNO shall follow is the **Virtual organisations' Breeding Environment**, defined as an association of organisations and related supporting institutions adhering to a base long-term cooperation agreement and adopting common operating principles and infrastructures, with the main goal of increasing both their chances and preparedness towards collaboration.[28]

The GM model of the ECHO CNO should be able to support the activities described below.

First, the ECHO CNO organises and implements its S&T activities in different Scientific Committees, which include Exploratory Teams (ETs), Ad hoc Research Groups (AHRGs) and Research Task Groups (RTGs), which are networking fora for experts from government, industry, small and medium enterprises (SMEs) and academia, moderated by the CNO's central network-wide authorities.

Second, the ECHO CNO brings together cybersecurity researchers and practitioners to discuss current and future challenges at Research Symposia (RSM) and Research Workshops (RWSs).

Third, the ECHO CNO serves as a Point of contact and facilitator of cooperation among cybersecurity experts of the EU MS, NATO and Partners. In order to support these activities, ECHO CNO hosts and maintains collaborative technology tools, as well as platforms to facilitate knowledge exchange such as **Cybersecurity Research and Education Connections (CSREC)**.

---

[28] LA. Cardoni, S. Saetta, and L. Tiacci (2010). Evaluating How Potential Pool of Partners Can Join Together in Different Types of Long Term Collaborative Networked Organizations. In: L.M. Camarinha-Matos, X. Boucher, and H. Afsarmanesh (Eds.). Collaborative Networks for a Sustainable World, PRO-VE 2010, IFIP Advances in Information and Communication Technology, vol. 336, pp. 312-321. Springer, Berlin, Heidelberg.

Fourth, in the area of Education and Training (E&T), the ECHO CNO delivers learning methodologies, training content, assessment methodologies and organizes education events like Research Training Courses (RTC) and Research Specialist Meetings (RSM).

Fifth, establishing Groups of Interests (GI) where the representatives of the EU MS, NATO nations and partners can further develop S&T project proposals.

Finally, the ECHO CNO prepares and publishes quarterly **expert reports on current and future challenges in cybersecurity.**

7.3.3 Number of participants and attractiveness

The ECHO CNO is a large organisation. In total, more than 30 countries and 35 organisations are participating in the CNO. There is also individual form of membership. More than 300 scientists, representatives of SMEs, cybersecurity experts and stakeholders worldwide participate as individual members.

In the ECHO CNO, Science and Technology domain is addressed using two different business models.

The **Collaborative business model** where the CNO provides a forum for the representatives of the EU MS, NATO nations and Partners where they can cooperate to define, conduct and promote cooperative research and information exchange.

The **In-House delivery business model** where S&T activities are conducted in ECHO CNO's dedicated executive body, having its own personnel, capabilities and infrastructure.

The overall objective for the CNO's partnership is to contribute to the effective European Research Area by making Europe the best-connected region in the world.

The ECHO CNO has a comparatively short history as a spin-off of the successful implementation of the European network of Cybersecurity centres and competence Hub for innovation and Operations (ECHO) project.

Even though the ECHO CNO is a relatively new organisation, the number of participants is expected to grow rapidly to 40 countries and more than 400 participants until 2025. In the years to follow, the goal is to continue the growth of the individual members by reaching approximately 500 scientists, engineers, and analysts originating from Europe. There is also a vision to attract experts worldwide and expand the borders of ECHO CNO's influence. It is envisaged that in near future the ECHO CNO will start Open Call project procedures, permitting organisations from all over the world to participate in particular types of projects.

The ECHO CNO has been rethinking its Improvement Programme in order to organize better and meet appropriately the future challenges and the ever-increasing demands for cybersecurity S&T and E&T services without significant increase in expenditures and organisational efforts.

Stakeholders, customers and potential members engagement

The ECHO CNO maintains 'Over the Horizon' as its constant and guiding principle, which is being implemented and organised under the following headings:

- Positioning;

- Innovation;
- Collaboration;
- Users;
- Services;
- People in support of Decision Making;
- Cybersecurity and Information assurance.

The main Actors and Stakeholders that ECHO CNO identifies as prospective collaborators are the following:

- EU Governments;
- EU Industry and Academia;
- EU Intelligence analysts;
- Military and civilian researchers, technologists, practitioners and stakeholders interested in S&T and E&T in the Cyber domain all over the Europe;
- Experts from the ICT sector.

Collaboration and coherence with the European Defence Agency's (EDA) and NATO Science and Technology Organisation's stakeholders are also identified as crucial. The ECHO CNO will closely cooperate with and support the capability efforts of all EU and NATO political and military structures and agencies and the Centres of Excellence (CoE). The collaboration environment can further expand whenever this makes a benefit for the ECHO CNO and its stakeholders.

The ECHO CNO maintains a web portal dedicated to the community of cybersecurity experts **Cybersecurity Research and Education Connections.** This approach provides a better opportunity for information exchange and easy networking for relevant European defence and security stakeholders for cooperation around topics of common interest.

The Portal provides an overview of the NR&EN formal responsibility, including the users and organisations that can connect, and current market shares of the institutions connected to each NR&EN.

ECHO CNO's Annual Reports regarding the Stakeholders, customers and potential member engagement are published and can be found at the organisation's web portal.

Finally, a Draft of contractual documents for stakeholders, describing the rights and level of engagement, as well as Multi-Beneficiary Model Grant Agreement, can be found at the Portal.

7.3.4 Network competences and certification procedure

The ECHO CNO is governed on the basis of the **Organisation's Charter – a document** agreed by the founding members at the date of the establishment of the organisation.

The organisational architecture of the ECHO CNO is based on the **Central Network Hub (CNH) principle**. This means that there is a Central Network Body (CNB) established with corresponding governance and executive structures. Besides, there exists a **Network of National Points of Contacts (NNPoCs)** that have an important role in the coordination of the CNO's work with the Members. The CNB and the NNPoCs are the spinal columns of the organisation.

The CNB coordinates and facilitates the members' activities through the Portal and periodically holds (twice per year) face-to-face meetings. The main documents regulating the operations of the ECHO CNO are the **Operating Procedures (OPs) and the Collaborative Program of Work (CPoW)**. Also, the current ECHO

CNO members are responsible for developing, implementing and updating the S&T Strategy and E&T Programme. The procedure is described below.

The ECHO CNO is highly active in guiding and influencing international standards development – ensuring interoperability across the research and education community in the cybersecurity domain worldwide. There are **Advisory Scientific Board** (ASB) and **Certification Commission** (CC) established. Both structures are responsible for CNO's competencies monitoring and guaranteeing standardisation procedures implementation.

The use of standards and information from standards' bodies are of great importance and continue to be incorporated in the development of CNO's services to ensure interoperability with services of other relevant collaborative networked organisations.

The ECHO CNO influences standards development through participants making significant contributions in the **Open Grid Forum (OGF), Internet Engineering Task Force (IETF)** standards organisations and the **European Standards Organisation (ESO).**

There is a procedure in place for monitoring and auditing of competences in the framework of the CNO. They are described in the Charter and the Operative Procedures of the CNO.

7.3.5 Maintaining the network goal consensus

The prevailing perspective for collaboration in the ECHO CNO has a long-term horizon.

The ECHO CNO's Central Governing Body is the General Assembly (GA) chaired on a rotational basis by each representing member. The Chair and the Vice-chair of the GA are first among equals, and the CNO members elect the Vice-chair for 2 years. After serving two years as a Vice-chair of the GA, the person becomes automatically Chair. This approach allows the Vice-chair to gain experience in managing the GA.

Each member of the ECHO CNO must be represented at the GA where the corresponding organisation has the right to nominate up to three representatives. Only one of them has voting rights.

The GA decides and approves the Mission, Vision and the Strategy of the ECHO CNO.

The day-to-day business in the ECHO CNO is the responsibility of the Steering Board (SB) led by Chair and Vice-chair elected for one year on a rotational basis from the members of the CNO. The SB is responsible for the implementation of the decisions of the GA.

The SB exercises unified governance of the CNO by:

1. Developing and updating the long-term S&T Strategy and medium-term S&T Priorities and E&T plans.
2. Propose network-wide goals and documents like CNO Operative Procedures (OPs), Collaborative Program of Work (CPoW), Plans, etc.
3. Acting as the focal point for coordinating the ECHO CNO S&T and E&T CPoW.
4. Provision of guidance and direction for the operations of the ECHO CNO scientific technical committees and working groups.
5. Obtaining GA approval of the S&T Strategy and medium-term S&T Priorities and E&T plans.
6. Obtaining GA approval of the CNO's CPoW and the annual budget.

The CNO Programme of Work and its budget are submitted by the SB annually for GA approval.

The work of SB is supported by the Permanent Executive Committee (PEC) acting as secretariat, and led by Chief Executive Officer (CEO) who is responsible for facilitation and coordination of the work of CNO members.

The PEC implements appropriate administration of the CNO members by the following activities:

1. Membership administration:
   a. Candidate members' application review;
   b. Membership registering;
   c. Auditing and review of members' status;

2. Providing effective planning and coordination for S&T and E&T activities;

3. Administration and publication of CNO Collaborative Network activities and coordination of CNO public relations matters.

The **Advisory Scientific Board (ASB)** is a consultative body, providing its expertise to the SB and its Chair on knowledge, information management, technology and policy matters to the benefit of the organisation.

The members engage with the goals of the CNO by agreeing to a general document of the ECHO **CNO Association Bylaws and Association Rules and Regulations**. This document shows the agreement of the member to the CNO Charter.

There are rules in place for monitoring and auditing the goal compliance of the members, described in the CNO Operative Procedures. The SB is responsible for monitoring the goal compliance of the CNO members and it decides on the quality of CNO S&T and E&T output.

There are consequences for the participants if they do not comply with the CNO's goals and do not provide good quality of S&T and E&T products. Following the ECHO CNO's Charter and the agreement on the Articles of association of the ECHO CNO, membership to the ECHO CNO shall end if a member fails to fulfil its statutory obligations towards the organisation. Termination or expulsion from the ECHO CNO shall be decided by resolution of the General Assembly.

7.3.6 Maintaining the trust within the network

The collaboration within the ECHO CNO is a consensus-driven, and there is a tendency to achieve consensus wherever and whenever possible. Within the ECHO CNO, real progress is achieved through democratic processes.

The focus is on the strategic objectives that are universally shared.

This does not imply unanimity is needed on specific issues that are subordinate to the strategy (for example, deployment architectures, technology choices, or pricing models), where compromise is often necessary, or where multiple approaches can be completed in parallel.

If consensus is not possible to achieve, the qualified majority can be applied to all decisions at all levels of the ECHO CNO.

There are no weights of votes. Each member has one voting representative in the central governance and management bodies (e.g. GA and SB).

The CNO ensures that appropriate internal and external transparency rules are in place to guarantee free access of the members to strategic documents, monitoring and auditing reports. The rules are described in the ECHO CNO Operative Procedures.

Internal Member's area of business/ interest/ expertise and public information is provided by the CNO Portal, Executive Committee and the internal network.

Conflict resolution procedures exist. They are described in the following documents:

1. The Charter of the CNO;
2. The CNO Association Bylaws and regulations;
3. CNO Operative Procedures.

In the conduct of its mission, the CNO implements approved Information assurance policies, which ensure that commercial information, shared under the auspices of the CNO, is duly protected by appropriate and approved by the GA Information Management Policy.

7.3.7 Centralisation and horizontal links

The decisions of ECHO CNO are made in a **single process for the Central Network Body (CNB).** The CNO is governed by the General Assembly through the Steering Board. The work of GA and the SB is supported by the Permanent Executive Committee and the Knowledge and Information Management Committee.

There is a high level of coordination of S&T and E&T activities through the ECHO CNO central bodies. The proposals for new activities are drafted by the Scientific Committees (Exploratory Teams and Task Groups). After that, the proposals are reviewed, evaluated and rated by the Knowledge and Information Management Committee and endorsed by the SB. The GA makes the final decision on the proposals twice per year and they become part of the CPoW.

The CNO members work together to provide network connectivity and to collaborate on joint S&T and E&T activities, investing in the development and delivery of an advanced portfolio of services, tools and network capabilities to institutions, projects, researchers and policy-makers in Europe and worldwide.

The participants in the CNO can decide to collaborate on their own projects. At least four ECHO CNO members have to express interest and to allocate resources for S&T or E&T cooperation to initiate a new activity. There is no requirement for all other participants to join this activity. After endorsement from the SB and approval by the GA, the new activity can start. The rules for cooperation are described in the Operative Procedures of the CNO.

The SB with the support of the Permanent Executive Committee exercises the oversight on the implementation of the S&T and E&T activities and reports to the GA twice per year about the implementation of the CPoW.

7.3.8 Risk management and shared funds

The CNO has agreed among the participants and approved by the GA **Rules for risk identification, management, and monitoring.** It is the responsibility of the SB to prepare and submit for approval of the GA **Risk Management Strategy**. The Rules and the Strategy are reviewed and updated regularly by the SB according to the needs of the organisation, the changing environment in which the ECHO CNO operates and the foreseen risks in the threats and security posture. ECHO CNO do not allocate centrally reserved funds for risk events.

The main document, which governs the ECHO CNO's financial and budgetary affairs, is the **Organisation's Financial Regulations (FR).** The responsibility of **the Budget Committee** is to develop the FR of the ECHO CNO and to present them for endorsement from the SB. After that, the Regulations have to be approved annually by the GA.

The ECHO CNO operates strictly within the limits of the resource allocations provided and for the purposes stipulated in the approved budget. The SB, supported by the Budget Committee, will oversee matters of budget and finance as per CNO's FR.

According to the Charter, the ECHO CNO operates within the financial budget set annually by the General Assembly. The Budget Committee, acting by a qualified majority, shall adopt the draft of the yearly budget. When doing so, it should suggest to the Steering Board to review and endorse the budget. The GA approves the proposed budget.

The ECHO CNO's budget is funded by several sources:

1. The CNO members are required to pay an annual membership fee, determined by the General Assembly. All members will pay the same membership fee.
2. European Union's research and innovation programmes;
3. Some members shall be customer-funded after approval by the GA;
4. Ad hoc projects or programmes and budget funds from additional revenue.

The General Assembly can decide to compensate some ECHO CNO members and reimburse their expenses. The Chair of the SB may transfer money between CNO's accounts without limit, after approval by the GA.

According to its Charter, the **International Board of Auditors** for the ECHO CNO (IBA), acting on behalf of the GA, shall audit the financial statements of the organisation. The IBA may carry out performance audits that shall ascertain that the operations of the CNO have been implemented in compliance with economy, effectiveness and efficiency principles. The IBA shall have access to any information necessary to conduct its financial and performance audits.

The Steering Board, acting on a proposal from the Chief Executive Officer, shall as necessarily adopt the rules regarding the implementation and control of the general budget, especially in regards to public procurement. The Steering Board shall ensure, in particular, that security of supply and protection of both defence secret and intellectual property rights requirements are duly taken into account.

7.4 Alternative 2

First section presents the acronyms used in alternatives description, its organisational chart and scope identified during the alternative development. Following sections presents the description of the Alternative 2

and full description of the roles and activities of the governance and management bodies are given in Annex 3 – Alternatives' Structures, Alternative 2.

7.4.1 Acronyms, scope and chart

Acronym	Description
CNB	Central Network Body
RNBs	Regional Network Bodies
GM	General Meeting
AM	Annual Meeting

Table 20: Alternative 2 acronyms and abbreviations
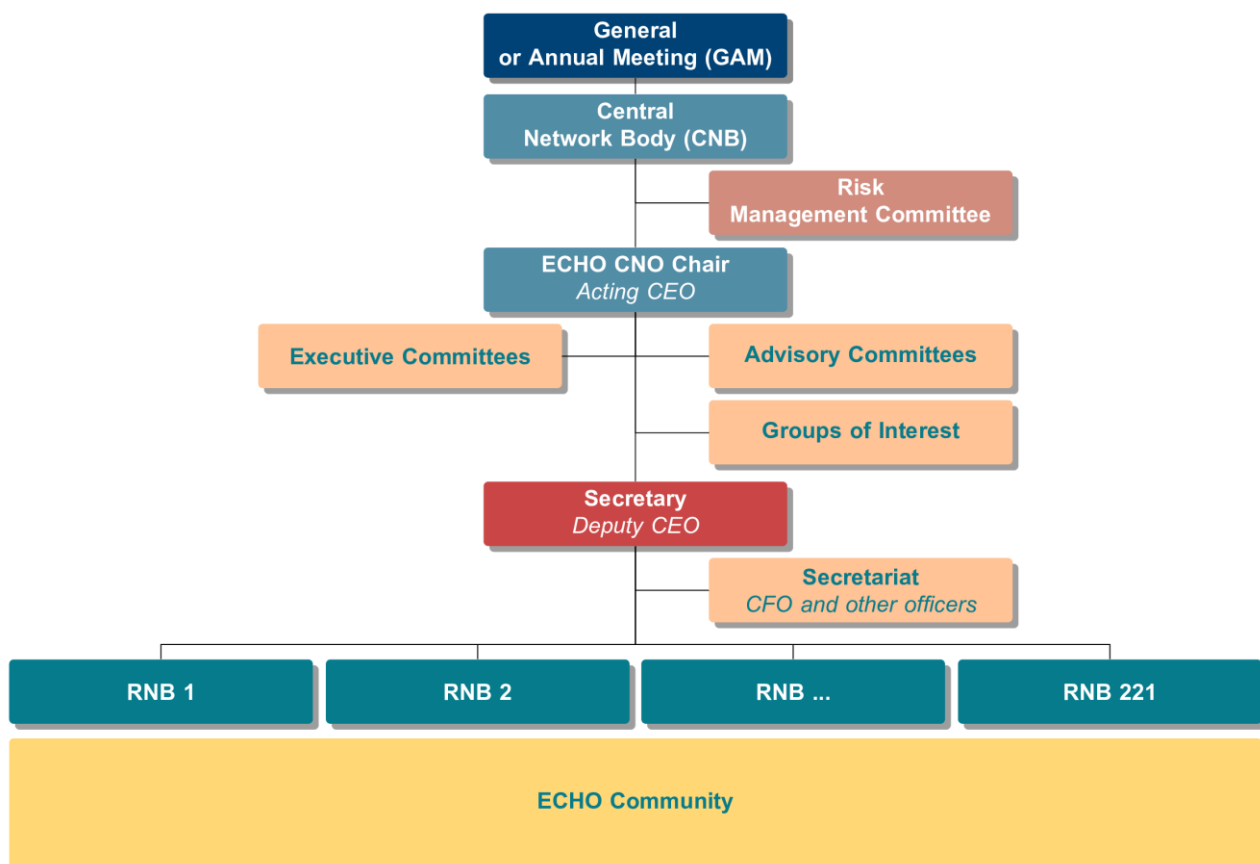
Figure 22: Alternative 2 Organisational chart

Auditing and Risk Control of ITS
- education and training of auditors
- certification programmes

Governance and Management
- standards development
- support in standards applications
- developing models

Regional Centers

Information Security Management and Data Privacy
- support to customers and stakeholder
- publications

Cyber Security Skills Development
- education and training programmes
- certification
- workshops and publications

Figure 23: Scope and main areas of the Alternative 2

7.4.2 Scope, diversity and management of complexity

The ECHO Collaborative Networked Organisation (CNO) is an international non-for-profit association which aims to develop:

- Membership communities of certified professionals in cybersecurity;
- Community of Certified privacy professionals;
- Mutual benefit for all members and society.

The ECHO CNO on a regional level is organised by **Regional Network Bodies (RNBs)** in order to promote its mission and activities all around the world. These RNBs are actually informal centres around well-organized groups that took leadership on their regions. The RNBs are established on the principle of geographical location and available capacities of their members. The RNBs are participating actively in the competence development activities promoted by initiatives of the Central Network Body (CNB) and network-wide authorities of the ECHO CNO.

In terms of the training and education activities, the ECHO CNO operates also as an informal worldwide internet community of practice, encouraging the cooperation and coordination among individual members.

The scope of the ECHO CNO covers the following activities:

- The ECHO CNO develops own, acquires or adapts third party models and standards on information security and privacy protection. The ECHO CNO maintains and regularly updates those models and standards;
- The ECHO CNO establishes and maintains certification criteria and procedures for cybersecurity professionals and disseminates a cybersecurity awareness in accordance with models and standards promoted;
- The ECHO CNO on the global level and the RNBs on local levels provide sponsorship on awareness activities in the information security and privacy protection;
- The CNB and he RNBs organize conferences and other events devoted to the professionals in cybersecurity and privacy;

- Accredited trainers among the members of the ECHO CNO train specialists, trainers and auditors on the information security standards promoted within the Network;
- Accredited by the ECHO CNO individual auditors in information security and privacy protection perform certification and improvement audits of enterprises, government and non-government organisations;
- The RNBs are responsible for ECHO CNO's sponsor activities on regional and local levels.

7.4.3 Number of participants and attractiveness

The membership of the ECHO CNO consists mainly of individuals. The hundreds of thousands of ECHO CNO individual members are organized in more than 200 professional RNBs. There are separate membership statues for organisations – as consulting members, associate members, and corporative members without voting rights and with observers' role.

The ECHO CNO publishes on annual base a report about its membership developments. The indicators in the report are as follows:

- Number of Members: more than 140,000 members;
- Engaged certified, full members-professionals: more than 460,000 engaged professionals;
- Number of RNBs: 221 regional bodies (centres);
- Number of countries: 188.

The report also informs about the annual growth of the Network for the year 2019 as follows:

- New members: 28,356 new members. This actually exceeds the 2019 annual goal of the organisation for attracting new members;
- Annual growth: 4.5 % growth in new candidate members in 2019 in comparison with 2018;
- Promotion score among the community: 88% of the members stated that they will recommend membership to their colleagues.

The members of the network are organized in different levels based on their contribution to the Network, duration of the membership or achieved qualifications. The ECHO CNO membership has the following types: *members, volunteers, contributors*.

Members of the ECHO CNO gain benefits in terms of recognition (certification), access to resources, discounts for events, training and career development, access to worldwide community knowledge on cybersecurity.

7.4.4 Network competences and certification procedure

The network builds and maintain competencies in the following areas:

- Auditing of information systems;
- Risk and information systems control;
- Information security management;
- Governance and management of enterprise information technologies;
- Cybersecurity technical skills and knowledge;
- Data privacy.

The ECHO CNO maintains its own bodies of knowledge or refers to external models for each of the above-mentioned fields.

The membership of the ECHO CNO is a well-developed and objectively proven procedure based on certifying competences.

The goal of the certification procedure is to verify skills and experience of each candidate member. It is structured **in training and certification pathways** designed to ensure the holistic nature of the cybersecurity domain. The certification path (procedure) for professionals consists of several steps, described below.

Select relevant certification

The network provides summary information about the scope, objectives, requirements and benefits from each certification program and membership in the network so the possible candidates can choose a program that fits their profile and needs.

Learn the necessary knowledge or acquire relevant skills

Different alternatives are available for those who want to be prepared for the exam. The candidates for the certification can learn by themselves or attend on-line or on-site training courses. The Network supports them with self-study guides, forums, mock exams and trainings.

The Examination

Candidates are able to schedule their exam for any available date, time and location within their eligibility period. Proctored certification exams are available on-line or on-site.

Apply for certification

Candidates gain and demonstrate relevant experience in the specific field of competence and apply for certification. This step is applied for selected certification paths.

Apply for ECHO CNO membership

Once the candidates are certified, they can apply for membership. Alternately, the candidates can apply for membership at any moment before taking the exam, but the application will be reviewed after the exam is passed successfully by the candidate.

Maintaining the certification

Certified professionals **maintain their certifications on an annual base**. They prove that skills and knowledge are up to date and relevant through validated learning and experience. The validity of learning and experience for each member is based on objective criteria like proven hours dedicated to learning, work experience, volunteering, teaching, etc.

7.4.5 Maintaining the network goal consensus

The ECHO CNO aims at long-term collaboration and positioned itself as a lifelong learning partner for professionals and enterprises. It **has a flexible governance** model focused on **knowledge sharing and capacity development**.

The **main governance objective** is to create an environment in which the RNBs have decision-making autonomy in order to make the best decisions on how to contribute to the network-wide strategy and objectives.

The Network **has two classes of members**.

Voting members with good standing have the right to vote as specified in the Bylaws criteria for voting rights. Members can vote online or by ballots on RNBs' sites.

Most of the decisions are made by **simple majority rule** but there are such specific situations where the decisions are made with **qualified majority** such as decisions about **Mission, Vision, Strategy, and the ECHO CNO network-wide Annual Plan**.

Usually, **five per cent of the voting power** (members with voting rights) constitutes a **quorum** for the transaction of business at any meeting.

The required **quorum for the General or Annual Meeting is 51%** of the members with full voting rights. Members can submit votes electronically or via postal mail prior to the meeting and this constitutes the quorum.

A **General Meeting** of members is held annually at such time and place, and on such notice, as the CNB may determine and is subject to the requirements set into the Invitation to the General Meeting.

The **Annual Meeting** is held each year and mainly discusses issues about the Annual Plan activities and year progress toward ECHO CNO's goals. Nevertheless, if changes of the Network environment or other challenges require to be addressed, the Annual Meeting can be gathered as a **General Meeting**.

The CNB decides about the requirements applicable for RNBs formation. Chapter RNBs applications are approved by the CNB, or its designee, in its sole discretion and shall include the proposed Bylaws of the RNB, which shall be consistent with the Articles of Incorporation, Bylaws and the CNB-approved policies.

Each **RNB is fully and solely responsible for its own legal and financial affairs**. RNBs meet regularly. Elected leaders of the CNB shall have the monitoring and auditing rights afforded respectively to members and directors under the law governing such RNBs.

7.4.6 Maintaining the trust within the network

The **CNB** is the governing body that may exercise all the powers and authority on behalf of the ECHO CNO. The CNB is formed by **Directors elected at the Annual Meeting**. Directors number, responsibilities and rights are decided on a **two-year basis at the General Meeting**.

The CNB may delegate the executive rights for management to a person called a **Chair of the ECHO CNO**. The CNB or a CNB Committee is directly responsible for approving the selection and the processes regarding the retention and evaluation of the Director.

The CNB may establish geographic or other demographic differentiators. The CNB delegates to the Chair the day-to-day management and executive rights for implementation of policies, subject of CNB's monitoring and control.

The executive management of the Network includes the **Chair** (acting as CEO), Secretary, **Chief Accountant** (acting as CFO) and any other role defined by the CNB.

The Chair and the Secretary appointed by the CNB shall serve as the Managers of the ECHO CNO. The **Secretary** is also appointed by the CNB. The **Secretary** forms and leads an executive and support body – the **Secretariat** of the ECHO CNO Chair. Other management positions, suggested by the Chair and the Secretary, if any, shall **be approved by the CNB**.

In some cases, at the meetings of the CNB's Directors at which a quorum is present, the proposals of the Directors brought before the meeting are decided by the vote of a majority of those present.

The CNB may establish **advisory committees**. Advisory committees may not exercise the authority of the CNB. CNB approves the documents that govern all committees.

Usually, **committees are formed for nominations, audit and risk, finance management** and other important areas of network-wide activities of the ECHO CNO. They report to the CNB. Any CNB committee that does not consist solely of Directors is advisory in nature and can only make recommendations to the CNB.

7.4.7 Centralisation and horizontal links

The ECHO CNO can be considered as a networked organisation with a **high level of decentralisation**. The CNB governs, manages and reviews **the certification, membership, capabilities and competences assessment-related processes.** The allocation of shared funds gathered by different types of fees is decided at the General (or Annual) Meeting. The ECHO CNO's CNB can be also considered **as a forum for R&D's activities** and as a **place for coordination of communities** of interests formed by the individual members.

The ECHO CNO's CNB has the important role of the contact point to the shareholders and customers from industry, education and government organisations. Nevertheless, this role is not exceptional and the ECHO CNO can be represented by each RNB on the regional level if it is conducted according to the rules described at the CNO's Bylaws.

Horizontal links are established and maintained for **information sharing and business development** among the members and RNBs, if applicable. RNBs **provide education, resource sharing, advocacy, networking and other benefits to the members**.

The initiatives and programmes of the RNBs do not need approval from the CNB – they are reported to the ECHO CNO General or Annual Meeting, providing evidence that the activities support the ECHO CNO's network-wide or RNBs' regional goals.

The CNB has the right to stop RNB's activity, programme or initiative if it breaches the Bylaws rule. The CNB decision can be appealed before the General or before the Annual Meeting.

7.4.8 Risk management and shared funds

Risk management is conducted by a separate Committee. The **Risk Management Committee** is independent from the executive management (the Chair and the Secretary) and reports directly to the CNB.

The Committee reviews financial statements and annual reports. It consists of **appointed by CNB experts and auditors**. The Committee provides an analysis of the ECHO CNO's threat and risks posture. The meetings of the Committee also provide a forum for discussion on any matters that are relevant to ECHO CNO goals and activities, as well as to stakeholders' needs and objectives.

The Committee prepares an **Annual Risk Management Plan**, which contains an assessment of information about risks applicable for the Network in terms of business and strategy risks, technology risks, operational risk, risk tolerance levels, risk appetite and others.

The Plan also describes activities and action for risks mitigation, risk transfer and avoidance. The CNB approves and oversees the Plan by Chair's proposal and reports.

The CNO operating revenues are formed mainly by fees.

The sources of the ECHO CNO **shared funds** are as follows:

- Certification procedures fees;
- Annual Membership fee;
- Education courses;
- Publications;
- Licensing and royalties;
- End user products and sponsorship;
- Interest, dividends, research and Intellectual Property Rights (IPRs);
- Industry support and consulting;
- Contributions and sponsorships.

The ECHO CNO shared funds can be used for the following operating expenses:

- Support for CNB services and administration;
- Organisation of Educational courses;
- General Program for improvement;
- Relations (including Membership);
- Certification, Research and IPRs;
- Publications.

Part of the shared funds, formed by these sources, are used in order to support the ECHO CNO activities, according to the **Annual Plan** of the organisation.

Another significant part is dedicated **to support the regional centres'** (the RNBs) activities. The amount of support is decided at the Annual Meeting by proposals from RNBs.

The proposals are aggregated by the Secretariat and are presented at the Annual Meeting by the Secretary.

7.5 Alternative 3

First section presents the acronyms used in alternatives description, its organisational chart and scope identified during the alternative development. Following sections presents the description of the Alternative 3 and full description of the roles and activities of the governance and management bodies are given in Annex 3 – Alternatives' Structures, Alternative 3.

7.5.1 Acronyms, scope and chart

Acronym	Description
CFO	Chief Financial Officer
CLCs	Co-Location Centres
DMCI	Digital Market Cybersecurity Innovation
EUCIRA	the EU Cybersecurity Innovation and Research Agenda
GA	General Assembly
GIs	Groups of Interest
MB	Management Board
MIF	Member Information Form
PPP	Public Private Partnership
SB	Supervisory Board
SME	Small- and Medium-sized Enterprises

Table 21: Alternative 3 acronyms and abbreviations
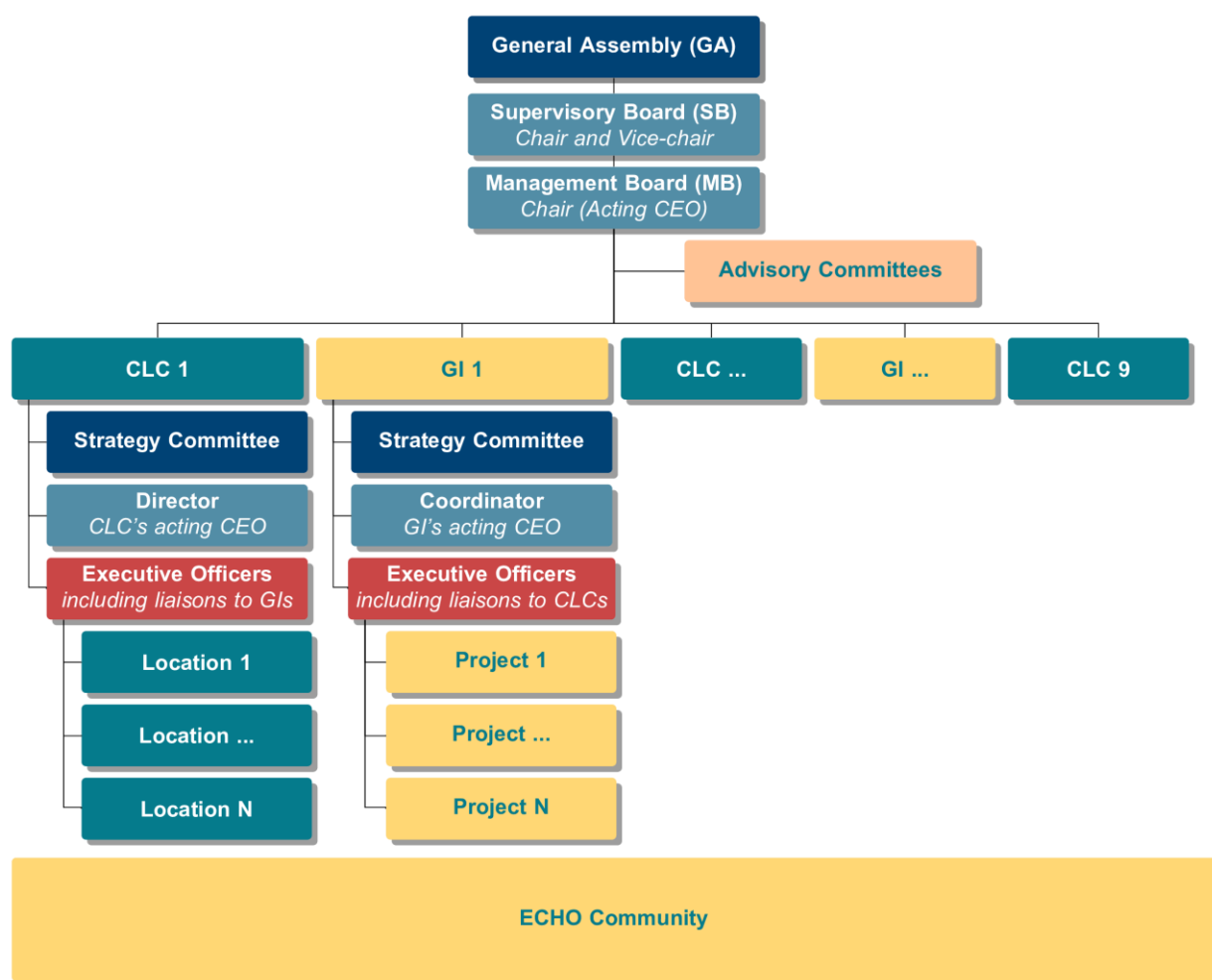
Figure 24: Alternative 3 Organisational chart
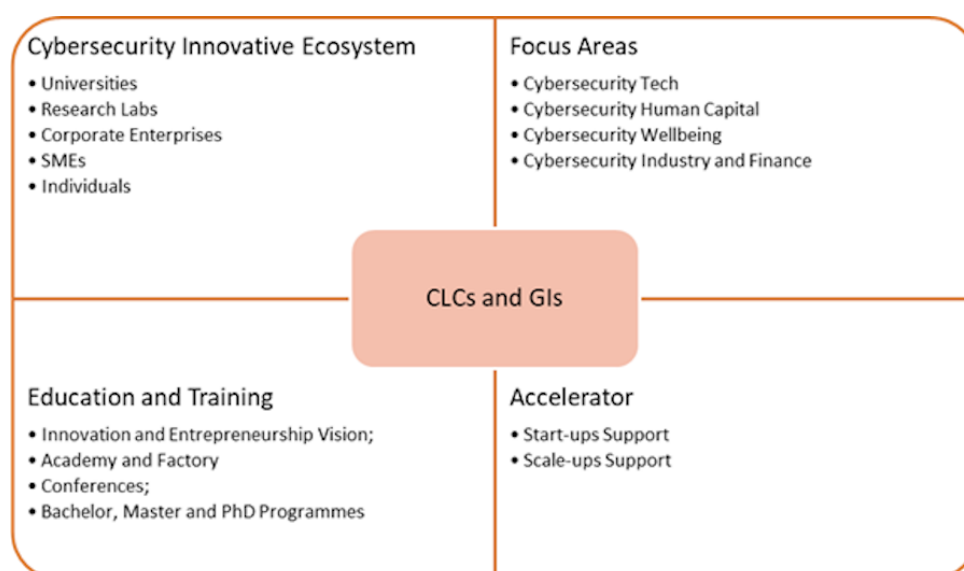
Figure 25: Scope and main areas of the Alternative 3

7.5.2 Scope, diversity and management of complexity

The ECHO CNO is a *Public Private Partnership* (*PPP*) international network between academia, private enterprises active in the cybersecurity domain and the public sector aiming to achieve following goals:

- Enhance research in the cybersecurity domain;
- Enhance collaboration between businesses and academia in the cybersecurity domain in order to enhance R&D capabilities of participating members;
- Bring together companies active in the cybersecurity domain in order to develop further collaborations;
- Represent and provide policy input for the public sector;
- Raise awareness about cybersecurity for the public at-large.

The PPP is developed through **common funding** mainly provided by the EC (Horizon 2020 Programme) and EU member states governments' agencies. The funding is established through programme **Digital Market Cybersecurity Innovation (DMCI)**. The Programme has the following main areas (goals):

- **Cybersecurity Tech** – development of technological base for cybersecurity in Europe;
- **Cybersecurity Human Capital** – education and training for cybersecurity work force, including development of innovative entrepreneurial leaders;
- **Cybersecurity Wellbeing** – assuring digital aspects of human and economy sustainable development;
- **Cybersecurity Industry and Finance** – secure growth in digital markets.

One of the main goals of the DMCI programme is to provide **venture and risk capital for start-ups and innovative enterprises in cybersecurity**.

The **DMCI eligible countries** are these EU member states that participate in the DMCI programme. There is an option to include countries in close relations with EU under other EU funding instruments.

ECHO CNO is a leading European digital innovation and entrepreneurial education organisation driving Europe's cybersecurity domain. Its way of working embodies a *pan-European ecosystem of over 200 top European corporations, SMEs, start-ups, universities and research institutes, where students, researchers, engineers, business developers and entrepreneurs collaborate in an open innovation setting*.

The *Governance Model (GM) of the ECHO CNO* shall sustain, execute and develop the **EU Cybersecurity Innovation and Research Agenda**[29] (EUCIRA). *EUCIRA* provides priorities related to cybersecurity domain, thus giving the framework for selection of prospective projects and activities that shall be funded and monitored.

The benefits for members and partners of the ECHO CNO are as follows:

- Access to venture and risk capital funding opportunities;

---

[29] The EUCIRA is not a real document. It is just a guess that such kind of document should exists in this alternative in order to achieve working PPP. In practice, in the past there was an European Security Research and Innovation Forum (ESRIF) contributing to the development of the European Security Research Agenda (ESRA), that was used to inform the Horizon 2020 Security component.

- Information about funding opportunities and policy updates to the CNO's members;
- Facilitate collaboration of academia and industry across Europe;
- Marketing support for the companies and their products or services;
- Industry feedback to the public sector stakeholders.

Building on a strong partner ecosystem of business, research and academia, ECHO CNO performs following key activities to strengthen European cybersecurity innovations:

- **Driving market uptake of top European research results**: ECHO CNO facilitates cross-border innovation collaboration to bring promising, mature research results out of the lab and quickly into the market.
- **Supporting growth on international markets:** The ECHO CNO helps fast-growing European deep tech scale-ups to expand internationally and become dominant global players.
- **Providing the European market with digital entrepreneurs through education:** The ECHO CNO equips talents with solid technical knowledge and the necessary entrepreneurship and business skills to spot opportunities, understand market needs and capitalise on them.

The DMCI eligible countries are these EU member states that participate in the DMCI programme.

The ECHO CNO has its central network bodies, but the main relationships with members, candidates and stakeholders is conducted through regional nodes called Co-Location Centres (CLCs)

7.5.3 Number of participants and attractiveness

The ECHO CNO *will not focus on getting large numbers* of partners instead the focus is on **finding the right partners**. As there are different membership opportunities then the goal for the number of partners varies between these membership types.

The ECHO CNO offers membership in order for businesses, academia and the public sector to find points of collaboration and to be able to communicate in an open manner.

The ECHO CNO offers various membership opportunities in order to support the collaboration. As there are different target groups who has to be involved then each of the groups has their own proposal as it is described below.

Membership types of the ECHO CNO are as follows:

1. *Members* – full members, approved by procedure maintained by the respective CLC.
2. *Linked Third Parties* that can be of following types:
    a. *Affiliated entities* – local subsidiaries or branches of member organisations.
    b. *Entities affiliated with a legal link with a member organisation* for purposes unrelated to ECHO CNO, e.g. national or regional ecosystem organisations.
3. *External Partners* are members with limited duration, usually on annual basis.

Each type of membership opens access to the ECHO CNO's *Cybersecurity Entrepreneurship Academy and Cybersecurity Innovation Factory*, which can be considered as members' forum on management and innovation issues as well as main ECHO CNO education and training facilities.

The ECHO CNO maintains *Alumni Association Group*. The Group consists of people finished successfully Cybersecurity Entrepreneurship Academy courses and participants within Factory activities.

Members from all types have to pay yearly membership fees.

Members have voting rights in the ECHO CNO General Assembly, Members and Linked Third Parties participate in their local CLCs Strategy Committee meetings.

The ECHO CNO *has 203 full members in 2019 registered* in all CLCs. The CNO started with *25 members at the beginning of 2010* and grows in an approximately linear fashion.

The ECHO CNO *strategy for new members' engagement* is focused on targeted companies and universities for each year which explains the linear growth of members, as well as relatively restrictive procedure for members' application and certification. The share of the ECHO CNO enterprise members in 2019 grows up to 62%, in comparison to 2010 – 21% corporate and business members.

Nevertheless, close coordination of corporate communications, marketing and sales helped to reinforce all channels and contributed to a significant increase in ECHO CNO visibility and audience engagement.

Coverage of ECHO CNO media publications in *2018 increased by 30% to 137 articles* in Europe. The number of followers on social media *increased by 20% to 120,000, while the traffic on ECHO CNO's website was up by 40% due to more compelling content*. ECHO CNO flagship annual conference attracted more than *900 participants*. The aim in 2019 and 2020 is to go even further in terms of engagement and impact, with the promotion of the new *EUCIRA 2020-2022* being a prime focus.

7.5.4 Network competences and certification procedure

The ECHO CNO in essence is open to anyone who is interested in engaging with the cybersecurity domain, however in order to *get access to meetings, marketplace and academic activities* one has to become a member.

The requirements for the membership are different according to the type of partner. The network competences, members' acceptance and audit are provided by strict procedure maintained mainly on regional level by CLCs and approved on network-wide central level. The procedure is described at *ECHO CNO Membership regulation*.

In order to start the membership process, the candidate organisations should **fill in the questionnaire for new members**. Once the questionnaire is filled in, organisations are contacted by the relevant local network node – Co-Location Centre (CLC) – to complete the process.

The CLC Director contact provides clarifications to the candidate organisation documents related to the following topics:

- the ECHO CNO Business Plan and the proposal submission process;
- the types of partnership (Member, Linked Third Party, External Partner);
- the associated costs;
- the Application Package Template Documents; including templates for the Letter of Intent (LoI), Membership and Partnership Criteria Document, Accession Letter and a link to generate the **Member Information Form** (MIF) online.

A candidate organisation creates the MIF online, fulfils the above-mentioned templates and receives the **Member Identification number**.

The CLC Director reviews and suggests improvements to these documents and then the CLC Strategy Committee (CLC SC) gives its support or not to the membership application on CLC SC Meeting. The CLC SC Members formed by the existing members in the local centre, discuss the application based on criteria which includes the *quality of the application and information, alignment with ECHO CNO ecosystem and membership criteria as well as financial robustness of the candidate member*.

The CLC Director writes the Support Letter on behalf of the CLC SC to the ECHO CNO Supervisory Board (SB) and to the ECHO CNO Chief Financial Officer (CFO).

The SB votes on the application of the candidate member.

Each *member is responsible for maintaining its record in ECHO CNO on-line member profile* and adding all changes in its status accordingly.

Candidate members from countries that are eligible for DMCI, but have no country's CLC established can apply to CLC of their choice.

The members' status and competences are audited annually by the CLC Director and reported to the CLC SC. If significant discrepancies between the status and registered Membership and Partnership Criteria occur, the CLC Director can report to the ECHO CNO's Supervisory Board. The General Assembly is the final point of conflict resolution on issues related to network competences and members' status.

7.5.5 Maintaining the network goal consensus

The ECHO CNO's prevailing perspective for collaboration has a long-term horizon.

The central network-wide bodies are with relatively simple structure. *This can be explained with the actual connections to the EU and member states authorities and regulations*.

The framework for ECHO CNO goals are in general set by the EU Cybersecurity Innovation and Research Agenda[30] (EUCIRA), agreed on EU and national level. The funding of activities is also centralized to the EU and national programmes. Thus, the goal consensus is evidently clear.

Nevertheless, the **ECHO CNO is main advisor to the authorities for changes and improvements for EUCIRA**.

The General Assembly Meeting has two specific feedback sessions named Corporate and Academia Pitch and SME Pitch. All members depending on their size can participate to one of the sessions with 5 minutes pitch. The pitch is registered online before the meeting as an expose of ideas and issues that the member wants to present to the authorities or to the ECHO CNO governance and management.

The main governance body of the ECHO CNO is the **General Assembly (GA)**, which consists of one representative from full member organisations. The GA decides on election and changes to the independent Directors of the Supervisory Board (SB), the Chair and Vice-chair of the SB, as well as the CLCs representation to the SB, the Mission, Vision, Strategy documents and financial documents.

---

[30] The EUCIRA is not a real document. It is just a guess that such kind of document should exists in this alternative in order to achieve working PPP.

The financial documents include following agreements:

- **Business Plan and Catalogue** for services and products delivery;
- **Grant Agreement with EU and national governments** for funding of the ECHO CNO activities;
- **Internal Grant Agreement** between members for delivering outcomes designed in Grant Agreement.

The GA approves annual reports of the *Management Board* about membership and about plans execution.

The **Supervisory Board (SB)** is formed by *3 CLCs representatives* elected by the GA*, three independent Directors* suggested by EU and member-states and approved by the GA, *Chair and Vice-chair*. All members of the SB have a 2-year mandate.

The **Management Board (MB)** is the executive committee of the ECHO CNO led by *its Chair, acting as CEO*. The MB consists of the *Chief Research and Innovation Officer, the Chief Education Officer and the Chief Financial Officer (CFO), as well as the Head of Communications, Head of HR and the all CLCs Directors, except the CLCs elected in the Supervisory Board*.

7.5.6 Maintaining the trust within the network

The trust among ECHO CNO is maintained by well-developed procedures and documents.

The acceptance, certification and auditing procedure of members is strictly followed and reported. The register of the membership is regularly updated and each member has access.

All decisions and meetings' records are also available to members' shared space of the ECHO CNO's website. The external transparency to the stakeholders and partners is provided through publication of the strategic documents and annual reports.

All decisions in all decision-making bodies are taken by **the simple majority rule**. There is no weighting of votes, except for the Independent Directors in SB. Each *Independent Director has 2 votes in SB*, thus having actual veto right for SB decisions *if they anonymously agree – all three of them are voting in same manner*. There is a resolution procedure which employs GA resolution.

The SB can establish non-permanent **Advisory Committees** on important topics as a forum for discussion and feedback. The committees have to include one representative or observer from each interested CLC.

The procedure for the Internal Grant agreement consists of two-way negotiations.

First, the ECHO CNO **Business Plan Framework and Priorities** are presented by the *MB for 3-year period to the CLCs and members.*

Second, the CLCs decide to which opportunities they will participate and present their **resource decisions and activities** to the MB. Each member or group of members (within their CLCs) can request additional resources.

The MB drafts the **Business Plan and Catalogue of services and products** based on the CLCs' proposals, SB review and amend the drafts and finally they are approved by the GA.

On the basis of the **Business Plan** the MB prepares the **Grant Agreement(s) proposal** to the EU and individual member states and other sponsors. The Chair of the SB signs these proposals and sends them to the sponsoring organisations. When the **Grant Agreement(s) are approved, Internal Grant Agreement is prepared** by MB and SB and is approved by the GA.

Each member signs **general contractual agreement** with ECHO CNO. Projects and activities that are maintained by members are arranged in **separate contracts**.

All projects executed according to the Internal Grant Agreement are strictly monitored and audited each six months by external auditors.

7.5.7 Centralisation and horizontal links

The *main focus* of the Governance model of the ECHO CNO is the **regional (local) level**. The ECHO CNO strategy and plans are given by the central network-wide level more as a framework within which the regional governance bodies can decide how to achieve the goals and how to execute the activities.

Co-location Centres (CLCs) are **established as non-for-profit legal entities** in countries participating to the Digital Market Cybersecurity Innovation (DMCI) programme. The CLC can be established from **5 members** of ECHO CNO in the country.

CLC has a **Director**, acting as a **CLC's CEO**. The CLC also has a **Strategy Committee** which is formed by CLC members' representatives and has the right to elect the Director and CFO of the CLC.

The *Strategy Committee* develops ECHO CNO implementation strategy for the region, based on strengths and opportunities in most prospective for the region ECHO CNO's innovation areas in cybersecurity. The CLC is *the main actor at members' acceptance procedure and it is responsible for network competence level audit and maintenance*.

The Director, the Strategy Committee and CFO are responsible for preparing the Budget, Internal Agreement and Business Plan for the CLC. These documents are further negotiated and agreed with the ECHO CNO Management and Supervisory Board. The CLC can take resource allocation decisions within the approved budgets and activities.

In addition to CLC, members and partners of the ECHO CNO can form **Groups of Interest (GIs)** which have same organisation as the CLC, but do not have obligation for member acceptance and do not have rights of representation to ECHO CNO central bodies. They have **advisory role to the Supervisory Board and CLCs' Strategy Committees**, providing insight, information and feedback to members for important developments and opportunities in cybersecurity domain fields of interest.

The GIs can also propose and lead programmes or projects to SB for activities in their specific field. The allocation of resources is made similarly to the allocation for CLCs' budget and activities.

7.5.8 Risk Management and shared funds

As far, as the ECHO CNO is focused on providing venture and risk capital for new and innovative activities, the **Risk Management is an important area** of ECHO CNO governance and management.

The Risk Management is described in series of documents applicable to processes on different level of the CNO.

The application procedures for DMCI projects has special part dedicated on projects' related risk management tools. The ECHO CNO also **maintains KPIs database for each project**. The level of KPIs and related processes are monitored on quarterly basis by the CLC's CFO in which authority falls the project. Network-wide projects are monitored by the Management Board and its Chair.

For each project (local or network-wide) **dash board** is created on the members' area of the ECO CNO web site, providing information about the progress of the project activities, resource use, identified risks, strategies and responsibilities for their mitigation.

Risk Management Helpdesk for members and partners is available on the website, as well as many supporting materials and publications on *how-to manage risks in different cases – as an example – for SME applying for funding, for members' starting development of new product, etc.*

In the CLCs with more than 10 members, a special **Risk Management Team**, supporting the CLC's Director can be established.

Shared Funds

The main source of ECHO CNO funding come from **grants from sponsoring organisations**, mainly EU and its member states' agencies. Grant Agreements with sponsoring organisations (or programmes*) are signed on behalf of the ECHO CNO by the Chair of the GA and the Chair of SB.*

The Grant Agreement funds are dedicated to project and activities proposed by the ECHO CNO *network-wide Business Plan*.

The internal allocation of funds and monitoring of their use is arranged through the **Internal Grant Agreemen**t on network-wide level, through CLCs' Business Plans and individual contracts with members.

Monitoring, reporting and risk management is provided mainly on regional level by the CLCs units. *The full annual report of the ECHO CNO is drafted by the MB, reviewed by the SB and approved by the GA.*

Other important funding sources with 30% weight in ECHO CNO budget are the *price for services and education courses fees*, as well as the *sponsorship coming from enterprise members*. The common financing for ECHO CNO projects from members is a part of the PPP.

The smallest source of funds are the membership fees, providing less than 10% of the ECHO CNO budget. They are collected and managed on central level by the MB (the CFO). The main type of activities that are funded through this source are *the maintenance of the website, on-line registers, publications and missions of the central and local administration – travels, accommodation, etc.*

7.6 Alternative 4

The first section presents the acronyms used in alternatives description, its organisational chart and scope identified during the alternative development. The following sections present the description of the Alternative 4 and full description of the roles and activities of the governance and management bodies are given in Annex 3 – Alternatives' Structures, Alternative 4.

7.6.1 Acronyms, scope and chart

Acronym	Description
CyPR	Cybersecurity Professional Register
FSP	Full-Scale Pilot
GA	Grant Agreement
SEB	Stakeholders Expert Board
SME	Small- and Medium-sized Enterprises
SIG	Special Interest Groups
BoD	Board of Directors
MC	Membership Committee
AGM	Annual General Meeting
StC	Steering Committee
ICRMS	Internal control & Risk Management System
IRAT	Internal Risk Audit Team
QMS	Quality Management System

Table 22: Alternative 4 acronyms and abbreviations

Annual General Meeting (AGM)
Chair

Hall of Fame
Advisory Committee

Steering Committee (StC)

Board of Directors (BoD)
5 seats

Membership Committee (MC)

Advisory Board (AB)

Secretariat

Permanent Committees (PCs)

Ad-hoc Committees (AHCs)

Chair of BoD
Acting CEO

Chief Financial Officer
(and Executive Officers)

Executive Committee (EC)
CEO's Secretariat

SIG Steering Board

SIG 1 **SIG2** **SIG ...** **SIG N**

ECHO Community

Figure 26: Alternative 4 Organisational chart

Industry dialogue
- Annual Conference
- Symposium

Early Warning System
- Event database
- Threats warnings
- Response advise

SIG

Education and Training
- Research Programme
- Management training
- Models
- Best Practices

Collaboration and Tools
- Collaboration chanels
- Incidents response tools
- Spporting sponsoring organisations
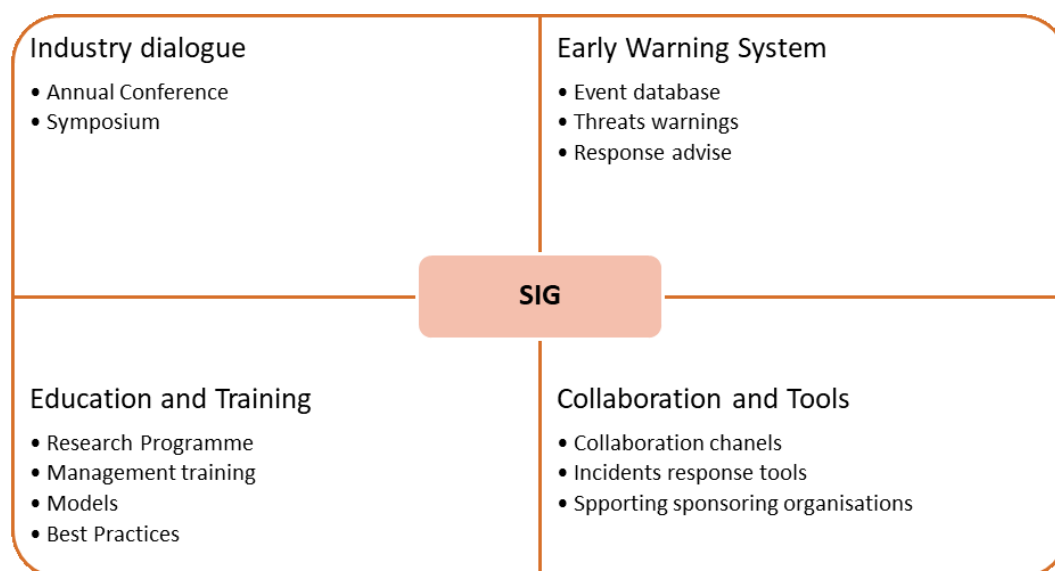
Figure 27: Scope and main areas of the Alternative 4

7.6.2 Scope, diversity and management of complexity

The ECHO CNO (Central Network Organisation) has a legal status of a non-for-profit organisation aiming to be an international coalition **unifying the global response to cybercrime** across industry, government and law-enforcement sectors and NGO communities.

The ECHO aims to form and to sustain an international **community of emergency response teams gathered together** from corporations, government bodies, universities and other institutions to cooperate among security incidents. The **sustainable system for cybersecurity** maintained by the ECHO CNO has to combine technology, public policy and economy.

The Governance Model (GM) is focused on sustaining the following **cybersecurity objectives:**

- *Information sharing* among incident response teams from government, commercial, and educational organisations;
- *Standardization procedures* for Cybersecurity incidents handling;
- *Unifying the global response to cybercrime* through data exchange, research and promoting public awareness;
- *Combining Technology, Public Policy and Economic Measures* to Create a Sustainable System of Cybersecurity;
- *To be a Point of Contact* between services and products of cybersecurity and main stakeholders/ clients of all sectors*.*

The ECHO CNO provides several types of support and benefits to its members and stakeholders.

There is a strong focus on establishing dialog and knowledge-sharing among parties, such as the **Discussion forum** for member teams, where they can share information about vulnerabilities, incidents, tools and all other issues that affect the operation of incident response and security teams.

The Network also provides a **coordination point for industry dialogue** on self-regulation issues such as market incentives, IT risk management and privacy. The **Annual Conference** on Computer Security Incident Handling and *Symposium on Electronic Crime* are other important network-wide events.

The research activities are supported by establishing and maintaining a **Research Program** in order to promote the universities and the industry to applied research on electronic crimes of all types. The education and training activities are supported by public **education utilities** for cybercrime prevention, data standards and policy development for cybercrime data exchange.

Models for **integration** and adoption of security best practices, as well **education to senior management and boards**, linking information security throughout the enterprise operations and facilitating of **executive-to-executive communications** are established within ECHO CNO.

The existence of variety of **technical tools and collaboration channels** enables members and stakeholders to understand and to respond more effectively to the security incidents. The e**xpertise covers a wide variety** of incident response and security issues.

Cybercrime **event data** and cybercrime response utilities for professionals from the private, public, and NGO sectors who combat cybercrime are available for all members, as well as products and services offered by sponsoring organisations supporting the network.

Early warning system for emerging security threats and **in-depth reports** on vulnerabilities and threats are in place.

The ECHO CNO has no regional centres or sectoral centres providing coordination to other members participating at regional level or sectoral level. The members are from different regions and belong to different ICT and non-ICT sectors and receive directions from the Board of Directors (BoD), the Secretariat and from the ECHO CNO committees.

Special Interest Groups (SIG) exist to provide a forum where the ECHO CNO members can discuss topics of common interest. A SIG is a group of individuals composed of member organisations and invited parties, typically coming together to explore an area of interest or specific technology area, with a goal to address common challenges by collaborating and sharing expertise and experiences.

7.6.3 Number of participants and attractiveness

Number of participants

The ECHO CNO offers membership opportunities to collaborate in the closed community with other **cybercrime professionals** from industry, law enforcement, government and university researchers globally. Members are **not limited to specific ICT sector or cybersecurity branch**: it consists of teams from a wide variety of organisations including educational, commercial, vendor, government and military.

The scope of the network is worldwide. There is no limit how many individuals from member organisations can participate in the network. The individuals participating are large number and are measured in several thousands. The members' growth by year is displayed in a diagram on the webpage describing the Network history and it is reported in the Annual Report: in particular, growth in 2018-2019 with over 480 members by the 2019 annual conference. Number of members grew mainly in Europe and Asia. Membership is also increasingly becoming international in a total of 92 countries, compared to 86 during the past year.

Stakeholders, customers and potential member engagement

The ECHO CNO has strategies for engagement of potential **members, sponsors and stakeholders**.

There are different **membership types with different annual fees** (*Premium, Sponsoring Corporate, Individual Corporate, and Accredited Reporter*). Applications are reviewed, and upon approval, an invoice and a data sharing agreement are sent prior to receiving an email invite to the data sharing and to the ECHO CNO's site.

Members who are interested in establishing a new SIG should contact the Secretariat. Special Interest Groups are of following types:

1. **Working Groups**: initiated by vote of the BoD and based on a charter proposed by a member. They address a particular problem or concern of interest to members.
2. **Standards Groups:** initiated based on a charter and a vote of the BoD. They develop a standard for internal use or publications for external use.
3. **Discussion Groups:** less structured groups, which allow discussion on a particular topic. Discussion Groups do not require a charter but will generally not receive any direct allocation of resources from the Network except support for groups' meetings.

In addition to the regular membership, the ECHO CNO provides following two opportunities for participation:

- **Fellowship Program**: recognizes the need of integrating security teams in unrepresented countries or region into the global incident response community.
- **Volunteering opportunities**: the list of volunteers is publicly available. The volunteers commit in areas of interest. They also reduce organisational stress, reach out to the community, learn new skills, and even advance their careers.

The ECHO CNO provides a **Forum** for responders and managers of cybercrime to discuss phishing and cybercrime issues, to consider potential technology solutions, to access data logistics resources for cybersecurity applications, to attract the university research community dedicated to cybercrime, and to advise government, industry, law enforcement and other treaty organisations on the nature of cybercrime.

The adopted Strategy and plans for stakeholders' engagement describe the membership opportunities. There is a member's benefits webpage, explaining the members' terms and conditions, membership application process. The ECHO CNO can offer discounted prices to Non-Profits, Academic, Government, Learning enterprises and NGO organisations.

The Report on stakeholders' engagement or satisfaction is provided on annual basis. The network polls its members asking how well, on a scale of 1-5, they feel the Network is fulfilling the goals (*Member Evaluations*).

There are **draft contractual documents** for stakeholders like "Terms and conditions" describing rights and level of engagement. The full list of publicly available documents about membership is given in Table 23.

Type of stakeholder	Public documents
Website visitors	Privacy policy; Refund policy; Contact form for more information; Institutional profile (development trajectory); Papers; Operating rules and policies;
New Members	Membership application process; Members' benefits and annual fees.
Members	Business Plan; SIG Planning Checklist; Content of Members' Blog; Annual General Meeting Report.

Type of stakeholder	Public documents
Fellows	Fellowship Program Terms and Conditions; Application process and form for the Fellowship Program.
Volunteers	Volunteer contribution record; Application process and form for the Volunteering opportunity.
All stakeholders	Social contract: practical framework that integrates technology, government policy and business economics

Table 23: Alternative 4 publicly available documents about ECHO CNO membership

The *Symposium on Electronic Crime* is an annual event to promote cybercrime research by providing means for researchers to publish their work. The program aims to publish several papers specifically focused on fraud and crime in the cyber world. Each year, papers are listed on the ECHO CNO website and Open Data repositories.

7.6.4 Network competences and certification procedure

ECHO CNO has a **Central Network Hub** body coordinating the members through the website and regular face-to-face meetings. Existing members should accept and guarantee the competence of the new applicant. Applications for all types of memberships are checked and reviewed by the Secretariat and the Membership Committee (MC) and upon approval by BoD, an invoice and a data sharing agreement are sent prior to receiving an email invite to the data sharing and workgroup site.

There are no specific standards for candidate competence evaluation, but valid contribution has to be assured if a new **member, sponsor, fellowship and volunteer** joins the network

Applicants are expected to meet at least the "must criteria" laid out in the **specific application form**.

Competences auditing processes can be described by answering the following questions:

Who can apply and how the application is processed?

New Members must be nominated by two existing ECHO CNO members (one existing member may be sufficient). The application is approved by a two-thirds vote of all members of the BoD,

Sponsors and Fellows must formally apply and will be selected based on their maturity and ability to grow and to participate to the ECHO CNO programs and community;

Volunteers have to make a proposal in which area of the ECHO CNO activities they want to engage and eventually to complete their contribution by filling the Volunteer Contribution Record on the ECHO website.

When the competences are evaluated and audited?

The competences can be audited by request, during the application by submitting the following information:

- the name or identification of the group, organisation, or individual;
- reasons for joining;
- expected benefits for the ECHO CNO by nominee's participation;
- All information required by the membership process (application form).

The members' competences are checked periodically. Each ECHO CNO member must comply with the Bylaws, meet certain operational requirements, and fulfil certain responsibilities towards other participants. There is a well-established procedure named "Status Maintenance".

Ad hoc evaluation of the members can be also initiated by the BoD for membership revocation. The membership revocation can be applied if any of the conditions specified in the Bylaws apply or if the information about the competences provided by the member's application form is not valid anymore.

What are the consequences if the audit is negative?

The approval period for an application is six months. If the approval procedure is successful, the applying participant is added to the list of members and is given full access to the members-restricted part of the ECHO website. During the approval period the candidate-member have access to the ECHO CNO data and information resources with "applying" status. If the application is refused the candidate-member is deleted from the list and the status is removed.

ECHO CNO reserves the right to revoke or terminate a Fellowship award if it reasonably determines, in its sole discretion, that the conditions under which the Fellowship award was granted have materially changed.

Who judges over the procedure?

The Secretariat collaborates with the Membership Committee (MC) and the BoD, providing initial check and assessment of the applications. **All nominations** must be approved by a two-thirds vote of all members of the BoD.

The **Hall of Fame** recognizes a selected group of visionaries, leaders, and luminaries who have made significant contributions to the development and advancement of the global security landscape. Nominations are reviewed and screened to ensure they meet the nomination criteria and eligibility. The *Hall of Fame Advisory Board*, comprised of a selected group of past inductees and BoD is responsible for the final selection of inductees.

7.6.5 Maintaining the network goal consensus

The collaboration within the ECHO CNO has a long-term horizon. The Vision of the ECHO CNO implies that the organisation has to become a central point for cybersecurity information sharing and services – a stable and effective community in the future European and worldwide cybersecurity landscape.

The ECHO CNO operates under a formal **Operational Framework**, which contains the governing principles and high-level operating rules. However, the ECHO CNO Central Hub does not exercise any authority over the members' organisations and operation of individual member teams. The main network-wide governance and management bodies (included into the Central Hub) are as follows:

- **Annual General Meeting (AGM).** The main governance body for the ECHO CNO is the *Annual General Meeting*, which has authority to approve Mission, Vision and Strategy, annual working and finance plans, Bylaws, to elect the BoD and act as a network-wide conflict-resolution authority.

- **Steering Committee (StC)** is an advisory body to the *Annual General Meeting* – it oversees the executive activities of the Board of Directors. Prepares analysis of the annual reports for AGM and provide operational advices to the BoD.
- **Board of Directors** (BoD) is a group of individuals responsible for general operating policy, procedures, and related matters affecting the network and its members;
- **Chair of the ECHO CNO** is elected by the 5 members of the BoD and acts as a Chief Executive Officer (CEO) for ECHO CNO.
- The **Secretariat** serves as an administrative body and provides a general contact to the members and to the public;
- Board of Directors establishes standing (permanent) and ad-hoc (temporary) **committees** in order to better achieve goals.
- **Advisory Board:** BoD may establish an Advisory Board to seek strategic guidance and advice.

In brief, the procedure of setting-up the network-wide goals is as follows: The BoD proposes the strategic documents (Mission, Vision and Strategy) or their change at the Annual General Meeting. The strategic documents are included as part of the ECHO CNO's Business Plan. The Business Plan and all of its parts are revised every three years;

For specific goals and tasks BoD can establish standing (permanent) or ad-hoc (temporary) committees. BoD shall appoint the members and Chair of permanent and ad-hoc committees and shall determine their operating procedures.

Members engage with the goals by signing **detailed contract agreements** for a year or more, according to the type of participation (*member, sponsor, fellowship, volunteer*).

The procedure for **monitoring and auditing the goal compliance of participants** is given in the responsibility of the Membership Committee and to the BoD. The Membership Committee supports membership application and the review processes. The MC proposes a decision about applicant's acceptance to the BoD. The MC also has responsibility for candidates' recruitment, membership recognition and for reviewing the membership condition.

Each participant must provide and maintain a profile of itself, describing the constituency and technical expertise. Each Member must also comply with the Bylaws, meet certain operational requirements, and fulfil certain responsibilities to the other participants.

Annual Report contains information about the activities of the organisation throughout the year. In the Annual **General Meeting**, members meet, discuss, and decide about the goals and the road ahead. During the AGM the 5 members of the Board of Directors are elected.

Consequences for not following the network-wide goals

BoD and the Secretariat are required to report suspected fraudulent or dishonest conduct to the Chair of the ECHO CNO. Matters will be reviewed and analysed by an appropriate person designated by the Chair or the BoD;

If the misbehaviour is found, the revocation process can start and the participant's access to rights and facilities may be suspended. Suspension or revocation shall require a two-thirds vote of all members of the BoD. The participant shall be provided an opportunity for rebuttal prior to revocation;

Participants who have their membership revoked or suspended for any reason are not entitled to a refund of their membership fee.

Officers may be removed, with or without cause, by the BoD.

A Director of BoD may be removed by a two-thirds vote of the remaining Directors. The Chair shall nominate a person to complete the remaining term. The nominee must be approved by a two-thirds vote of the remaining Directors.

7.6.6 Maintaining the trust within the network

In brief, the rules for representation of network members in main network decision bodies are described below.

Individuals for five **BoD** positions shall be elected at the Annual General Meeting. A candidate must be nominated by petition of at least six members. A member may vote for no more than the number of open positions. The five candidates receiving the most votes shall become members of the BoD.

The BoD shall elect from its members the Chair and the Chief Financial Officer (CFO). The Chair shall also serve as a Chief Executive Officer (CEO) and exercise and perform any other powers and duties that the BoD may assign. Officers shall serve one-year terms. A person may not serve as Chair for more than two consecutive one-year terms.

The BoD shall appoint the members and **chairs of different committees** and shall determine their operating procedures.

The BoD may appoint a **Secretary** who shall serve a term of one year. The Secretary is not an officer.

The Secretariat can be considered as an outsourced service. The Secretariat's employed professionals are the general contact point of the CNO and they maintain the membership database, provide general guidance for (potential) members, serve as an administrative point and maintain the Internet services, notably website and e-mail. The details of the role of the Secretariat are described in ECHO CNO's Operational Framework;

The BoD shall appoint the members and the Chair of the Advisory Board and determine its operating procedures. Directors are not eligible to serve in the advisory board. Membership in the Advisory board is otherwise open and does not require any prior involvement with the ECHO CNO.

Members that want to establish a Special Interest Group (SIG) should contact the Secretariat. The groups can be of following types: **Working Groups**, **Standards Groups**, **and Discussion Groups** (see above).

Annual General Meeting is conducted in accordance with the Operational Framework. Attendance and participation are limited to members. Members can invite guests, but the participation of the guest has to be approved by the BoD. Each member organisation shall be represented by its own Representative.

The rules for voting change with respect to the specific situation. In general, all matters, except as described elsewhere in these Bylaws, are decided by majority vote. The BoD takes its decision by two-thirds voting rule. There is no weighting rule for votes. Each Member has one vote.

Voting rights of a Director shall not be delegated to another, nor exercised by proxy. Actions of BoD may be taken without a meeting if the action is consented to in writing by all members of the Board. Written consents may be transmitted by postal mail, electronic mail, or by other means of electronic transmission.

In brief, internal transparency is implemented throughout the following rules:

- Access to and dissemination of strategic documents, monitoring and auditing reports is limited to the ECHO CNO members;
- Information about network members' profiles, certification and activities are available publicly on the ECHO website;
- Minutes of meetings shall be taken and distributed to all Members.
- Names of experts constituting the BoD, CFO and the Chair of ECHO CNO are available to the public on the ECHO website. Experts represent some of the largest companies in the world. Their names and photos are displayed in the website.
- The historical list of past elected members of the BoD is kept publicly on the ECHO website;

There are specific policies for conflicts avoidance and resolution between ECHO CNO members as follows:

1. Code of Conduct;
2. Conflict of Interest Policy;
3. General Event Registration Refund Policy;
4. Guidelines for Site Selection for all events;
5. Media Policy;
6. Translation Policy;
7. Travel Policy;
8. Uniform Integrated Resource Plan (IPR) Policy;
9. Whistle-blowers Protection Policy.

7.6.7 Centralisation and horizontal links

In order to define priorities in Research and Development (R&D), proposals come from SIG groups to be evaluated and consolidated by the Advisory Board before presenting them to the BoD by asking for a specific meeting to discuss the proposals. The BoD (also CEO and CFO) decide whether to approve the proposal, how much funds to allocate for it, and the type of contractual agreement needed to be signed between members.

Decisions are coordinated within specific governing body and by meetings.

Decisions made by central bodies

The Chair and the CFO are authorized to sign contracts, documents, checks, or other orders for payment on behalf of the CNO or shall delegate such authority to staff members as approved by the BoD.

The **BoD** can decide alone on following issues:

- Resource decisions during the Fiscal year;
- Strategy, annual plans and actions;
- Different member categories for full representation of ECHO CNO;
- Sets up and dissolution of SIGs and Committees;
- Draft and approval of Bylaws;

- Membership fees;
- Resolution binding on all members;
- Mission statements and terms of references.

Members rights and decisions

The ECHO CNO members and bodies can propose a solution or to make their own decisions on the following issues:

- To propose amendments to ECHO CNO Bylaws;
- Resigning from the ECHO CNO;
- Members can present in person their defence to the General Assembly before exclusion from Membership;
- Members' representatives are eligible to the BoD, SIG and to any of ECHO CNO Committees;
- Each Member can propose a new SIG;
- Chairman of each SIG is elected each year by the members participating to the SIG;
- Upon approval by the SIG chair(s), additional participants which are not ECHO members (experts or representatives of relevant organisations or bodies), can be invited to attend SIG meetings as observers, without voting rights;
- SIGs can create "Steering SIG Board" composed by Chair and representatives of SIG members;
- Members of BoD are elected by General Assembly according to established criteria;
- Secretariat executes day-to-day administration.

Rules for representation of the ECHO CNO to external organisations

The ECHO CNO representation is centralised and has to be done in accordance to the following rules:

- Members can contact independently any person or organisation to present their opinion, but not on behalf of the CNO. The representation right is approved by the BoD (if needed, following a vote);
- Secretariat, Board Members, SIG Chairs and Members can be invited to give general speeches as "independent" speakers;
- The "hierarchy level" representing the ECHO CNO should be decided based on the specific event: EC and other bodies, Forums and Symposiums, Specific CNO events or workshops, SIG meetings;

In general, when a member represents the CNO externally the following rules shall be followed:

- Views and interests expressed will be those of ECHO CNO and not of the individual member.
- Participants should validate specific positions prior to meetings on specific issues;
- Written reports of meetings shall be sent to the members' mailing list within 15 working days;
- Relevant information shall be shared with all Members: information obtained under the auspices of ECHO CNO shall not be retained by individual members;
- CNO templates (with CNO logo) should be used.

Rules for the gathering and dissemination of information

The following rules apply to each ECHO CNO member when data or information is shared to internal or external organisations or persons:

- All business communication shall be conducted in English;
- Accurate books and records of account shall be kept;
- Minutes of BoD's meetings shall be taken and distributed to all Members;
- Each participant must provide and maintain a profile of itself describing the constituency, technical expertise and other information as determined by the Board of Directors;
- Each participant must provide the operational and communications support capabilities as determined by the Board of Directors;
- Each Member must designate a Representative and alternate. All official correspondence will be addressed as designated by the Representative. The Representative may delegate this authority and must notify the Secretariat in writing about the delegation;
- All information and communications shall be provided with security protection appropriate to the nature and sensitivity of the information involved;
- All participants must adhere to the dissemination constraints specified by the originating source. Only the originator may relax any dissemination constraints. Information that has no specific dissemination instructions may not be disseminated further;
- Each participant should have an established procedure for interaction with the press in accordance with the participant's constituency requirements;

Individual participants may not speak for other participants, nor the network as a whole. The BoD may authorize the Secretariat or a participant to speak for the network.

7.6.8 Risk Management and shared funds

The Risk Management

The ECHO CNO has an Internal Control & Risk Management System (ICRMS) which consists of a set of instruments, organisational structures, and procedures. These are aimed at contributing, through a process of identification, management and monitoring of the main risk posture of the ECHO CNO. The System has a management model which is proper and consistent with the objectives set by the Board of Directors.

Risk management strategy is based on ISO 9001: the main goal of Quality Management System i8QMS. The goal is for an organisation to achieve conformity and customer satisfaction. In ISO 9001:2015, a risk-based thinking is used to achieve this goal. The standard outlines a process of four steps for addressing risks and opportunities:

1. Identify the risks and opportunities;
2. Plan the response;
3. Integrate the response into the quality management system (QMS);
4. Evaluate effectiveness.

Risks' and opportunities' impact on business and their probabilities within the quality and information security domains will be considered in defining the priorities for the risk management processes and activities.

Internal Risk Audit Team (IRAT) is responsible for preparation of all internal risk management documents. The Team supports the process of document approvals by the Advisory Board, Board of Directors and Annual General Meeting. The IRAT also has responsibility to support other bodies and officers in Risk Management processes.

Shared Funds

The ECHO CNO shall be a self- financed and independent organisation supported through Membership fees, subscriptions, grants, contracts and donations.

Membership fees will be set and reviewed annually by the BoD. The membership fee structure, due dates, and other associated requirements will be determined by the Board of Directors and will be reviewed and modified as necessary on an annual basis to reflect current membership or financial issues.

8. Assessment of the Alternatives

The alternatives' assessment is done by pairwise comparison of alternatives' performance against each criterion.

The final results and global (calculated for all criteria) priorities of the alternatives according to the group of expert opinion are given in Table 24.

Alternative	Priority	Rank
Alternative 3	29.45%	1
Alternative 4	28.34%	2
Alternative 1	21.11%	3
Alternative 2	21.09%	4

Table 24: Alternatives Priorities

The alternative weights and priorities are calculated with resolved inconsistency in individual expert's answers.

Following sections provide details about local priorities for each alternative. Seventeen experts participating in the Alternatives Assessment Questionnaire campaign gave very near estimation of the performance of the Alternatives. The leading Alternative 3 is just 1.11% better in performance than the Alternative 4.

8.1 Individual comparisons consistency

The check for consistency of the individual answers' matrices is shown in Figure 28.

Figure 28: Alternatives comparison inconsistency

As we can see from the Figure 28 there is inconsistency in individual answers above the 10% of CR. Some of them are with very significant levels above 80-90%.

The main sources of errors in answers are presented in Figure 29.

Figure 29: Most significant errors in alternatives comparisons[31]

There are significant errors in comparison of the Alternatives 2 and 3 in comparison of their performance in almost all criteria. Another significant source of error is the comparison of the Alternative 2 with Alternative 4. The biggest spike in error is found in comparison between Alternative 1 and 2 in criterion Risk Management.

Figure 30 shows the consistency ratio in individual answers after application of Harker's method for automatic resolution of inconsistency.

---

[31] About consistency and errors see Section 4.2.2, Section 4.2.3 and Section 6.2.

Figure 30: Resolved inconsistency in individual answers

As the figure shows the inconsistency is resolved to acceptable levels. The four inconsistent answers have the following CR values: 17.03%, 12.12%, 12.12%, 13.83%. These answers are found in different Alternatives' comparisons and their inconsistency is relatively small, so they are used in analysis without changes.

8.1.1 Changes in alternatives assessment

The automatic resolution of the inconsistency also changes the alternatives assessment. The resulted change in alternatives weights and ranks is shown in Figure 31.
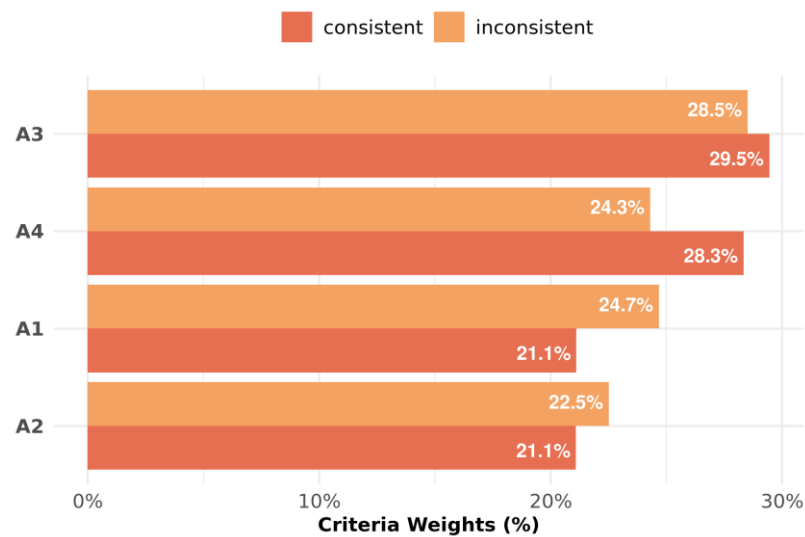
Figure 31: Changes of alternatives assessment

The Figure 31 shows that the most significant change appears in evaluation of Alternative 4. The change in weights leads to change in ranks of Alternative 4 with Alternative 1.
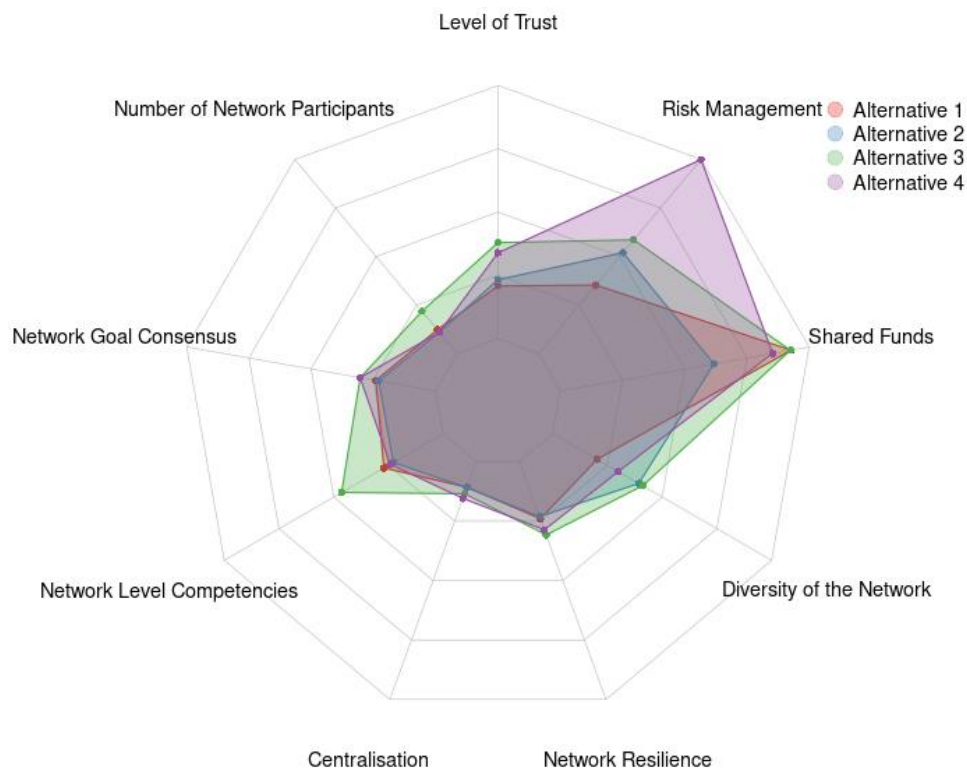
Figure 32: Four alternatives radar chart

The radar chart on Figure 32 shows the distribution of global priorities for all alternatives within all criteria on second level of the hierarchy. The individual values for alternatives are presented within next sections.

8.1.2 Alternatives Groups' Assessment

Three sub-groups of experts were identified within the expert group for Alternatives Assessment. The list of sub-groups can be found in Table 47, Annex 2 – Groups of Experts. The classification (identification) of the experts is made by applying FANNY algorithm to experts' answers. (see Section 4.2.8 and Chapter 6).

Alternative	P1	P2	P3	R1	R2	R3
A1	0.229%	0.167%	0.269%	3	4	2
A2	0.194%	0.249%	0.199%	4	3	4
A3	0.287%	0.262%	0.293%	2	2	1
A4	0.290%	0.322%	0.240%	1	1	3

Table 25: Alternatives' Priorities and Ranks within sub-groups

The three expert sub-groups diversity can be seen on Table 25. Columns named from P1 to P3 show the priorities and columns from R1 to R3 present ranks of the Alternatives, according to the priorities for the three sub-groups.

The value of the Kendall coefficient of concordance is $W = 0.6$, which means strong consensus exists among three subgroups about the ranking of alternatives.

8.2 Alternative 1

The leading criteria on the first level of the hierarchy are the **Adaptability** and the **Effectiveness** (Table 26)**.**

Criteria	Priority
Adaptability	10.11%
Effectiveness	6.65%
Network Efficiency	4.36%
Criteria	**Priority**
Shared Funds	7.32%
Risk Management	2.79%
Network Level Competencies	2.14%
Network Resilience	1.90%
Network Goal Consensus	1.90%
Level of Trust	1.64%
Diversity of the Network	1.60%
Number of Network Participants	0.97%
Centralisation	0.86%
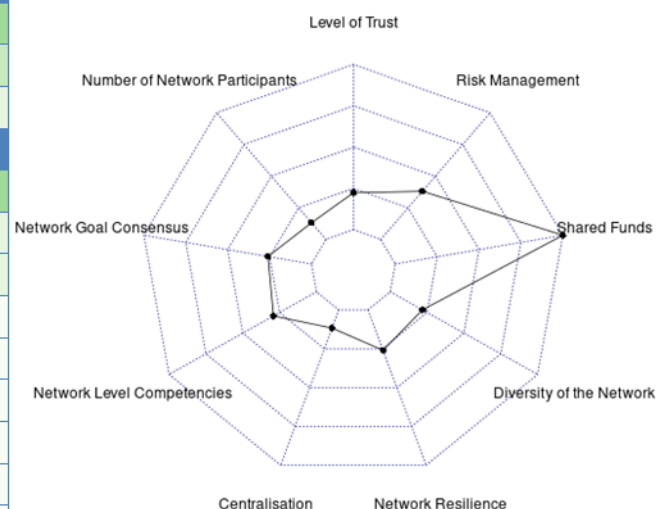
Table 26: Criteria and sub-criteria for Alternative 1

In the second level of the hierarchy this alternative is preferred by the experts because it is performing better towards **Shared Funds** and **Risk Management** criteria.

This composition of preferences is true for all other three alternatives (see below).

The Table 27 presents the aggregated opinion among the subgroups about performance of the Alternative 1 against criteria on First Level of the goal hierarchy.

Criteria	P1	P2	P3	R1	R2	R3
Effectiveness	0.118%	0.029%	0.081%	1	3	2
Network Efficiency	0.046%	0.042%	0.042%	3	2	3
Adaptability	0.066%	0.096%	0.147%	2	1	1

Table 27: Sub-groups opinion about First Level of the criteria hierarchy for Alternative 1

The value of the Kendall coefficient of concordance is $W = 0.44$, which means consensus exists among three subgroups about the performance of the alternative.

Table 28 presents the priorities and rankings of the sub-groups of experts and Figure 33 visualises the priorities in radar chart.

Criteria	P1	P2	P3	R1	R2	R3
Level of Trust	0.033%	0.005%	0.023%	4	9	4
Number of Network Participants	0.015%	0.005%	0.012%	7	8	8
Network Goal Consensus	0.033%	0.008%	0.026%	3	6	3
Network Level Competencies	0.037%	0.012%	0.020%	2	5	5
Centralisation	0.014%	0.005%	0.008%	8	7	9
Network Resilience	0.020%	0.020%	0.015%	5	3	7
Diversity of the Network	0.012%	0.017%	0.019%	9	4	6
Shared Funds	0.049%	0.062%	0.103%	1	1	1
Risk Management	0.017%	0.034%	0.043%	6	2	2

Table 28: Sub-groups opinion about Second Level of the criteria hierarchy for Alternative 1

Figure 33: Visualisation of sub-groups opinion about Alternative 1

The value of the Kendall coefficient of concordance of rankings of Table 28 is $W = 0.65$, which means strong consensus exists among three subgroups about the performance of the alternative.

8.3 Alternative 2

The Alternative 2 has strong local preference on **Adaptability** on the first level of criteria hierarchy.

Criteria	Priority
Adaptability	8.98%
Effectiveness	6.31%
Network Efficiency	5.80%
Criteria	**Priority**
Shared Funds	4.88%
Risk Management	4.10%
Diversity of the Network	3.10%
Level of Trust	1.84%
Network Resilience	1.83%
Network Goal Consensus	1.81%
Network Level Competencies	1.80%
Number of Network Participants	0.87%
Centralisation	0.87%
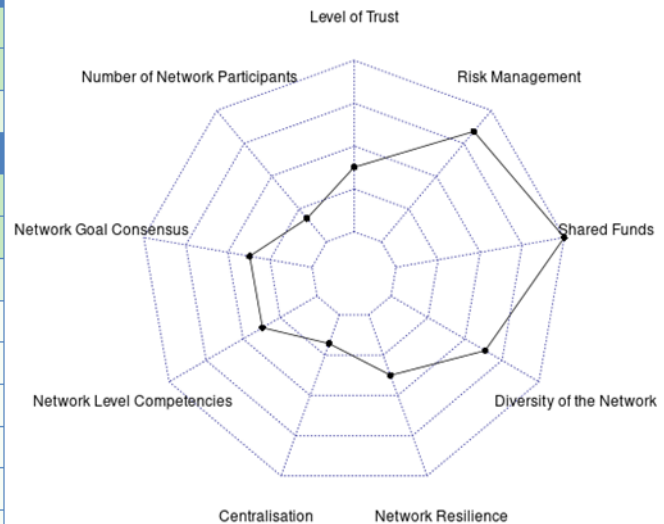
Table 29: Criteria and sub-criteria for Alternative 2

The local preferences of **Shared Funds** are also well established, but the alternative shows also a good performance on Effectiveness second level criterion of *Network Goal Consensus, Level of Trust and Competences.* These three criteria are more evenly distributed in comparison to Alternative 1.

Table 30 presents the aggregated opinion among the subgroups about performance of the Alternative 2 against criteria on First Level of the goal hierarchy.

Criteria	P1	P2	P3	R1	R2	R3
Effectiveness	0.077%	0.054%	0.072%	1	3	2
Network Efficiency	0.050%	0.064%	0.050%	3	2	3
Adaptability	0.067%	0.132%	0.077%	2	1	1

Table 30: Sub-groups opinion about First Level of the criteria hierarchy for Alternative 2

The value of the Kendall coefficient of concordance is $W = 0.44$, which means consensus exists among three subgroups about the performance of the alternative.

Table 31 presents the priorities and rankings of the sub-groups of experts and Figure 34 visualises the priorities in spider-web graphics.

Criteria	P1	P2	P3	R1	R2	R3
Level of Trust	0.022%	0.019%	0.015%	5	5	7
Number of Network Participants	0.015%	0.006%	0.008%	7	9	9

Network Goal Consensus	0.015%	0.014%	0.033%	6	7	3
Network Level Competencies	0.025%	0.015%	0.016%	4	6	5
Centralisation	0.008%	0.009%	0.008%	9	8	8
Network Resilience	0.014%	0.022%	0.016%	8	4	6
Diversity of the Network	0.028%	0.033%	0.026%	3	3	4
Shared Funds	0.033%	0.085%	0.040%	2	1	1
Risk Management	0.034%	0.046%	0.037%	1	2	2

Table 31: Sub-groups opinion about Second Level of the criteria hierarchy for Alternative 2

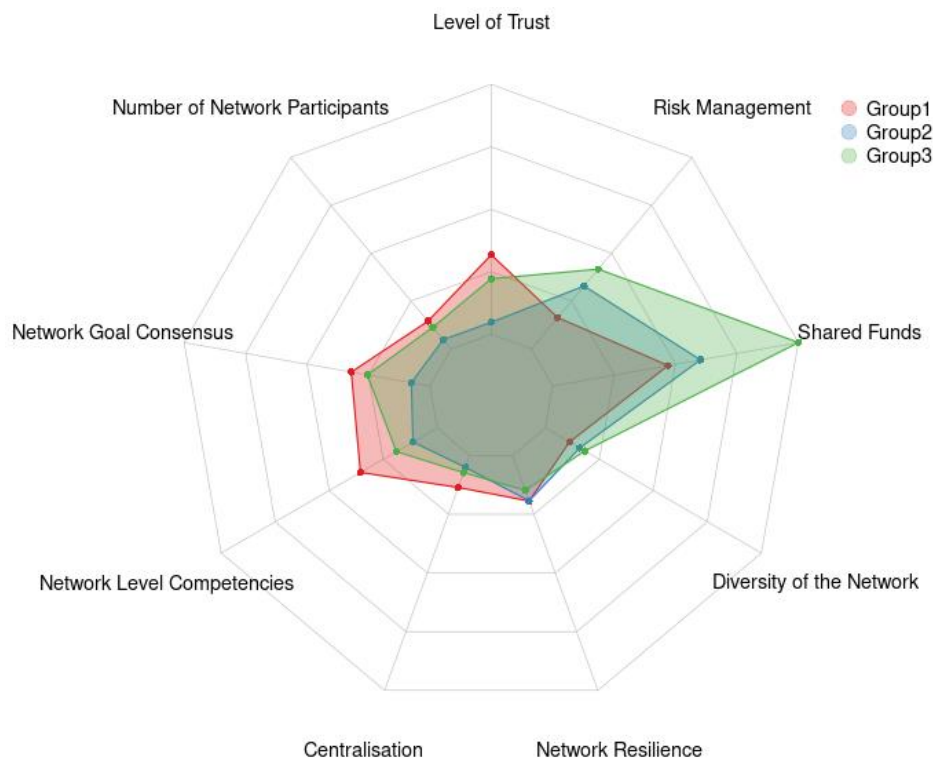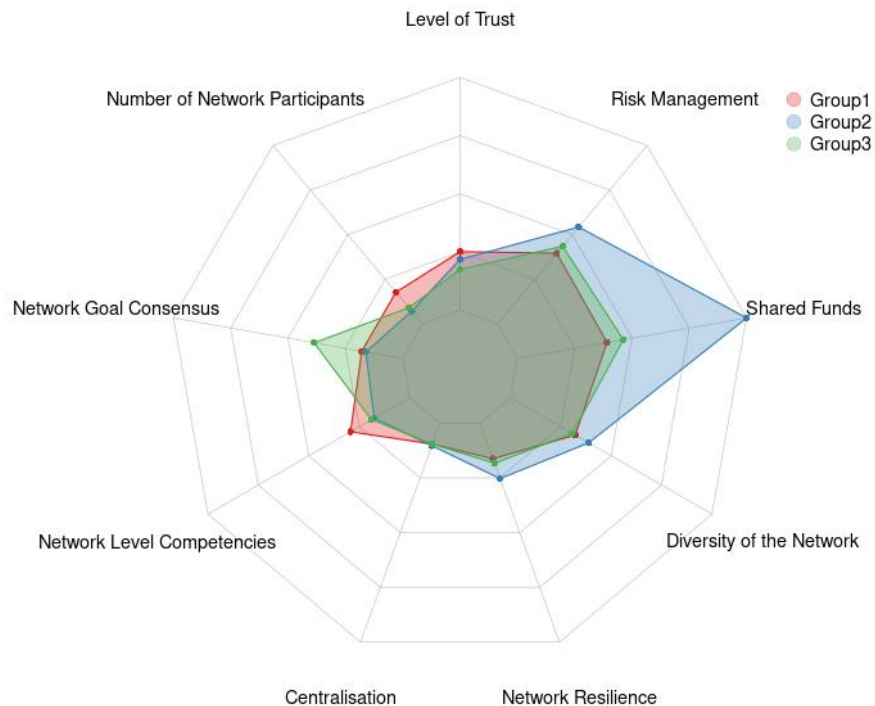Figure 34: Visualisation of sub-groups opinion about Alternative 2

The value of the Kendall coefficient of concordance of rankings of Table 31 is $W = 0.85$, which means very strong consensus exists among three subgroups about the performance of the alternative.

8.4 Alternative 3

The Alternative 3 has similar assessment as proportions (but with better values in performance) as Alternative 1.

Criteria	Priority
Adaptability	11.93%
Effectiveness	10.77%
Network Efficiency	6.75%
Criteria	**Priority**
Shared Funds	7.30%
Risk Management	4.62%
Network Level Competencies	3.66%
Diversity of the Network	3.25%
Level of Trust	3.00%
Network Resilience	2.43%
Network Goal Consensus	2.39%
Number of Network Participants	1.72%
Centralisation	1.07%
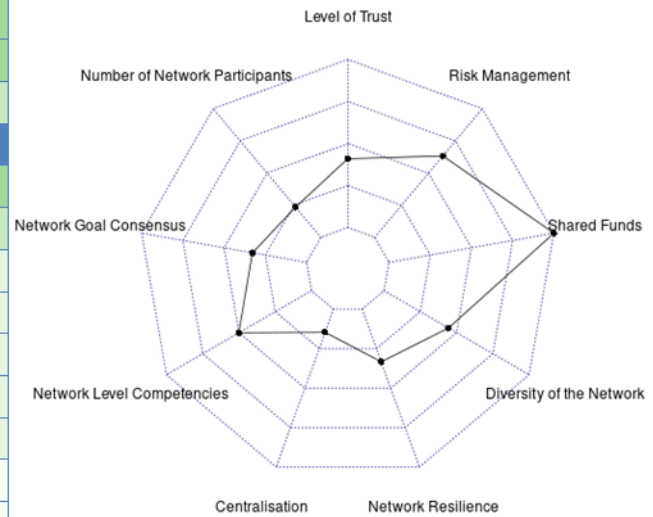
Table 32: Criteria and sub-criteria for Alternative 3

The experts evaluated highly alternative's performance against **Adaptability** and **Effectiveness**.

Table 33 presents the aggregated opinion among the subgroups about performance of the Alternative 3 against criteria on First Level of the goal hierarchy.

Criteria	P1	P2	P3	R1	R2	R3
Effectiveness	0.134%	0.092%	0.094%	1	2	2
Network Efficiency	0.056%	0.055%	0.081%	3	3	3
Adaptability	0.097%	0.115%	0.117%	2	1	1

Table 33: Sub-groups opinion about First Level of the criteria hierarchy for Alternative 3

The value of the Kendall coefficient of concordance is $W = 0.78$, which means very strong consensus exists among three subgroups about the performance of the alternative.

Table 34 presents the priorities and rankings of the sub-groups of experts and Figure 35 visualise the priorities in radar chart.

Criteria	P1	P2	P3	R1	R2	R3
Level of Trust	0.039%	0.030%	0.018%	2	4	7

Number of Network Participants	0.032%	0.011%	0.013%	4	8	8
Network Goal Consensus	0.024%	0.016%	0.031%	7	7	5
Network Level Competencies	0.039%	0.036%	0.031%	3	3	4
Centralisation	0.011%	0.007%	0.012%	9	9	9
Network Resilience	0.017%	0.029%	0.028%	8	5	6
Diversity of the Network	0.028%	0.019%	0.042%	5	6	3
Shared Funds	0.070%	0.065%	0.058%	1	1	2
Risk Management	0.026%	0.050%	0.059%	6	2	1

Table 34: Sub-groups opinion about Second Level of the criteria hierarchy for Alternative 3
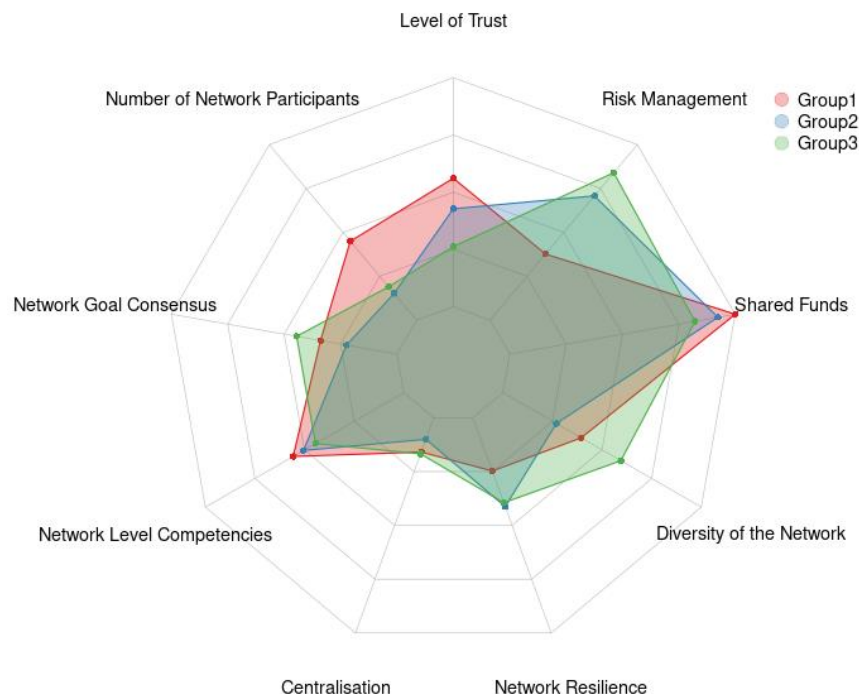
Figure 35: Visualisation of sub-groups opinion about Alternative 3

The value of the Kendall coefficient of concordance of rankings of Table 34 is $W = 0.72$, which means very strong consensus exists among three subgroups about the performance of the alternative.

8.5 Alternative 4

The preference to *Adaptability* is proved by very high level of preferences of the **Shared Funds and Risk Management** in Alternative 4 (Table 35).

Criteria	Priority
Adaptability	14.63%
Effectiveness	7.85%
Network Efficiency	5.86%

Criteria	Priority
Risk Management	7.90%
Shared Funds	6.74%
Level of Trust	2.68%
Network Goal Consensus	2.40%
Diversity of the Network	2.36%
Network Resilience	2.27%
Network Level Competencies	1.91%
Centralisation	1.23%
Number of Network Participants	0.87%
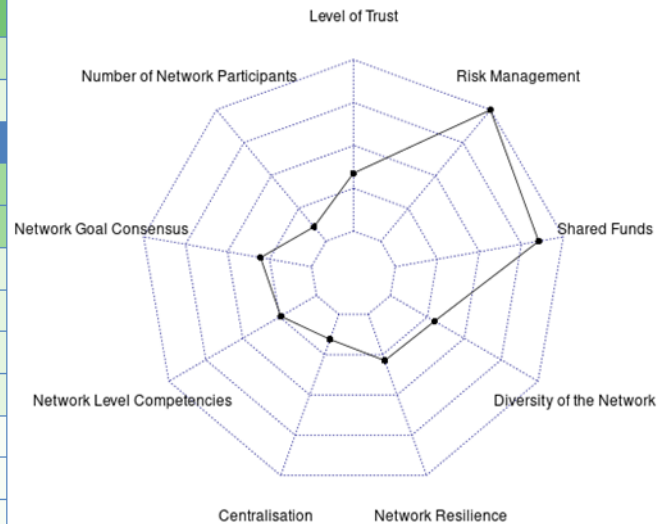
Table 35: Criteria and sub-criteria for Alternative 4

All other criteria have small (and evenly distributed) contribution to the global performance of the Alternative 4.

Table 36 presents the aggregated opinion among the subgroups about performance of the Alternative 4 against criteria on First Level of the goal hierarchy.

Criteria	P1	P2	P3	R1	R2	R3
Effectiveness	0.094%	0.071%	0.072%	2	2	2
Network Efficiency	0.053%	0.069%	0.063%	3	3	3
Adaptability	0.143%	0.182%	0.105%	1	1	1

Table 36: Sub-groups opinion about First Level of the criteria hierarchy for Alternative 4

The value of the Kendall coefficient of concordance is $W = 1.00$, which means absolute consensus exists among three subgroups about the performance of the alternative.

Table 37 presents the priorities and rankings of the sub-groups of experts and Figure 36 visualises the priorities in spider-web graphics.

Criteria	P1	P2	P3	R1	R2	R3
Level of Trust	0.028%	0.027%	0.018%	4	4	5
Number of Network Participants	0.012%	0.007%	0.010%	9	9	8

Network Goal Consensus	0.028%	0.021%	0.028%	3	5	4
Network Level Competencies	0.025%	0.017%	0.016%	5	7	6
Centralisation	0.020%	0.010%	0.008%	6	8	9
Network Resilience	0.018%	0.042%	0.016%	7	3	7
Diversity of the Network	0.016%	0.017%	0.039%	8	6	2
Shared Funds	0.087%	0.086%	0.030%	1	2	3
Risk Management	0.056%	0.096%	0.075%	2	1	1

Table 37: Sub-groups opinion about Second Level of the criteria hierarchy for Alternative 4
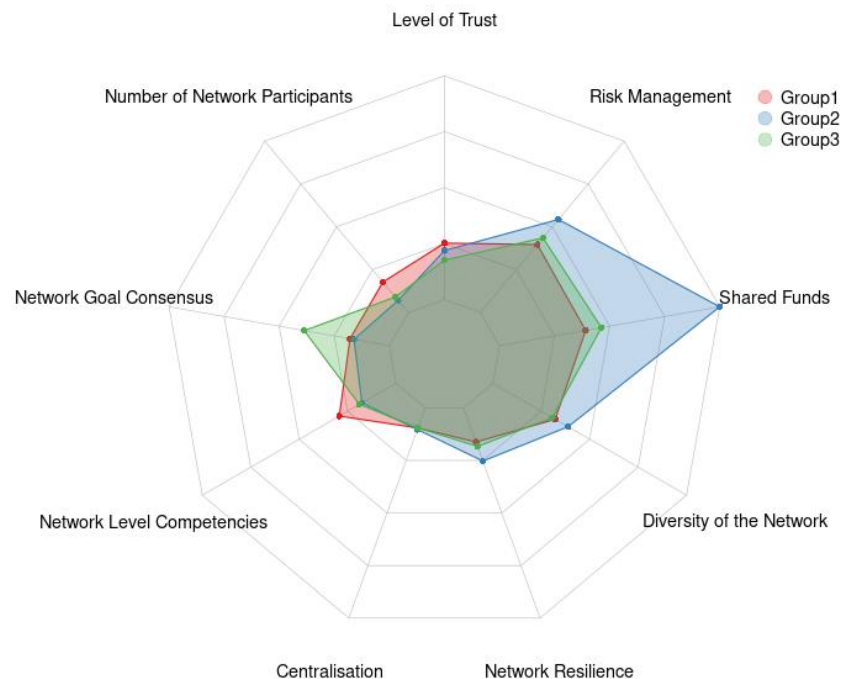
Figure 36: Visualisation of sub-groups opinion about Alternative 4

The value of the Kendall coefficient of concordance of rankings of Table 37 is $W = 0.77$, which means very strong consensus exists among three subgroups about the performance of the alternative.

8.6 Sensitivity analysis

Literature provides several methods for sensitivity analysis application in AHP. There is linear simulation with graphical support to the decision, completely at random changes simulations, restricted simulations.

For the purpose of this document we have changed the method of analysis for the most critical changes of criteria weights and most critical changes in performance of the alternatives.

The most critical change in criteria weights

The most critical criterion is defined as the criterion C_k, with the smallest change of the calculated weight W_k by the amount of δ_{kij} changing the ranking between the alternatives A_i and A_j.

The absolute top critical criterion is the most critical criterion with the smallest change δ_{kij} changing the ranking of the best alternative – ranked on the top.

The absolute value of the δ_{kij} should be smaller than W_k – the weight of the criterion C_k

The δ_{kij} is calculated for each pair of alternatives A_i, A_j, with $i = 1\ to\ n$ and $i < j$ by the following formula:

$$\delta_{kij}(W_k, A_i, A_j) = \left(\frac{P_j - P_i}{a_{jk} - a_{ik}}\right)$$

where P is the global performance of the alternative A and $|\delta_{kij}(W_k, A_i, A_j)| \le W_k$

The most critical measure of performance[32]

The most critical measure of performance is defined as the minimum change of the current value of a_{ij} such that the current ranking between alternative A_i and A_j will change.

The most critical measure of performance is calculated by the following formula:

$$\delta_{kij}(W_j, A_i, A_j) = \frac{P_i - P_k}{P_i - P_k + W_j(a_{kj} - a_{ij} + 1)}$$

for all alternatives A_i and A_j with $i \ne j$ and each criterion, where P is the global performance of the alternative A and $|\delta_{kij}(W_k, A_i, A_j)| \le W_j$

The results of the two analyses are given respectively in Table 38 and Table 39.

---

[32] Evangelos Triantaphyllou and Alfonso Sánchez, "A Sensitivity Analysis Approach for Some Deterministic Multi-Criteria Decision-Making Methods*," *Decision Sciences* 28, no. 1 (1997): 151–94, https://doi.org/10.1111/j.1540-5915.1997.tb01306.x.

	Level of Trust	Number of Network Participants	Network Goal Consensus	Network Level Competencies	Centralisation	Network Resilience	Diversity of the Network	Shared Funds	Risk Management
Weights	**9.15%**	**4.42%**	**8.49%**	**9.52%**	**4.02%**	**8.43%**	**10.32%**	**26.24%**	**19.41%**
A1 – A2									
A1 – A3									
A1 – A4									12.67%
A2 – A3	-6.39%	-4.20%		-4.12%				-8.72%	-6.39%
A2 – A4									-14.92%
A3 – A4									-12.51%

Table 38: Sensitivity to change in criteria weights

	Level of Trust	Number of Network Participants	Network Goal Consensus	Network Level Competencies	Centralisation	Network Resilience	Diversity of the Network	Shared Funds	Risk Management	
	32.73%	**38.84%**	**28.21%**	**38.51%**	**30.48%**	**28.88%**	**31.46%**	**27.90%**	**40.68%**	
A1										**A2**
A1										**A3**
A1								-14.95%	-15.75%	**A4**
A2								17.90%		**A1**
A2	7.26%	13.27%	8.16%	6.62%	16.05%	8.20%	7.16%	2.74%	3.89%	**A3**
A2							23.35%	9.40%	11.16%	**A4**
A3								17.18%		**A1**
A3	-11.23%		-11.37%	-11.79%		-11.50%	-8.61%	-3.51%	-4.46%	**A2**
A3	19.28%		19.88%			20.33%	18.27%	7.59%	8.51%	**A4**
A4							23.15%	11.51%	11.98%	**A1**
A4								-11.58%	-14.37%	**A2**

Table 39: Sensitivity to change in alternatives' performance

The **most critical change in criteria weights** is the smallest absolute change that can lead to change in ranking of the criteria. This value of **-4.12%** is found in **Network Level Competences**. It means that if in **Network Level Competences** criterion weight fells below **-4.12%** the ranking between the alternatives 2 and 3 will be changed.

The most critical measure of performance is found in **Shared Funds** (see Table 39). If the values of performance of Shared Funds are assessed over the value of **2.74%** the Alternative 2 will become more preferable than the Alternative 3 (change of preferences between two alternatives).

All other values in Table 38 and Table 39 are also critical – each change over these values will change preferences over respective alternatives and their order in Table 24.

Considering the Kendall coefficient of concordance as a measure to sensitivity, it can be concluded that the Criteria Ranking is not stable as solution (see Table 13). Only in one group of criteria on the second level of the hierarchy strong consensus exists.

The Alternatives' Assessment shows very strong to absolute consensus about two leading alternatives – A3 and A4. Nevertheless, considering results in Table 39 the solution is still unstable and small changes in performance estimation can lead to change in alternatives' ranks.

9. Selected (Most Suitable) Alternative and the way ahead

The results from the analysis of the Criteria Ranking and Alternatives Assessment were presented at the Workshop on Governance Model Alternatives Assessment and Selection, 12 May 2020, conducted as a Telco meeting.

The analysis (presented here in Chapters 6 and 8) shows that the four alternatives receive similar assessment and the result of the assessment is sensitive to small changes in experts' opinion. The overall opinion of the experts was that all alternatives are good for their own specific objectives and goals, thus it is difficult to compare and choose one among them in the context of agreed ECHO CNO goal and criteria approved at the Workshop on 01 October 2019.

The solution accepted during the Workshop was to create one "umbrella" alternative – Alternative 0 (A0) which will assure flexibility and rapid decision-making processes in the future ECHO CNO Governance Model and will be based on best practices from the other four alternatives accepted by the experts.

Section 9.1.2 below explains the notion and expectation of the term "umbrella" organisation.

A working group for the development of A0 – governance alternative was formed. The group discussed and approved the key decision points for A0 and its "umbrella" CNO governance model. The decision points are presented in Section 9.2. Section 9.3 outlines the common elements for all alternatives to be incorporated in A0.

The selection of the key processes and organisational structures are presented in Section 9.4. and Section 9.5 respectively.

Sections from 9.6 to 9.8 are dedicated to discussion on main aspects for further development in regard to implementation and improvement, as well as to future partnership development.

9.1 Decision for Alternative 0 – "an umbrella" governance model

The D3.2 methodology framework from the very beginning was oriented to generate alternatives, based on the mandate (Mission, Vision, Value proposition, Strategy) for the ECHO organisation, and identified in D3.1 needs and objectives to the governance (management) model of the organisation.

Development, assessment, comparison, and sensitivity analysis of the four alternatives presented in the previous chapters brought us to the decision not to select one of the presented alternatives, but to develop (detailed design in D3.3 – see Figure 37) an umbrella alternative (A0) combining the common elements of A1–A4, over and above specific arrangements. This alternative will provide a framework for the "breeding environment" to generate "partnerships" under more specific predefined models (A1–A4 modifications) to address certain functional area or sector as well as to provide specific arrangements for multisector or multifunctional solutions to be developed as a capability and offered as a service.

In the current chapter we will describe final selected governance model, based on a structured process of consultations. This was the reason to extend the scope of participants in the Workshop and listen to more ideas, involving participants from all the working packages and engaging with other pilot projects, ECSO and the NATO Communications and Information Agency (NCIA).

Definitely, the strategic autonomy of EU is needed in the field of Cyber security, but at the same time civil-military cooperation (EU MS[33], EDA[34]) and cooperation with NATO (ASG ESC[35], CDC[36], NCIA[37]) are also required.

On institutional level Cyber security cooperation will go through ECC/NCCs and we make some assumptions and recommendations as we will also use advisory council mechanism to have our ECHO organisation aware and visible in this environment.

AFCEA[38] and DCAF[39] represent good examples on how does it work for NGO and non-for-profit organisations. ECSO[40] is an example in Public-private Partnership environment, so we will design in D3.3 suitable for us model, inheriting good practices.

In D3.3 a special focus will be put on the service groups (CHECKs in CS4E context)[41]. We want to bring together under ECHO organisation an opportunity to support the creation of new service groups (CHECKs) in the future – so the next steps will be in strong cooperation (with a critical input) from ECHO's WP2,3,4,5,6 with testing of governance arrangement as part of the WP7 and WP8 efforts.

For the development of business planning and innovation management, WP3 should contribute to WP9 by identifying key processes for business and innovation planning. On the other hand, within D3.3 the business process modelling (BPM) and organisational design will be used for detailed analysis and description.

In addition, we will ask WP4 to develop a roadmap for the Governance Information Management System (GIMS) to support the processes and structures, identified here and designed in D3.3, based on improvement of our SharePoint Portal and some initial tools developed under WP1.

---

[33] "The European Union Military Staff (EUMS)," Text, EEAS - European External Action Service - European Commission, accessed July 14, 2020, https://eeas.europa.eu/headquarters/headquarters-homepage/5436/european-union-military-staff-eums_en.

[34] "European Defence Agency," Home Page, accessed July 14, 2020, https://www.eda.europa.eu/.

[35] NATO, "Assistant Secretary General for Emerging Security Challenges," NATO, accessed July 14, 2020, http://www.nato.int/cps/en/natohq/who_is_who_150524.htm.

[36] NATO Cyber Defense Committee

[37] NATO Communication and Information Agency, "Home," NATO, accessed July 14, 2020, https://www.ncia.nato.int/.

[38] Armed Forces Communications and Electronics Association, "What Is AFCEA?," AFCEA International, July 12, 2015, https://www.afcea.org/site/WhatIsAFCEA.

[39] DCAF – Geneva Centre for Security Sector Governance, "Home," DCAF, accessed July 14, 2020, https://www.dcaf.ch/.

[40] European Cyber Security Organisation, "Home Page," ECSO, accessed July 14, 2020, https://ecs-org.eu.

[41] Community Hubs of Expertise in Cybersecurity Knowledge (CHECKs) are proposed focus groups by the CS4E Project. CHECKs are focused mainly on international industry sectors, not on the Regional level. Natalia Kadenko, "CyberSec4Europe D2.1 Governance Structure v1.0,", July 2020, https://cybersec4europe.eu/wp-content/uploads/2020/02/D2.1-Governance-Structure-final-Submitted.pdf 145
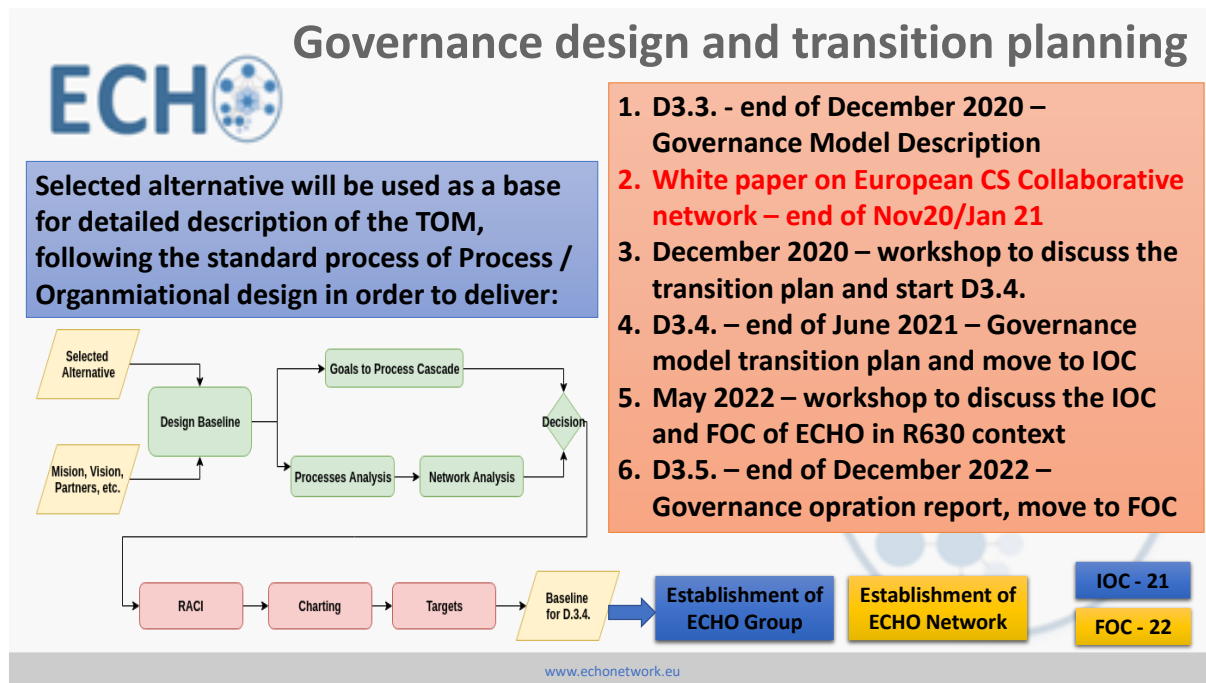
Figure 37: Process of development of GM design in ECHO D3.3 Governance model description

As a result of the Workshop's discussion and several follow up meetings, a decision was taken to develop "an umbrella alternative" A0, that will provide high level governance of ECHO Network through a central hub (ECHO Group) with identified core processes, structures, and services management "under the umbrella" in the area of Governance and Management Consulting, MSAF applications, Cyber Skills E&T framework (including ontology).
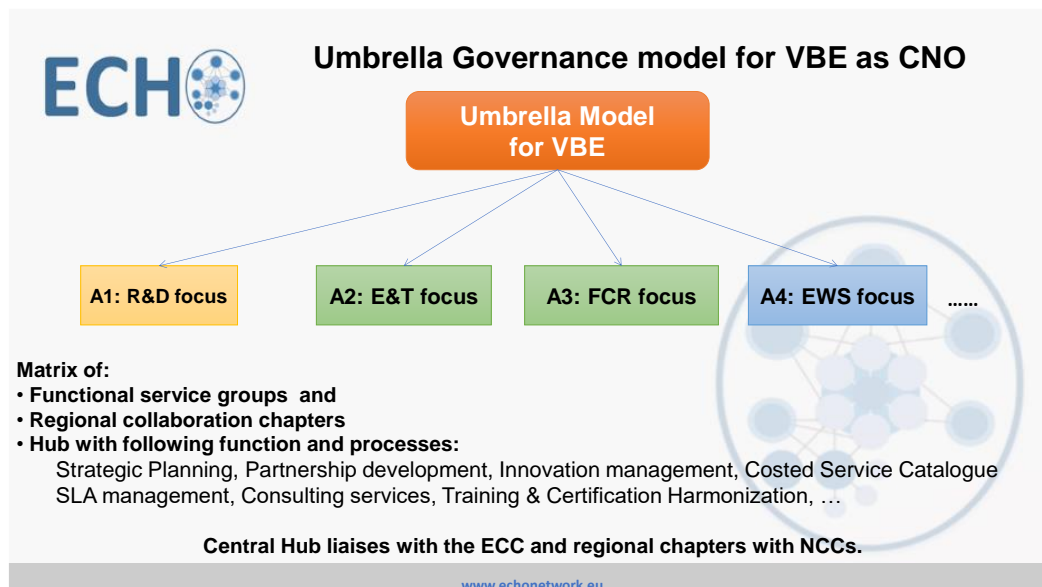
Figure 38: Defining the A0 as "over and above" the A1–A4 agreed processes and structures, delegated by functional groups and regional chapters to the central hub

The development of A0 is based on the assessment of A1–A4 and their sensitivity analysis. The process was led by WP3 and WP2 Leaders, in consultation with WP4,5,6,9 Leaders and with the involvement of T3.4 and T3.5 leaders aiming to provide integration of expectations of the different service groups and partnership

(network) development perspective as well as link with the current status of ECHO project governance and management (reflected in the Governance Annual Report 2019 – D3.5.A1**[D4]**) and current assessment of the R630**[D2]** implementation.

The description of a generic A0 as it is presented in Figure 38 provides opportunity to run breeding environment, which will be able to generate virtual organisations (service or project groups) to deliver specific services and projects, benefiting from the framework established by A0 for strategic and business planning, partnership development, innovation management, service catalogue management with a framework for Services Level Agreements (SLAs) and other value added services to the Network.

9.1.1 Matrix model of regional chapters and functional service organizations

The suggested CNO – EU Cyber Security Collaborative Network (ECSCON) – is to cover European Cybersecurity Competence Community (see Figure 39), where on one side it will communicate with ECC/NCCs as an institutional framework, and on the other side will interface with EC/EU MS, ENISA/EDA/EUROPOL and NATO Cyber organization (NCIO) as executive partners. On the "partnership" side it will work with "market" customers, based on service (project) offering developed by the functional service groups, presented through the Catalogue of services (in the form of a "federated" catalogue).
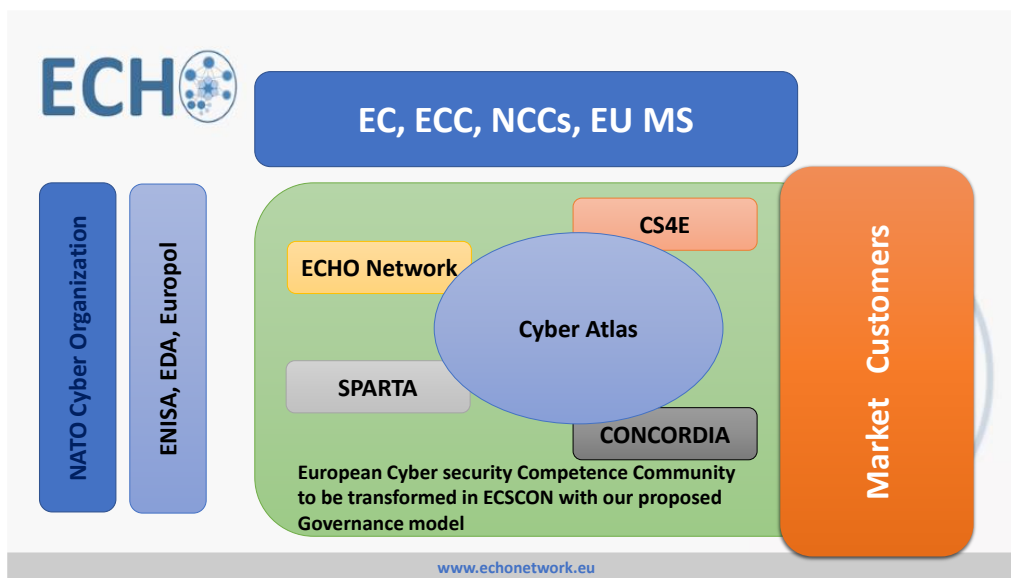
Figure 39: Framework for development of the CNO: Institutional framework, Executive partners (ENISA/EDA/EUROPOL – NCIO), "Market" Customers, Cybersecurity competence entities (individuals, academic, industry, NGO).
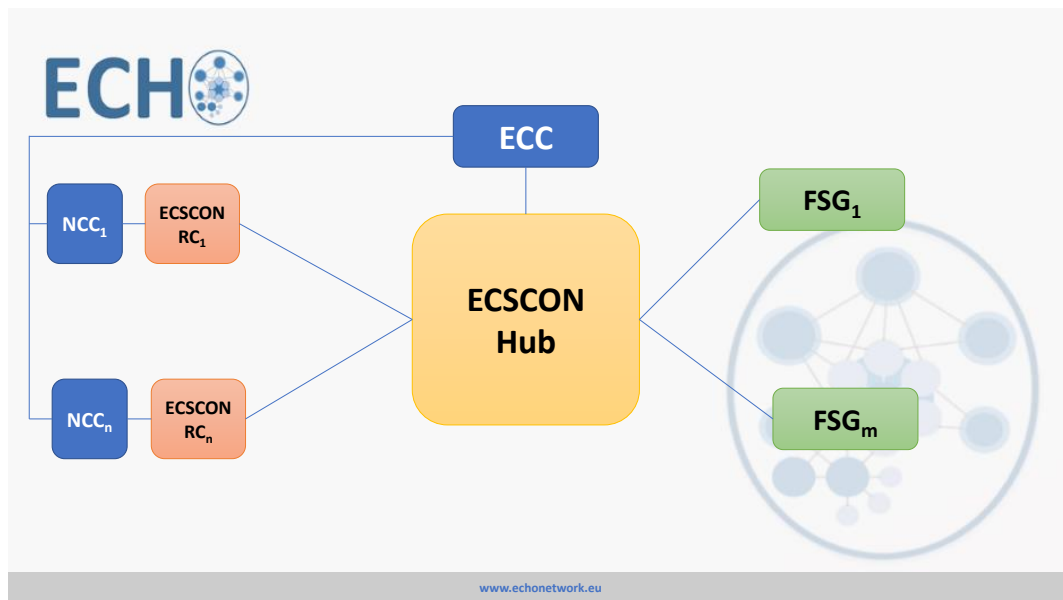
Figure 40: Matrix model for EU Cyber Security Collaborative Network (ECSCON)

At the core of the CNO as a breeding environment is a Matrix (see Figure 40) of regional entities (R, chapters) and functional entities (F, service groups) with a central hub, exercising the Governance and agreed (delegated) central management role (C, ECHO/ECSCON[42] Hub).

9.1.2 The definition of the "umbrella" organisation

The most suitable definition (and explanation) of the umbrella organisation is given by the US legal definition:

> An umbrella organization is a large association of institutions, which coordinates the activities of its member organizations and works to protect their shared interests. Therefore, umbrella organization provides resources and identity to the smaller organizations.

> The umbrella organization is often responsible for the groups under its care, to some degree. The umbrella organization is usually established when it is found difficult for an institution to carry out activities alone, when a sense of community and support makes institutions derive utility from multilateral and shared activities, when public awareness exists, and when legality for the engaged actions is required[43].

In this regard and in regard to Virtual Breeding Environment (VBEs) and Virtual Organisations (VOs) analysed in D3.1 we can draw the parallel and express the "umbrella" organisation in terms of the D3.1 analysis if we look at the following definition:

---

[42] EU Cyber Security Collaborative Network Organization

[43] USLegal, Inc., "Umbrella Organization," Law and Legal Definition, accessed May 26, 2020, https://definitions.uslegal.com/u/umbrella-organization/.

A VBE is defined as an association of organisations and related supporting institutions adhering to a base long-term cooperation agreement, and adopting common operating principles and infrastructures, with the main goal of increasing both their chances and preparedness towards collaboration in potential VOs. Establishing trust relationships among VBE members and the ability to assess the trustworthiness of others in the VBE are the basic requirements for the effective operation of VBEs and the creation of successful VOs.

A Virtual Organisation (VO) is an association of (legally) independent organisations that come together to share resources and skills to achieve a common goal such as acquiring and executing a collaboration opportunity. VOs are configured from constituting suitable VBE members that are selected based on requirements of the opportunity, such as competence, trust level, etc.[44]

The idea of umbrella organisation that associates many members was supported by proposal to form a central hub of the organisation (the umbrella) and to form a type of dynamic Virtual Organisations (VOs), which are benefiting from the VBEs trust, decision support and information management subsystems **[D1, pp. 23]**. The sub-umbrella organisations – the focus groups can be formed on the basis of similarity in the goals, tasks and services provided by the members (see **[D1, pp. 22-27]**).

The complexity of having a large number of members of an umbrella organisation, sharing of the association funds and risks can be managed by forming additional regional hubs, focused on members' registering and certification, as well as, on information sharing, support and coordination with the focus groups (based on group of services or customers globally or regionally).

9.1.3 Organisational levels

In this regard, the regional-focus groups' dimensions can be seen as a high-level coordination matrix of resources to services and products of the umbrella organisation, delivered mostly by service-focused groups.

In terms of ECHO Target Operating Model (TOM), provided by T3.5, the two dimensions of the matrix are illustrated in Figure 41.

The organisations with umbrella-wide governance and management functions are designated with letter **"C"** *(Central)*. These functions are maintained in order to provide the stability of goal, mission, vision, as well as governance and management compliance across the network.

The compliance is based on several products of negotiation and agreement process among member organisations – documents such as strategic and annual plans, services catalogues and others. These documents are related to benefits and resources sharing and also common provision of services and products.

The **"C*"** means mainly monitoring and controlling functions of the central authorities over the activities provided by the Regional and Functional/Sectoral elements. In principle it comprises Governance, Risk Management and Compliance elements.

The regional aspects of the TOM can be seen in boxes designated with letter **"R"** *(Regional)* in Figure 41 and services *(sectoral, focus group on services)* aspects can be considered in boxes designated with **"F"**.

---

[44] See D3.1: Governance needs and objectives, pp. 22-23 and Figure 4 (**[D1])**

Regional hubs have to alleviate and assure the overall administrative function in relation to the central level (left part of Figure 41) and focus groups should provide capabilities, competences and capacities for services provision, linking regional and functional aspects of ECHO organisation.

The matrix is established between Regional structures and Functional structures in a CNO with certain Central elements.

There is a level of independence of Regional and Functional elements of the CNO, but the synergy is provided by the Central elements which are justified by the mandate provided by Regional and Functional elements with opportunity to grow those functional and regional elements.

More stable from organisational perspectives are the Regional elements, that in R630 context will be associated with the National Coordination Centres (NCCs) in the member-states. Functional elements are type of Virtual Organisations established for delivery of specific services. Some universal services could be maintained by the Central hub for standardisation and compliance in closer cooperation with the EC and ECCC.

9.1.4 Membership and representation

The flexibility of decisions provided to regional focus groups should be considered from point of view of the actors and structures involved in the processes. Their rights and representation should be considered. The possible solution is to divide members according to their commitment to the network.

The umbrella type of organisation with regional and functional focus groups should have at minimum the following membership categories:

- *Accredited member* – certified organisation or individual for cybersecurity competences, benefiting from reputation gained, without any voting rights;
- *Associated member* – member associated to regional chamber with voting rights to the chamber's structures. Commitment of this category of members is related to provision of recourses and organisation of regional level events and activities. (The expected level of commitment should be further specified.);
- *Full member* – member with full commitment both to the regional level and to network services.

Representation in legislative bodies on central level – General Assembly or General (Annual) Meeting – should be ensured for the full members and for representatives elected from the regional bodies (hubs, chambers/chapters) of the ECHO association/organisation.

Flexibility in management operations should be presented by procedures describing the interactions of regional-functional services dimensions of the organisation.
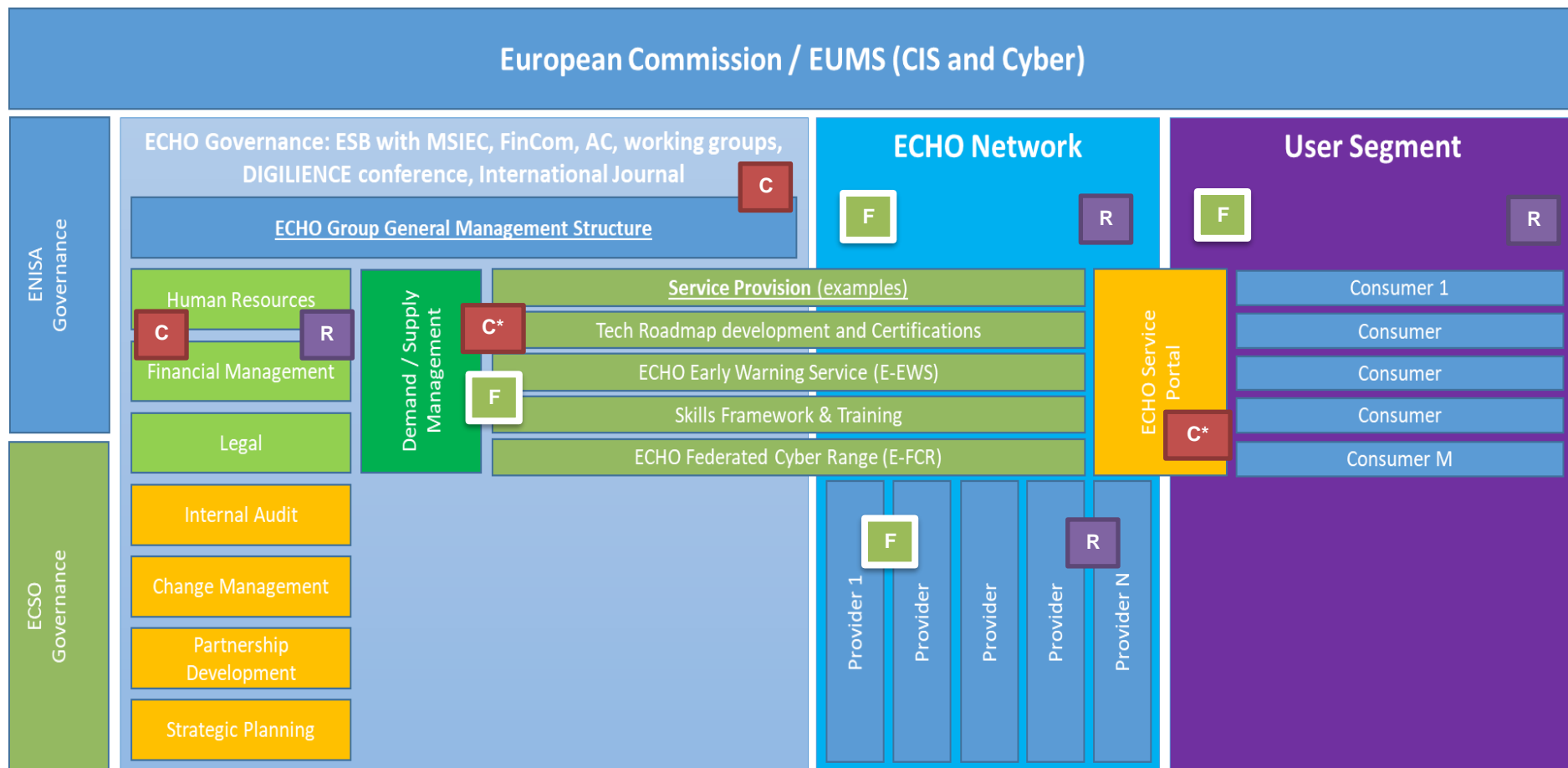
Figure 41: ECHO Target Operating Model (TOM)

9.1.5 Virtual Organisations and Virtual Breeding Environment

These types of organisations can be considered as forms for flexible establishment and restructuring of Collaborative Networked Organisations (CNOs) and can be considered as possible form of environment to generate entities of focus service groups.

According to the research reported in D3.1 "Governance needs and objectives" (pp. 24-31) they can be distinguished mainly by the time horizon and commitment.

The processes

The umbrella organisation of the VBE, with option for structuring and restructuring itself with establishment, changing and closing its VOs will have specific procedure. A simplified procedure is given in Figure 42.
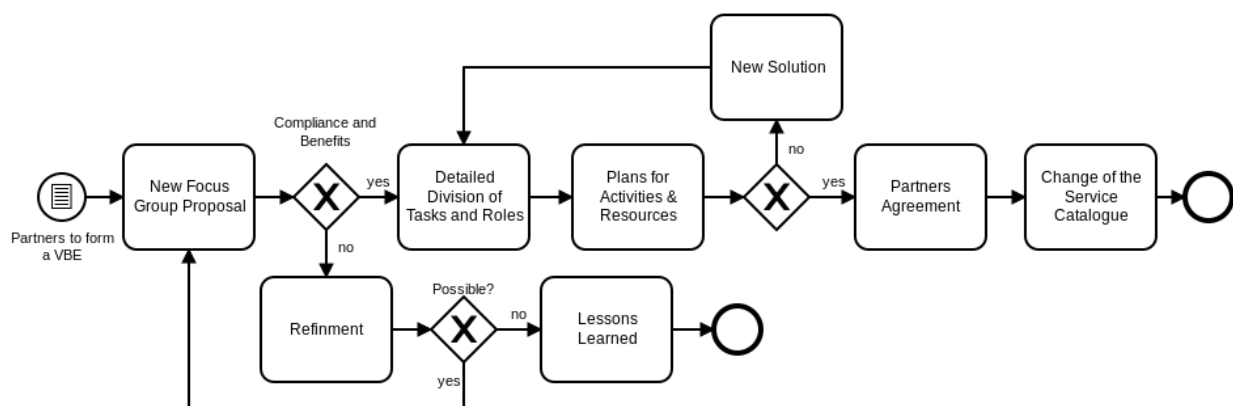
Figure 42: Simplified procedure for new focus group establishment

This procedure does not consider the actors involved in the process. The Figure 43 presents a possible involvement of actors and their activities.
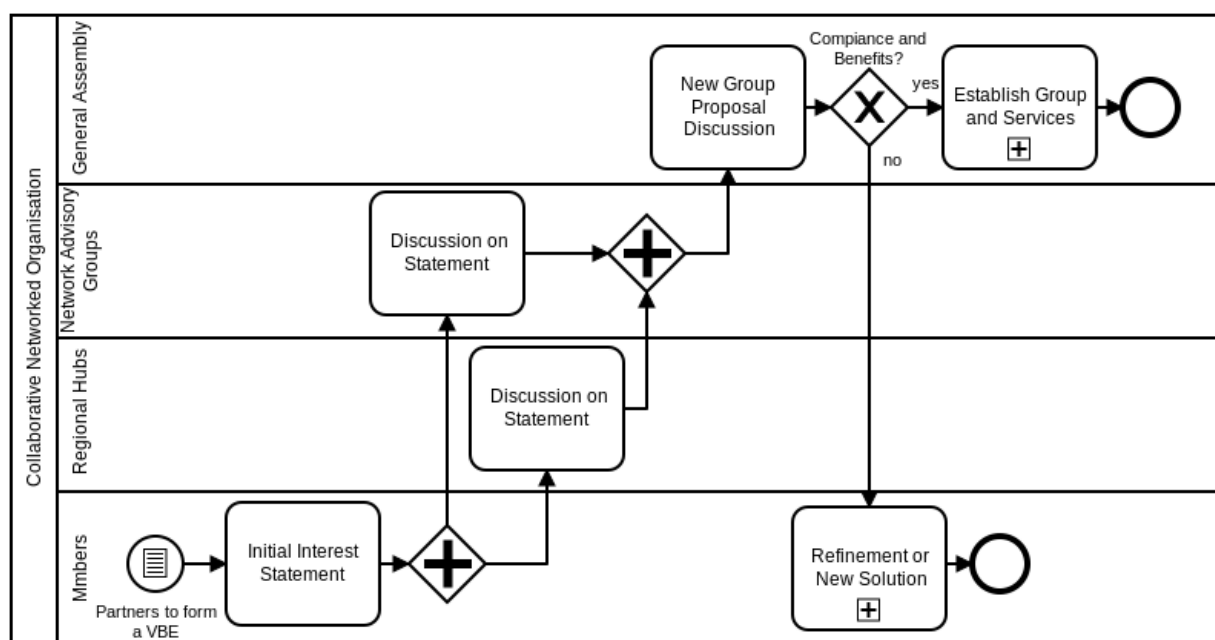
Figure 43: Activities and actors

The comparison of Figure 42 and Figure 43 shows that such a procedure will have certain points of identification in CNOs' documents. (The two parts of possible process flows after the first decision in Figure 42 are given as sub-processes in Figure 43.)

9.2 Key decisions to define Alternative 0

Based on the results from the 12 May 2020 Workshop and the decision taken to define A0 as an umbrella governance model for ECHO organisation, the decision points shown in Table 40 were identified. These points were further discussed in order to identify preferable decisions for the A0 development.

Decision point	Options	Decision
Scope	**Basic** – provides only the basic legal and information infrastructure **Interim** – provides in addition some products and services (e.g. E-MAF, certification of personnel) **'Full'** – encompasses the work on and the market realisation of all (current) ECHO assets	*Interim, which provides Governance and Management Consulting* *(E-GMC) and MSAF (E-MAF), but core E&T and even R&D activities as well*
Sub-entities	**None** **On geographic basis**, e.g. in participating states **On thematic basis**, e.g. for type of activity (R&D, E&T, certification, …) or by sector (health, energy, transport, …) **Mixed**, with both geographic and thematic entities	*Mixed as CHECKs or VOs* *Some may be legal entities*
Strategic autonomy of the ECHO organisation	**Non-issue** Applies only **to certain VOs** Applies **to the umbrella network OP VBE, but not necessarily to all VOs** Applies **to the VBE and all VOs**	*Consult with the EC/EU MS for establishing CHECKs and approval of the participants*

Decision point	Options	Decision
Types of membership	**Describe levels** of commitment to the organisation and consequently benefits from the membership	*Individual,* *Institutional Partner,* *Participant*
Key processes	**Identify the processes** that will be considered as critical for the success of the CNO and assess which part of them (according to the KPI for WP3) **will be further developed in D3.3**.	*Strategic and business planning,* *Partnership development, Catalogue management, Customer relations management,* *Innovation (R&D) management*
Key organisational structures	**Identify the organisational structures**, required for formal assignment to the processes in RACI matrix for effective and efficient implementation of the governance model.	*GA, BoD and Secretariat, Committees to the BoD,* *EM (CEO/COO, CFO, CPO, CTO, CCO)*

Table 40: Decision points options and selection

Using the above brief discussion on umbrella model (A0), introduction of flexibility through CNO, procedures, structures and roles we can identify a mapping of the criteria to the main decision points on such organisation (Table 41).

Decision point	Selected options for ECHO	Criteria Mapping
Scope	*Long-term horizon of cooperation* *Interim scope of centralisation:* *Central Governance and Management, with mainly consulting and monitoring roles of:* • ECHO Governance and Management model (E-GMMC); • Organisation and Personnel Certification; • Programme and Project Management.	Network Goal Consensus; Level of Trust; Network-Level Competencies; Shared Funds; Risk Management.
Sub-entities	Mixed structure with both: • Regional structures and; • Focus groups on services or other important activities	Centralisation; Network Resilience; Adaptability

Decision point	Selected options for ECHO	Criteria Mapping
Strategic autonomy of the ECHO organisation	Strategic autonomy of the CNO with close cooperation with EC/EU MS. High level of management autonomy of focus groups.	Network Goal Consensus; Level of Trust; Adaptability
Types of membership	Different types of membership, which permit: • Flexibility; • Expansion through attracting new members; • Appropriate representation; • Establishment of new groups.	Number of Network Participants; Level of Trust; Network Resilience; Diversity of the Network.
Key processes	Strategic and business planning; Partnership development, Catalogue management Customer relations management Innovation (R&D) management Education and training	Number of Network Participants; Network Goal Consensus; Network-Level Competencies; Shared Funds; Risk Management
Funding	Sources of funding: • Membership fees; • Institutional funding from the EC/MS and others; • Pricing of services; • Other Expenditures and Benefit Management	Adaptability; Level of Trust.

Table 41: Decision point mapping to the Criteria

The first column reports the decision points, the second column of Table 41 provides combination of brief discussion about the umbrella organisation and preferred options declared from the ECHO experts and management on the Workshop held on 12th May 2020.The third column of the table provides criteria that are related to the selected options in the second column.

9.3 Common elements from four alternatives to be included in A0

Four alternatives A1–A4 have the following similarities in the seven areas examined:

Scope

All alternatives have a high level of diversity of members – they include organisations from industry, public sector, academia, research organisations (public and private). All CNOs have a long-term horizon for cooperation.

All CNOs' have **sub-divisions** of governance and management *to regional and sectoral (functional) sub-entities*, except Alternative 4 which has only Groups of Interests, organised strictly on the basis of similarity in industry services and products.

The compliance to overall "umbrella" (central-hub) organisation is maintained in all cases through two main instruments as follows:

- **Establishment of central authorities of one or two main "legislative" bodies**, which serve as discussion and agreement forum, as well as the highest level of monitoring. Therefore, the representation to these bodies is very important. Usually, the bodies are named as "General Assembly" or "General Meeting". In Alternative 1 there is a Steering Board which has to oversight the central management bodies. There are variety of representation and voting rules, that have to be analysed additionally.
- **Establishment of central advisory bodies to the central governance and management**. This practice is common for all CNOs – it provides additional flexibility to discuss, establish and communicate the important parts of CNO's work to and from members. The work of the Committees is important to support the main central bodies' decision, as well as the operative central management decisions.

As a rule, the Membership Committee is established on the central level and it is given the authority to propose policy, to check the applications and to suggest actions in case of membership violations.

The partnership is usually given as a policy from the central bodies, but it is done mainly on sub-levels of regional or functional hubs.

Another important committee on central level is the one related to R&D (innovation), and standardisation of network competences.

All CNOs in all four alternatives provide variety of services, but probably the most important similarity is provisioning of publicly visible events related mainly to the R&D, E&T and Cyber security issues – variety of conferences, symposia, education and training courses and events.

Sub-entities

There is no single solution that could be identified as dominating for all alternatives. Except *Alternative 4* all other CNOs have regional sub-entities.

The *Alternative 2 and Alternative 3* are competing for the highest level of autonomy of the regional hubs. In *Alternative 3* the regional bodies have their own strategic committees.

Although *Alternative 1* has mainly regional hubs, the Centres of Excellence can be considered as service-oriented industry hubs.

The rules for establishment of *Special Interest Groups (SIG) in Alternative 4* can be considered as most liberal. In this regard, it is interesting that the specific governance body for governance and coordination is established – SIG Steering Committee.

Strategic autonomy of the ECHO organisation

All four alternatives' CNOs can be considered *fully autonomous*. The most self-sufficient as funding sources (mainly membership and training courses fees) is the CNO of *Alternative 2*. *Alternatives 1 and 3* are oriented toward a strategic partnership with external organisations, which provides funding for CNOs' programmes and projects.

Alternatives 3 and 4 sub-entities have strategic autonomy of their decisions, but they have to comply with the CNOs' overall policy.

Types of membership

The membership types vary within the alternatives – there are *full, associated, sponsorship, volunteer, contributor memberships*. Also, the membership is divided in organisational and individual options. The organisational supports the individual option. *Alternative 2* is the only one which has just individual membership.

Two main models of representation can be found – representation mainly through regional or sectoral (functional) bodies to the General Assembly, Board of Directors, etc., representatives are selected from the sub-bodies (*Alternatives 1 and 2*), where is the main focus of activities. *Alternatives 1 and 4* full members are represented directly in central bodies.

The forms and representation of the members depend from the *network competences to dedication* to the network. In all alternatives if one organisation applies for membership, first, it is important to have and prove the competences and then, to provide commitment to goals and activities.

Key Processes

The most common processes in all four alternatives *are the E&T and R&D management of common network activities* – they can be considered from two viewpoints. *First*, as a *type of Customer relationship and Partnership development* and *second*, as common network investment and planning for new competences that single member cannot achieve.

These two processes are also related *to the sharing of information and knowledge*. The visibility and reputation gained through courses, training and scientific events is another important benefit that CNOs receive through these common activities.

In regard to strategic planning and catalogue development *Alternatives 1 and 4* are more centralised than *Alternatives 2 and 3*, which relies mainly on sub-entities decision.

Another *important preference of all alternatives* is the *internal oversight and external transparency to stakeholders and potential customers*, thus providing ground for trust-building among partners and external stakeholders.

Finally*, representation of the CNO to external audience* is arranged carefully in all alternatives.

Funding

The alternatives have their differences in regards to funding sources – *Alternatives 1 and 3* depend more on grants from external programmes. *Alternative 3* has its own internal grant programme, agreed among

members. Both *Alternatives 2 and 3* rely *on membership fees and pricing of services and have well-developed procedures for identifying the amount of the fees*.

All alternatives have provisions for risk management.

The most common aspect among alternatives (probably except some points in Alternative 4) is the *two-staged procedure for benefit and risks share*.

First, the general agreement between the CNO and membership applicant. The agreement settles the network capabilities that applicant shall maintain, as well as the participation in fees and benefits sharing.

Second, there is single agreement per project, service or event signed among partners engaging to the activity. If it is considered as a strategic CNO's activity or the activity is funded by CNO's budget, the agreement is signed also by CNO's central authorities' representative.

9.4 Key processes to be designed for A0 in D3.3.

Setting up the umbrella organisation requires flexibility and coordination between central, regional and sectoral (functional) bodies with well-developed procedures for setting-up the VOs "under the umbrella" (VBE itself).

The analysis of the common Alternatives' elements shows that this is done by taking several measures as follows:

1. *Develop appropriate level of common goal agreement, agreement on network level of competences, benefit and risk sharing.* These agreements support the level of trust about the qualities and capabilities of the members and provide a framework for development and operations of the VBE. These prerequisites are maintained through the following measures:
    a. *Membership p*olicy with mandatory and standardized requirements for network-level capabilities;
    b. *General agreement* and per *activity* agreement among members;
    c. *Representation* to the central and regional/functional bodies;
    d. Assurance of high level of *Accountability and Transparency in all levels*.
2. *Transfer of processes and functions of governance from central to* regional/functional *level.* This transfer is always aligned with creation of advisory units within CNOs' central bodies as discussion, coordination and standardisation forums. These advisory units support both governance and central management bodies – General Assemblies, BoDs, CEO, CFO, etc.
3. *The expansion of the network, publicity and promotion* is of great importance and is addressed through education, training and scientific events. In all alternatives there are one or several annual events. In addition, there is a specific policy of external transparency to potential customers and members that shows both the benefits and the burdens to work with the CNO.
4. Despite the willingness to attract new members, all CNOs do not compromise the members' *compliance to network goals and network-wide competences*. The acceptance and evaluation of members is always approved at central level, even if the application process starts within some regional/functional bodies. Most of alternatives have their membership committee or CNOs' scientific committee which provide requirements and oversight. On-line registers and documentation on membership status is also developed.
5. *The strong focus on R&D and E&T* of all CNOs is supported by establishing advisory committees which provide methodological support and strategic planning support. In Alternatives 2 and 3 these functions are transferred to regional/functional level, but are coordinated through common plan accepted by General Assembly or on BoD level.

6. *The Catalogue of services* is defined in only one of the alternatives (A3), but it can be argued that *it exists in some forms in other alternatives' CNOs*. Planning and coordination of the Catalogue is considered mainly as a management task. The governance part of strategic direction and agreement is provided through annual or biannual Business plan of the CNO.

Selection of key processes, practices and organisational levels

Taking into account the considerations given above, **key processes** to consider as a first priority are:

1. Strategic and business planning;
2. Partnership development;
3. Innovation (R&D) management;
4. Catalogue management and Customer Relations Management;
5. Competence development and Human Resource Management (HRM), including E&T management;
6. Financial management.

Table 42 presents a possible mapping of the levels of the network – its Central hub, regional or services' level and the level of the programmes and projects (activities) for the first 4 processes as an example. These activities are conducted in collaborative manner by the partners on the regional/functional level or on central level. The activities should be managed by additional per activity agreement and are targeted in actual delivery of CNO's goals, tasks and services.

The mapping in Table 42 is related, but not limited to COBIT reference model. The logic behind follows the results of alternatives assessment and A0 development requirements – the flexibility to adopt new objectives and fields of management within the "umbrella" of the CNO.

Processes	Central Level	Regional or services hubs	Activities (programmes and projects)
Strategic and business planning	Ensure Governance and Management Framework Settings	Programme management	Project Management
	Resource and benefits sharing	Management of performance	Delivery and continuity management
	Budget and Investment Mix	Planning of R&D and E&T, specialisation and resources	Activities' risk planning and monitoring
	Improvement and change management	Plan for capabilities and implementing changes	Implementing changes
	Monitoring and auditing	Managed business controls and information	Compliance with external requirements and assurance
Partnership development	Network-Level Competences	Cooperative activities agreement and management	Competences selection
	Conflict resolution	Logs for members' activities	Documentation of the activities
	Transparency	Information assurance and	Reporting

Processes	Central Level	Regional or services hubs	Activities (programmes and projects)
		documents availability	
	Information sharing, knowledge management and representation of the CNO	Knowledge Management, E&T and events	Media presentation of the activities
Innovation (R&D) management	Ensure network-level R&D goal consensus	Set-up group-level goals	Execute tasks
	Managed R&D strategy	Manage compliance with the strategy	Assure performance and results
	Common budgeting and funds approval	Suggest, plan and report for group activities	Risk management and reporting
Catalogue management and Customer Relations Management	Ensured Stakeholders engagement	Management of requirements	Development and configuration management
	Ensured benefit delivery	Compliance and performance	Continuity and problems resolution
	Ensured resources optimisation	Managed capacity	Cost and resources optimisation

Table 42: Process and levels of CNO

The mapping of the process to key organisational elements and to the AHP results is given in the following sections.

9.5 Key organisational elements to be designed for A0 (D3.3)

Summarising the findings from the previous sections about the key organisational structures, it can be concluded that the following structures can be identified as a first priority for development of D3.3 on Central-hub level:

1. General assembly (GA);
2. Board of Directors (BoD) with a Secretariat;
3. Committees reporting to the BoD (and GA):
    a. Partnership (Membership) Committee;
    b. Technology and innovation Committee;
    c. Financial Committee;
    d. Audit Committee;
4. Executive Management:
    a. Chief Executive and Chief Operational Officer (CEO/COO);
    b. Chief Financial Officer (CFO);
    c. Chief Partnership Officer (CPO);

    d.   Chief Technology Officer (CTO);
    e.   Chief Customer Officer (CCO).

The Regional or sectoral (focus groups) level hubs must have at least the following key structures:

1. Strategy Committee;
2. Director or Coordinator (Chief Executive Officer);
3. Secretariat (Executive Management):
   a. Chief Financial Officer (CFO);
   b. Project Management Officer (also acting as liaison for planning and reporting committees);
   c. Appointed contacts (Liaisons) for partnership development and membership management.

In regard to the above selection of key processes, organisational structures mappings in Table 41 and Table 42, as well as group consensus of the assessment discussed in Chapter 8, the best evaluated practises are summarised in Table 43.

Criteria	Alternatives
Shared Funds	A4 and A1
Risk Management	A4 and A3
Level of Trust	A4
Network-Level Competencies	A3 and A2
Network Goal Consensus	A3 and A4
Number of Network Participants	A3 and A2

Table 43: Criteria and exemplar alternatives

During the development of Governance Model Definition in D3.3 as exemplars processes and structures should be taken in respective criteria fields (see Table 43).

9.6 Key change management initiatives and phases to be designed in the transition plan (D3.4)

The deliverable that will develop and describe the transition plan is D3.4: Governance model implementation plan. The work on this deliverable has not started yet, however a number of activities can be considered which will be performed in order to be able to develop the transition plan of ECHO from the current operating model (COM), as described in the Annual Report for 2019 (accepted at the General Assembly in April 2019), to the Target operating model (TOM – maturity level 4 in CMMI[45]).

---

[45] CMMI Institute, "CMMI V2.0," accessed September 5, 2019, https://cmmiinstitute.com/cmmi.

The main methodology that the transition plan will be based on is ADKAR[46], an approach that is outcome-based in order to limit the resistance to change within an organisation. Apart from that, in the transition plan we will also use CMMI model to make sure that the processes will be improved in the desired way to ensure reaching level of maturity four or above by the end of the project. Balanced Scorecard[47] system will be used to plan and measure the progress through the different stages.

The transition plan will be based on the outputs from the definition of the initial operating capability (IOC) (expected to be delivered in November 2020 as part of D3.3. and to be achieved in December 2021) and the description of the final operating capability (FOC, see Figure 37, expected to be delivered in December 2020 as part of D3.3 and to be achieved in December 2022).

After defining the IOC and FOC, a design of the scope of the change that will be planed and implemented (as part of T3.4 and T3.5.) ahead in the transition plan will be developed. By the completion of this task T3.3 is planned to assess the ECHO readiness for the transition proposed, following the ADKAR methodology by conducting surveys with predefined expert focus group as part of D3.4, planned to be finalized with a workshop in May 2021.

The analysis of the results from the assessment activity of the transition plan will be further developed mapping the main processes that have to be changed and explaining what changes have to be made and how to manage the transition. This will feed the work of T3.4 and T3.5 with the results reflected in D3.5 in January 2023.

As part of the D3.4 there are certain key change management initiatives that will be considered and developed in order to establish the ECHO CNO as a stable and resilient organisation, with good governance model and transparent structures and procedures. The work on the deliverable will be looking for input from other WPs in order to be able to plan activities according to the services offered by the ECHO CNO.

A Strategic plan for the ECHO CNO will be outlined in order to provide initial input to the T3.4 and T3.5 and map the main operational activities and key future partnership engagement activities, together with a proposal for a strategy of their implementation, on how to allocate the resources the ECHO CNO has in order to fulfil its goals.

The team that will be developing the deliverable will be the core team of WP3, that was also involved in the previous deliverables connected with the selection and assessment of the governance model and its detailed description (current D3.2 and D3.3). It is planned to also bring on board partners from other work packages, especially those involved in the development of the key services that ECHO CNO will be providing. The same team will be also responsible for the implementation of the transition activities outlined in the transition plan.

Apart from that, it is envisaged to include in the deliverable a description of a programme for cultural change that will guide ECHO towards the path of becoming a well-known and appreciated for its excellent services CNO, that is also getting most of its funding from customers satisfied by the services the CNO is offering.

---

[46] The full name of the approach is Awareness, Desire, Knowledge, Ability and Reinforcement

[47] Robert S. Kaplan and David Norton, "The Balanced Scorecard: Measures That Drive Performance," January 1, 1992, https://www.hbs.edu/faculty/Pages/item.aspx?num=9161.

Moreover, the work on the transition planning will be seeking input from WP9, as based on the D9.9 Exploitation and Innovation Plan (to be delivered by January 2021). As D9.8 ECHO Business and Sustainability Plan is expected to be delivered after D3.4 is due, what is expected to include in D3.4 regarding the business planning activities is a brief overview of the main activities, together with a proposal for a demand plan, that will be using input from D9.6 Market Analysis.

All the activities that will be proposed as part of the change management plan will be subject to scenario-testing – in order to be able to verify their effectiveness and relevancy towards meeting the goal of establishing a CNO with a maturity level four or above. The validation plan is expected to be developed in cooperation with WPs 7 and 8 as part of the demonstration activities that will be executed.

The work on D3.4 will conclude by adding assessment on future partnership development and risk mitigation, considering the FOC that is expected to be achieved.

In case the established Focus Group on Governance of the EU Cyber Security Collaboration network (ECSCON) with CS4E, CONCORDIA, SPARTA (probably ECSO and Cyber Atlas with JRC) agree and is able to develop and deliver to the EC a White paper "Governance model for ECSCON", the update of D3.4. could cover the transition from ECHO, CS4E, SPARTA, CONCORDIA, ECSO and Cyber Atlas to ECSCON as a joint effort (potentially with an additional funding from the European Commission).

9.7 Key tasks for internal audit to support A0 implementation through Initial and Final Operating Capabilities (D3.5 of T3.4)

Within ECHO, COBIT will be used for the design of the ECHO Governance Model and the CMMI framework will be used to assess the maturity level of the Governance and to plan a roadmap for improvements. CMMI is structured in Capability Areas, Practice Areas, and Practices: the most relevant connection points between the COBIT and CMMI models are Practices. The CMMI levels are more focused and related to the processes and organisational structure (process and organisational design) of the Governance model. This will be the focus of D3.3 (static description) and D3.4 (dynamics of transition from COM to TOM).

Key processes of appraisal

The Standard Capability Maturity Model Integration (CMMI®) Appraisal Method for Process Improvement (SCAMPI[48]) is designed to provide a well-defined set of methodologies for providing appraisals relative to CMMI model. Key phases and related processes are presented in Table 44.

Appraisal team members are individuals who are on the appraisal team during the assessment of ECHO CNO maturity.

Phase	Process
1. Plan and prepare for appraisal	Analyse requirements
	Develop appraisal plan

---

[48] SCAMPI Upgrade Team, "Handbook on Standard CMMI® Appraisal Method for Process Improvement (SCAMPISM)" (SEI, 2011), https://resources.sei.cmu.edu/asset_files/Handbook/2011_002_001_15311.pdf.

Phase	Process
	Select and prepare team
	Obtain and inventory Initial Objective Evidence
	Prepare for appraisal conduct
2. Conduct appraisal	Prepare participants
	Examine Objective Evidence
	Document Objective Evidence
	Verify Objective Evidence
	Validate preliminary findings
	Generate appraisal results
3. Report Results	Deliver appraisal results
	Package and archive appraisal assets
4. Action plan reappraisal	Action plan reappraisal

Table 44: CMMI, SCAMPI appraisal phases and processes

The appraisal will be conducted through an Internal Control Questionnaire and Assessment (ICQA) based on the CMMI – COBIT 5 Practices Pathway Tool[49]. The ICQA is covering the following areas:

1. Investments in infrastructure;
2. Innovation, R&D and technology;
3. Human Resources development;
4. Organisational development;
5. Service provision offering and funding;
6. Partnership development (including outsourcing);
7. Financial management;
8. Strategic planning and change management;
9. Business management;
10. Legal agreements, ethics and anti-fraud issues.

Considering that the questionnaire is covering a wide range of topics, participants from various organisational bodies have to be invited to complete the questionnaire. In particular, participants can be identified in a bi-directional approach:

---

[49] ISACA, *Maximizing the Combined Effects of COBIT 5 and CMMI: A Guide to Using the Practices Pathway Tool* (Rolling Meadows, IL, USA: ISACA, 2017).

a. Starting from COBIT RACI Matrix, we look at which Process Area and Practice name we need to select and audit;
b. Starting from organisational structures defined in A0, we map them to Processes/Practice area of interest in which being involved.

A structured, documented and approved Process of IA with roles and responsibilities should be written, involving people in the Consortium who have contributed to T3.1, T3.2, T3.3, T3.4, T3.5 activities or are leaders of the ECHO Asset development task. Currently, Development Team for D3.5 under the leadership of Deliverable Owner are our **Internal Audit Office** (at least for the Governance & Management issues) and there are simple rules how the IA mission is defined, implemented, report is assessed by the PIC and Process Owner is asked for comments and corrected plan to be approved and implemented.

Currently, Development Team for D3.5 under the leadership of Deliverable Owner are our **Internal Audit Office** (at least for the Governance & Management issues) and there are simple rules how the IA mission is defined, implemented, report is assessed by the PIC and Process Owner is asked for comments and corrected plan to be approved and implemented.

The Development Team is engaged in main areas of operation (see Figure 44), based in their expertise and previous involvement in similar areas of contribution within ECHO Project.

Mission, Vision, Strategy [BDI, IICT, TME, SIV]
Change Mng [RHEA, BDI, IICT, ESI CEE, TME, EXP, CIRM]
Implementation stages [BDI, IICT, RHEA]
Sustainability [BDI, ESI CEE, IICT, NUIM]
Market place [RHEA, TUT, ESI CEE, TBS, TME, EXP, GT SIV]
Organizational development [RHEA, BDI, ESI CEE, IICT, TME, SIV]
Governance level [RHEA, BDI, ESI CEE, IICT, TME, SU, SIV]
E – FCR [RHEA, BDI, VTCB, ESI CEE, TBS, CERTH, EXP, Z&P, BU, GT, NG, NDU]
E – MAF [RHEA, BDI, ESI CEE, TBS, CIRM, EXP]
E – EWS [RHEA, BDI, VTCB, ESI CEE, TBS, CERTH, EXP, Z&P, BU, NG, NDU]
E – CSCS [RHEA, VTCB, ACEA, TME, CIRM, FIN, SIV]
E – CSF [BDI, ESI CEE, TME, BU, SIV ENQ]
E – Roadmaps [BDI, TBS, CERTH, AGH, SU, BU, FIN, NG, NDU]
Finance [RHEA]
Legal [RHEA, ENQ, TUT]
Relation with Partners [RHEA, BDI, KHAI, SU, VST, Z&P]
Relations with ENISA, EDA, NCIA, ECSO [RHEA, BDI, ESI CEE, SU]
Relations with EC, EU council and parliament, members states [IICT]
Customer satisfaction [RHEA, VTCB, ESI CEE, NUIM, EXP, CIRM, SU, VST, FIN]
Strategy and innovation [BDI, VTCB, ACEA, NUIM, TME, CIRM, KHAI, SU, Z&P, GT, FIN, SIV, ENQ]

Figure 44: D3.5 Development team main areas[50]

---

[50] All Partners' Short Names (abbreviation) can be found in Grant Agreement**[GA]**

For now, we consider PMB to be the **Audit Committee** (as it is Finance Committee as well), but in the future the Governance Model will propose to have a separate Audit and Financial Committees and we need to elect people for these positions.

When the D3.4 will be ready we will have a **Change Management Plan** and its implementation will be taken over by the T3.4 / Internal Audit Office.

T3.4 Leader will engage with WP7 and WP8 to be sure we implement the Governance model as it is planned and in order to execute demonstrations by WP2, WP5, WP6 under WP7, WP8.

The core team of WP3 needs to integrate the work of all other WPs through the Governance model in one CNO (ECHO). The Partners Points of Contact of WPs will be involved in monthly calls to build the ECHO GM Consulting Group.

9.8 Key partnership development tasks to support A0 implementation (D3.5. of T3.5.)

The ECHO Project is actively developing the partnership processes and have achieved significant results as it is explained in Chapter 3 of this document. In summary, following ECHO Project organisational bodies have responsibilities for partnership strategy and development:

1. General Assembly;
2. Project Management Board;
3. Scientific and Technical Committee;
4. Multi-Sector Innovation and Exploitation Committee (MSIEC).

In addition to these high-level project's governance and management bodies, the project coordinators and points of contact from ECHO Partners have their roles in partnership development processes (see Table 3, Chapter 2).

The most important task from partnership point of view for the future ECHO CNO is **to inform potential partners, stakeholders and customers** about the discussion and planned changes. To explain the scope of the change and its meaning – how this will affect the membership, representation and relation to external stakeholders, customers and services.

The **task for communication and coordination with strategic partners** should be extended to early stages of Governance model implementation and improvement. In this regard, strategic partners and stakeholders are already involved in the Governance model development of D3.2. EC, ENISA and NATO experts were involved in D3.2 related activities. In addition, the Focus group of experts and managers among the four pilot projects – ECHO, SPARTA, CS4E and Concordia was formed and the group has its regular meetings.

The partnership development task should be **extended to the regional and sectoral group level** when it is established. The guidance for partnership development for all levels of ECHO CNO should be developed and approved and points of contact should be considered and appointed according to this guidance.

The key document is the Partnership book**[D3]**, approved by the General Assembly in April 2020 meeting.

10. Conclusions

This deliverable reflects the efforts since the start of the activities of *WP3: ECHO Governance Model* in May 2019 with the focus to define the scope for the GM model and prepare the ground for its detailed design in *D3.3: Governance model description* and transition planning in *D3.4: Governance model implementation plan*.

One of the additional goals of these activities was to build awareness among all the partners and WPs about the role of GM model of ECHO community as a CNO and to engage them directly through the development of goals, criteria, alternatives and their assessment, as well as to engage other pilot projects and key external partners as ECSO.

The main conclusion from the work that was performed for about a year is that there is a high level of consensus on the GM model to be used for ECHO CNO. Based on assessment of the 4 (four) alternatives (based on analysis of 12 prototypes, selected from more than 90 analysed in D3.1 CNOs) the decision is to design, in D3.3, an "umbrella" GM model for the ECHO CNO.

Key processes, organisational structures and RACI matrix, as well as key change initiatives, are identified to be designed in *D3.3: Governance model description*. The *Initial Operating Capability* (IOC) is planned to be achieved by the end of 2021 and *Full Operating Capability* (FOC) by the end of 2022. In addition, key Internal Audit missions are defined to measure the maturity of the processes and structures for IOC and FOC to be used under *T3.4: Governance Operation* and *T3.5: New partner engagements* for the development of *D3.5: ECHO Operations status report*.

Annexes

Annex 1 – References

1. Aczél, J., and T. L. Saaty. "Procedures for Synthesizing Ratio Judgements." *Journal of Mathematical Psychology* 27, no. 1 (March 1, 1983): 93–102. https://doi.org/10.1016/0022-2496(83)90028-7.

2. Armed Forces Communications and Electronics Association. "What Is AFCEA?" AFCEA International, July 12, 2015. https://www.afcea.org/site/WhatIsAFCEA.

3. Bouayad, Hakim, Loubna Benabbou, and Abdelaziz Berrado. "An Analytic Hierarchy Process Based Approach for Information Technology Governance Framework Selection." In *Proceedings of the 12th International Conference on Intelligent Systems: Theories and Applications*, 15:1–15:6. SITA'18. New York, NY, USA: ACM, 2018. https://doi.org/10.1145/3289402.3289515.

4. CMMI Institute. "CMMI V2.0." Accessed September 5, 2019. https://cmmiinstitute.com/cmmi.

5. DCAF – Geneva Centre for Security Sector Governance. "Home." DCAF. Accessed July 14, 2020. https://www.dcaf.ch/.

6. Duleba, Szabolcs, and Sarbast Moslem. "Sustainable Urban Transport Development with Stakeholder Participation, an AHP-Kendall Model: A Case Study for Mersin." *Sustainability* 10, no. 10 (2018): 1–14.

7. European Cyber Security Organisation. "Home Page." ECSO. Accessed July 14, 2020. https://ecs-org.eu.

8. Home Page. "European Defence Agency." Accessed July 14, 2020. https://www.eda.europa.eu/.

9. Forman, Ernest, and Kirti Peniwati. "Aggregating Individual Judgments and Priorities with the Analytic Hierarchy Process." *European Journal of Operational Research* 108, no. 1 (July 1, 1998): 165–69. https://doi.org/10.1016/S0377-2217(97)00244-0.

10. Goepel, Klaus. "Implementing the Analytic Hierarchy Process as a Standard Method for Multi-Criteria Decision Making in Corporate Enterprises – a New AHP Excel Template with Multiple Inputs," 2013. https://doi.org/10.13033/isahp.y2013.047.

11. Gower, J. C. "A General Coefficient of Similarity and Some of Its Properties." *Biometrics* 27, no. 4 (December 1971): 857. https://doi.org/10.2307/2528823.

12. Guitouni, Adel, and Jean-Marc Martel. "Tentative Guidelines to Help Choosing an Appropriate MCDA Method." *European Journal of Operational Research* 109, no. 2 (1998): 501–21.

13. Harker, P. T. "Incomplete Pairwise Comparisons in the Analytic Hierarchy Process." *Mathematical Modelling* 9, no. 11 (January 1, 1987): 837–48. https://doi.org/10.1016/0270-0255(87)90503-3.

14. ISACA. *Maximizing the Combined Effects of COBIT 5 and CMMI: A Guide to Using the Practices Pathway Tool*. Rolling Meadows, IL, USA: ISACA, 2017.

15. Kaplan, Robert S., and David Norton. "The Balanced Scorecard: Measures That Drive Performance," January 1, 1992. https://www.hbs.edu/faculty/Pages/item.aspx?num=9161.

16. Kaufman, Leonard, and Peter J. Rousseeuw. *Finding Groups in Data: An Introduction to Cluster Analysis*. Wiley Series in Probability and Mathematical Statistics. Hoboken, N.J: Wiley, 2005.

17. LimeSurvey Project Team / Carsten Schmitz. *LimeSurvey: An Open Source Survey Tool*. Hamburg, Germany: LimeSurvey Project, 2012. http://www.limesurvey.org.

18. Lin, Changsheng, Gang Kou, Yi Peng, and Fawaz E. Alsaadi. "Aggregation of the Nearest Consistency Matrices with the Acceptable Consensus in AHP-GDM." *Annals of Operations Research*, March 13, 2020. https://doi.org/10.1007/s10479-020-03572-1.

19. Maechler, Martin, Peter Rousseeuw, Anja Struyf, Mia Hubert, and Kurt Hornik. *Cluster: Cluster Analysis Basics and Extensions*, 2019.

20. Mu, Enrique, and Milagros Pereyra-Rojas. *Practical Decision Making.* SpringerBriefs in Operations Research. Cham: Springer International Publishing, 2017. https://doi.org/10.1007/978-3-319-33861-3.

21. NATO. "Assistant Secretary General for Emerging Security Challenges." NATO. Accessed July 14, 2020. http://www.nato.int/cps/en/natohq/who_is_who_150524.htm.

22. NATO Communication and Information Agency. "Home." NATO. Accessed July 14, 2020. https://www.ncia.nato.int/.

23. Neves, Adriano José da Silva, and Roberto Camanho. "The Use of AHP for IT Project Priorization – A Case Study for Oil & Gas Company." *Procedia Computer Science*, 3rd International Conference on Information Technology and Quantitative Management, ITQM 2015, 55 (January 1, 2015): 1097–1105. https://doi.org/10.1016/j.procs.2015.07.076.

24. R Documentation. "Ahp.Harker Function." Accessed June 17, 2020. https://www.rdocumentation.org/packages/ahpsurvey/versions/0.4.1/topics/ahp.harker.

25. Russo, Rosaria de F.S.M., and Roberto Camanho. "Criteria in AHP: A Systematic Review of Literature." *Procedia Computer Science* 55 (2015): 1123–32. https://doi.org/10.1016/j.procs.2015.07.081.

26. Saaty, Thomas L. "Decision-Making with the AHP: Why Is the Principal Eigenvector Necessary." *European Journal of Operational Research* 145, no. 1 (February 2003): 85–91. https://doi.org/10.1016/S0377-2217(02)00227-8.

27. SCAMPI Upgrade Team. "Handbook on Standard CMMI® Appraisal Method for Process Improvement (SCAMPISM)." SEI, 2011. https://resources.sei.cmu.edu/asset_files/Handbook/2011_002_001_15311.pdf.

28. Simon, Herbert A. *The New Science of Management Decision.* New York: Harper, 1960.

29. EEAS - European External Action Service - European Commission. "The European Union Military Staff (EUMS)." Text. Accessed July 14, 2020. https://eeas.europa.eu/headquarters/headquarters-homepage/5436/european-union-military-staff-eums_en.

30. Triantaphyllou, Evangelos, and Alfonso Sánchez. "A Sensitivity Analysis Approach for Some Deterministic Multi-Criteria Decision-Making Methods*." *Decision Sciences* 28, no. 1 (1997): 151–94. https://doi.org/10.1111/j.1540-5915.1997.tb01306.x.

31. USLegal, Inc. "Umbrella Organization." Law and Legal Definition. Accessed May 26, 2020. https://definitions.uslegal.com/u/umbrella-organization/.

32. Wei, Chun-Chin, Chen-Fu Chien, and Mao-Jiun J. Wang. "An AHP-Based Approach to ERP System Selection." *International Journal of Production Economics* 1, no. 96 (2005): 47–62. https://doi.org/10.1016/j.ijpe.2004.03.004.

33. Todor Tagarev and Yantsislav Yanakiev, "Business Models of Collaborative Networked Organisations: Implications for Cybersecurity Collaboration," Proceedings 2020 11th IEEE International Conference on Dependable Systems, Services and Technologies, DESSERT 2020, Kyiv, Ukraine, May 14-18, 2020, pp. 431-438.

34. Todor Tagarev, "Towards the Design of a Collaborative Cybersecurity Networked Organisation: Identification and Prioritisation of Governance Needs and Objectives," *Future Internet* 12, no 4 (2020), 62, https://doi.org/10.3390/fi12040062.

Annex 1.1 - Sources for alternatives' prototypes

1. AISA. "Home." Australian Information Security Association. Accessed July 31, 2020. https://www.aisa.org.au/.

2. APWG. "APWG Membership." Accessed July 31, 2020. https://apwg.org/membership/.

3. ———. "Unifying The Global Response To Cybercrime." Accessed July 31, 2020. https://apwg.org/.

4. CNIT. "Technical Reports." National Inter-University Consortium for Telecommunications (blog). Accessed July 31, 2020. https://www.cnit.it/en/other-activities/technical-reports/.

5. EIT Digital, "EIT-Digital_Partnership-Models" Accessed July 31, 2020, https://www.eitdigital.eu/fileadmin/files/2020/eitdigital2021/EIT-Digital_Partnership-Models-2021.pdf

6. EIT Digital. "About Us." Accessed July 31, 2020. https://www.eitdigital.eu/about-us/.

7. ———. "EIT Digital Partnership-Models 2021." Accessed July 31, 2020. https://www.eitdigital.eu/fileadmin/files/2020/eitdigital2021/EIT-Digital_Partnership-Models-2021.pdf.

8. FIRST. "Bylaws of FIRST.Org, Inc." FIRST — Forum of Incident Response and Security Teams. Accessed July 31, 2020. https://www.first.org/about/policies/bylaws.

9. ———. "Hall of Fame." FIRST — Forum of Incident Response and Security Teams. Accessed July 31, 2020. https://www.first.org/hof.

10. ———. "Special Interest Groups (SIGs)." FIRST — Forum of Incident Response and Security Teams. Accessed July 31, 2020. https://www.first.org/global/sigs.

11. IAPP. "Accreditation." Accessed July 31, 2020. https://iapp.org/certify/accreditation/.

12. ———. "Ever Wondered What Value You're Getting for Your Membership? Now You Know." Accessed July 31, 2020. https://iapp.org/news/a/ever-wondered-what-value-youre-getting-for-your-membership-now-you-know/.

13. ———. "International Association of Privacy Professionals." Accessed July 31, 2020. https://iapp.org/.

14. ———. "International Association of Privacy Professionals." Accessed July 31, 2020. https://iapp.org/join/corporate/.

15. ICE71. "Scale - ICE71." Accessed July 31, 2020. https://ice71.sg/scale/.

16. ICE71. "Innovation Cybersecurity Ecosystem at Block 71." Accessed July 31, 2020. https://ice71.sg/.

17. ISACA. "Advancing IT, Audit, Governance, Risk, Privacy & Cybersecurity." Accessed July 31, 2020. https://www.isaca.org/.

18. ———. "ISACA Membership." Global Business & Technology Community. Accessed July 31, 2020. https://www.isaca.org/membership.

19. (ISC)2. "Benefits of Membership." Why Join. Accessed July 31, 2020. https://www.isc2.org:443/Benefits-of-Membership.

20. ———. "Community." Accessed July 31, 2020. https://community.isc2.org/.

21. ———. "Cybersecurity Certification and Training." Accessed July 31, 2020. https://www.isc2.org:443/About.

22. OECD. "OECD Internet Economy Outlook 2012." OECD iLibrary. Accessed July 31, 2020. https://read.oecd-ilibrary.org/science-and-technology/oecd-internet-economy-outlook-2012_9789264086463-en.

23. Renic. "Cyber-Security and Safety." Spanish Network of Excellence on Cybersecurity Research (RENIC). Accessed July 31, 2020. https://www.renic.es/en/cyber-security-and-safety-0.

Annex 2 – Groups of Experts

Table 45: List of experts participating to the questionnaires presents the name-ordered list of experts participating in both Questionnaires.

	First Name	Last Name	Partner	Criteria Ranking	Alternatives Assessment
1	Alessandro	Zanasi	Z&P	Yes	Yes
2	Alfonso	Sassun	CIRM	Yes	Yes
3	Antoniya	Shalamanova	IICT	Yes	Yes
4	Georgi	Penchev	IICT	Yes	Yes
5	Giuseppe	Chechile	FIN	Yes	Yes
6	Kis	Marton	SU	Yes	No
7	Luc	Dandurand	GT	Yes	No
8	Luis Angel Galindo	Sanchez	TME	Yes	Yes
9	Marco	Angelini	LCU	Yes	Yes
10	Maria Vittoria	Marabello	EXP	Yes	Yes
11	Mascia	Toussaint	ENQ	Yes	Yes
12	Matteo	Merialdo	RHEA	Yes	Yes
13	Mauro	Brignoli	VTCB	Yes	Yes
14	Theodora	Tsikrika	CERTH	Yes	No
15	Tiago	Nogueira	VisionSpace	Yes	No
16	Todor	Tagarev	IICT	Yes	Yes
17	Vasilis	Katos	BU	Yes	Yes
18	Velizar	Shalamanov	IICT	Yes	Yes
19	Wim	Mees	RMA	Yes	No
	External Experts				
20	Dirk	Kuhlmann	ECSO	Yes	Yes
21	Luigi	Rebuffi	ECSO	Yes	No
22	Mario	Quarta	NATO	Yes	Yes
23	Michel	van Eeten	CS4E	Yes	No
24	Tobias	Fiebig	CS4E	Yes	Yes

Table 45: List of experts participating to the questionnaires

Questions Legend:

1. I have following experience at the management position (**Experience)**:

   a. 1-5 years **(1-5)**;

   b. 5-10 years **(5-10)**;

   c. More than 10 years **(> 10).**

2. I work primarily in the following sector (**Organisation)**:

   a. Public sector - None-for-profit organisation **(Pub_NFP)**;

   b. Public sector - For-profit organisation **(Pub_FP)**;

   c. Private sector - None-for-profit organisation **(Pri_NFP)**;

   d. Private sector - For-profit organisation **(Pri_FP)**.

3. I have following experience working in network organisations (**CNO Experience)**:

   a. Most of my work was (is) related to Collaborative Network Organisations **(Most)**;

   b. I have some experience forking in Collaborative Network Organisations **(Some)**;

   c. Never worked for organisation participating to Collaborative Network Organisations **(Never).**

4. I have experience on the following governance and management level of a Collaborative Network Organisations **(GM Positions)**:

   a. In central governance and management body: Governance and management related **(CG_GM)**;

   b. In central governance and management body: Technical Support or Secretariat **(RC_GM)**;

   c. In regional or sector centre: Governance and management related **(CG_TS)**;

   d. In regional or sector centre: Technical Support or Secretariat **(RC_TS);**

   e. I have only experience in Collaborative Network Organisations' member organisation **(CNO_Mem)**.

5. My experience is mainly related to the following areas **(Functions)**:

   a. Organisation – Governance and management in general **(GM)**;

   b. IT Service Development and Management **(IT)**;

   c. Cybersecurity related services management **(Cyber)**.

ID	Experience	Organisation	CNO Experience	GM Positions	Functions	Cluster
21	> 10	Pri_FP	Some	CG_GM	GM	1
22	1-5	Pri_FP	Some	RC_TS	GM	1
23	> 10	Pri_FP	Most	RC_GM	IT	1
26	> 10	Pri_FP	Some	CG_TS	GM	1
31	> 10	Pri_FP	Some	CNO_Mem	IT	1
32	> 10	Pri_FP	Most	CG_TS	GM	1
40	1-5	Pri_FP	Some	CG_GM	GM	1
25	> 10	Pub_NFP	Never	CG_GM	GM	2
27	> 10	Pub_NFP	Most	CG_TS	Cyber	2
30	> 10	Pub_NFP	Most	CG_GM	GM	2
36	1-5	Pri_NFP	Most	CG_GM	GM	2
37	> 10	Pub_NFP	Some	RC_GM	GM	2
44	> 10	Pri_FP	Most	CG_GM	GM	2
45	> 10	Pub_NFP	Some	CG_GM	GM	2
47	> 10	Pub_NFP	Most	CG_GM	GM	2
50	> 10	Pub_NFP	Some	CG_GM	GM	2
35	1-5	Pub_NFP	Some	CG_TS	Cyber	3
38	> 10	Pub_NFP	Some	CNO_Mem	Cyber	3
39	> 10	Pub_NFP	Some	CNO_Mem	Cyber	3
41	1-5	Pri_FP	Some	CNO_Mem	Cyber	3
46	1-5	Pub_FP	Some	CNO_Mem	Cyber	3
48	> 10	Pub_FP	Some	CG_GM	Cyber	3
51	1-5	Pub_NFP	Some	CNO_Mem	Cyber	3
52	1-5	Pub_NFP	Some	CNO_Mem	GM	3

Table 46: Criteria Ranking group of experts

ID	Experience	Organisation	CNO Experience	GM Positions	Functions	Cluster
45	> 10	Pri_FP	Some	CG_GM	GM	1
43	1-5	Pri_FP	Some	RC_TS	GM	1
68	> 10	Pri_FP	Most	RC_GM	IT	1
65	> 10	Pri_FP	Some	CG_TS	GM	1
70	> 10	Pri_FP	Some	CNO_Mem	IT	1
74	1-5	Pri_FP	Some	CG_GM	GM	1
69	> 10	Pub_FP	Some	CG_GM	Cyber	1
56	> 10	Pub_NFP	Never	CG_GM	GM	2
44	> 10	Pub_NFP	Most	CG_GM	GM	2
57	> 10	Pub_NFP	Some	RC_GM	GM	2
49	> 10	Pri_FP	Most	CG_GM	GM	2
47	> 10	Pub_NFP	Some	CG_GM	GM	2
73	1-5	Pub_NFP	Some	CG_TS	Cyber	3
71	> 10	Pub_NFP	Some	CNO_Mem	Cyber	3
53	1-5	Pri_FP	Some	CNO_Mem	Cyber	3
50	1-5	Pub_FP	Some	CNO_Mem	Cyber	3
67	1-5	Pub_NFP	Some	CNO_Mem	GM	3

Table 47: Alternatives Assessment group of experts

Note: The IDs in Table 46 and Table 47 are specific for the questionnaires and do not match IDs in Table 45.

Annex 3 – Alternatives' Structures

Alternative 1

General Assembly (GA)

The General Assembly is chaired on a rotational basis by each representing member in alphabetical order.

The *Chair and the Vice-chair* of the GA are first among equals, and the CNO members elect the Vice-chair for 2 years. After serving two years as a Vice-chair of the GA, the person becomes automatically Chair.

Each member of the ECHO CNO must be represented at the GA where the corresponding organisation has the right to nominate up to three representatives. Only one of them has voting rights.

The GA approves *Mission, Vision and Strategy* and establishes Scientific Committees by the proposal from the Executive Committee, as well as all ECHO CNO regulation, risk management documents and annual allocation of the resources.

The GA serves as final point for conflict resolution among members and as final judge about membership issues.

International Board of Auditors (IBA)

The *International Board of Auditors (IBA) for the ECHO CNO*, acting on behalf of the GA, shall audit the financial statements of the organisation.

The IBA may carry out performance audits that shall ascertain that the operations of the CNO have been implemented in compliance with economy, effectiveness and efficiency principles. The IBA shall have access to any information necessary to conduct its financial and performance audits.

Steering Board (SB)

The day-to-day business in the ECHO CNO is responsibility of the *Steering Board (SB)* led by *Chair and Vice-chair* elected for one year on a rotational basis from the members of the CNO.

The SB is *responsible for the implementation of the decisions of the GA*.

The SB exercises unified governance of the CNO by:

- Developing and updating the long-term S&T Strategy and medium-term S&T Priorities and E&T plans.
- Propose network-wide goals and documents like CNO Operative Procedures, Collaborative Program of Work, Plans, etc.
- Acting as the focal point for coordinating the ECHO CNO S&T and E&T CPoW.
- Provision of guidance and direction for the operations of the ECHO CNO scientific technical committees and working groups.
- Obtaining GA approval of the S&T Strategy and medium-term S&T Priorities and E&T plans.
- Obtaining GA approval of the CNO's CPoW and the annual budget.

The CNO Programme of Work and its budget are submitted by the SB annually for GA approval.

The work of SB is supported by the Permanent Executive Committee (PEC) acting as secretariat, and led by Chief Executive Officer who is responsible for facilitation and coordination of the work of CNO members.

The SB with the support of the Executive Committee exercises the oversight on the implementation of the S&T and E&T activities and reports to the GA twice per year about the implantation of the CPoW.

The responsibility of the SB is to prepare Risk Management Strategy and to submit it for GA approval.

Certification Commission (CC)

The *Certification Commission (CC)* is responsible for CNO's competencies monitoring and guaranteeing standardisation procedures implementation for members. The CC reports to the SB and GA about membership status and issues.

Groups of Interested (GI)

Groups of Interested can be established in order for representatives of the EU MSs, NATO nations and partners to further develop R&T project proposals.

Advisory Scientific Board (ASB)

The ECHO CNO is highly active in guiding and influencing international standards development – ensuring interoperability across the research and education community in the cybersecurity domain.

The Advisory Scientific Board (ASB) is established with the purpose of guaranteeing standardisation procedures implementation. ASB supports the SB, GA and all members with advice about standards development and implementation.

The ASB also prepares plans, analyses and reports to the SB about CPoW activities related to standardization, S&T and R&D.

Scientific Committees

The *Scientific Committees* are established by the decision of the ECHO CNO General Assembly on the suggestion from the Steering Board.

At least four members of the ECHO CNO can initiate new Scientific Committee (ET, RTG and AHRG). Day-to-day business of these committees is facilitated and supported by the Executive Committee.

The Steering Board exercises oversight of their work and products. The SC with the support of the Executive Committee exercises the oversight on the implementation of the S&T and E&T activities and reports to the GA twice per year about the implantation of the CPoW.

The responsibility of the SC is to prepare and to submit for approval by the GA Risk Management Strategy

Exploratory Teams (ETs), Ad hoc Research Groups (AHRGs) and Research Task Groups (RTGs)

There is a *high level of coordination of S&T and E&T activities through the ECHO CNO central bodies.*

The ECHO CNO organises and implements its R&T activities in different Scientific Committees, which include *Exploratory Teams (ETs)*, *Ad hoc Research Groups (AHRGs)* and *Research Task Groups (RTGs)*, which are networking fora for experts from government, industry, small and medium enterprises (SME) and academia, moderated by the CNO's central network-wide authorities.

There is a *high level of coordination of S&T and E&T activities through the ECHO CNO central bodies*.

The proposals for new activities are drafted by the Scientific Committees *(Exploratory Teams and Ad hoc and Task Groups)*. After that, the proposals are reviewed, evaluated and rated by the Advisory Scientific Board and endorsed by the SC. The GA makes the final decision on the proposals twice per year and they become part of the CPoW.

Chair of Executive Committee (EC)

The Chair of Executive Committee (EC) is acting as Chief Executive Officer (CEO), is supported by the EC, and supports SB and other committees.

Executive Committee (EC)

The Permanent Executive Committee (EC) is acting as secretariat, and is led by Chief Executive Officer, who is responsible for facilitation and coordination of the work of CNO members by:

- Appropriate administration of the CNO members in the following activities:
- candidate members' application review;
- membership registering;
- auditing and review of members' status.
- Providing effective planning and coordination for S&T and E&T activities.
- Administration and publication of CNO Collaborative Network activities and coordination of CNO public relations matters.

National Research and Education Networks (NR&ENs)

The ECHO CNO is geographically spread and covers the whole of Europe. It is a pan-European network for R&D and E&T of cybersecurity scientists and practitioners.

The ECHO CNO interconnects *National Research and Education Networks (NR&ENs) and Centres of Excellence (CoE)* across Europe. In addition to the European partners, the ECHO CNO is opened for cooperation with other similar networks all over the world based on common interests and opportunities to share resources.

ECHO CNO Community

The Community consists of Ad hoc projects and programmes developed by members without approval from other bodies.

At least *four ECHO CNO members have to express interest* and allocate resources for S&T or E&T cooperation to initiate a new activity. There is no requirement for all other members to join this activity. After endorsement from the SB and approval by the GA, the new activity can start.

The rules for cooperation are described in the *Operative Procedures of the CNO*.

The CNO's members work together to provide network connectivity and to collaborate on joint S&T and E&T activities, investing in the development and delivery of an advanced portfolio of services, tools and network capabilities to institutions, projects, researchers and policy-makers in Europe and worldwide.

Alternative 2

General or Annual Meeting (GAM)

A General Meeting of members is held at least once a year, at such time and place, and on such notice, as the CNB determines and is subject to the requirements set into the Invitation to the General Meeting.

The Annual Meeting is held each year and mainly discusses issues about the Annual Plan activities and year progress toward ECHO CNO's goals. Nevertheless, if changes of the Network environment or other challenges require to be addressed the Annual Meeting can be gathered as a General Meeting.

The required quorum for the GAM is 51% of the members with full voting rights. Members can submit votes electronically or via postal mail prior to the meeting and this constitutes the quorum.

Most of the decisions are made by simple majority rule but there are such specific situations where the decisions are made with qualified majority such as decisions about Mission, Vision, Strategy, and the ECHO CNO network-wide Annual Plan.

The Directors of the ECHO CNO Central Network Body (CNB) are elected and evaluated at Annual Meeting, the General Meeting decides on a two-year basis about Chair of the CNB and overall activities of the Directors.

The Chair of the GAM is elected at the Meeting among members with voting powers.

Central Network Body (CNB)

The CNB is the governance and management body that may exercise all the powers and authority on behalf of the ECHO CNO. The CNB is formed by Directors elected at the Annual Meeting. Directors number, responsibilities and rights are decided on a two-year basis by the General Meeting.

The CNB may delegate the executive rights for management to a person called a Chair of the ECHO CNO. The CNB or a CNB Committee is directly responsible for approving the selection and the processes regarding the retention and evaluation of the Director.

The CNB may establish geographic or other demographic differentiators. The CNB delegates to the Chair the day-to-day management and executive rights for implementation of policies, subject of CNB's monitoring and control.

The CNB decides about the requirements applicable for RNBs formation. Chapter RNBs applications are approved by the CNB, or its designee, in its sole discretion and shall include the proposed Bylaws of the RNB, which shall be consistent with the Articles of Incorporation, Bylaws and the CNB-approved policies.

The CNB may establish advisory committees. Advisory committees may not exercise the authority of the CNB. CNB approves the documents that governs all committees.

Risk Management Committee

Risk management is conducted by a separate Committee.

The Risk Management Committee is independent of the executive management (the Chair and the Secretary) and reports directly to the CNB.

The Committee reviews financial statements and annual reports. It consists of appointed by CNB experts and auditors. The Committee provides an analysis of the ECHO CNO's threat and risks posture. The meetings of the Committee also provide a forum for discussion on any matters that are relevant to ECHO CNO goals and activities, as well as to stakeholders' needs and objectives.

The Committee prepares an Annual Risk Management Plan, which contains an assessment of the information about risks applicable for the Network in terms of business and strategy risks, technology risks, operational risk, risk tolerance levels, risk appetite and others.

The Plan also describes activities and action for risks mitigation, risk transfer and avoidance. The CNB approves and oversees the Plan by Chair's proposal and reports.

ECHO CNO Chair

The Chair is appointed by the CNB and shall serve as the Manager (Chief Executive Officer) of the ECHO CNO.

The executive management of the Network includes the Chair (acting as CEO), Secretary (acting as Deputy CEO), Chief Accountant (acting as CFO) and any other role defined by the CNB.

Executive Committees

Committees are formed for nominations, audit and risk, finance management and other important areas of network-wide activities of the ECHO CNO. The Committees report to the CNB.

CNB committee that consists solely of Directors is executive and can operate and make decisions according to the rights delegated by the CNB.

Advisory Committees

Committees are formed for nominations, audit and risk, finance management and other important areas of network-wide activities of the ECHO CNO. The Committees report to the CNB.

CNB committee that does not consist solely of Directors is advisory in nature and can only make recommendations to the CNB.

Groups of Interest

The members can propose and establish Groups of Interest on the network-wide level on topics of common interest into the fields of cybersecurity skills, education and training.

The establishment and planned activities are approved, supported and monitored*** by the CNB and GAM.

Secretary

The Secretary is appointed by the CNB. The Secretary forms and leads an executive and support body – the Secretariat of the ECHO CNO Chair.

Other management positions, suggested by the Chair and the Secretary, if any, shall be approved by the CNB.

Secretariat

The Secretariat is a management executive body.

The executive management of the Network includes the Chair (acting as CEO), Secretary (acting as Deputy CEO), Chief Accountant (acting as CFO) and any other role defined by the CNB.

Other management positions, suggested by the Chair and the Secretary, if any, shall be approved by the CNB.

Regional Network Bodies (RNBs)

The hundreds of thousands of ECHO CNO individual members are organized in more than 200 professional Regional Network Bodies (RNBs).

The main governance objective is to create an environment in which the RNBs have decision-making autonomy in order to make the best decisions on how to contribute to the network-wide strategy and objectives.

The initiatives and programmes of the RNBs do not need approval from the CNB – they are reported at the ECHO CNO General or Annual Meeting, providing evidence that the activities support the ECHO CNO's network-wide or RNBs' regional goals.

The CNB has the right to stop RNB's activity, programme or initiative if it breaches the Bylaws rule. The CNB decision can be appealed before the General or before the Annual Meeting.

The representation role is not exceptional for the CNB and the ECHO CNO can be represented by each RNB on the regional level if it is conducted according to the rules described at the CNO's Bylaws.

ECHO CNO Community

The ECHO CNO can be considered as a networked organisation with a high level of decentralisation.

The CNB governs, manages and reviews the certification, membership, capabilities and competences assessment related processes.

The allocation of shared funds gathered by different types of fees is decided in the General (or Annual) Meeting. The ECHO CNO's CNB can be also considered as a forum for RNB's activities and as a place for coordination of communities of interests formed by the individual members.

The members can propose and establish Groups of Interest on network-wide and on regional level.

Alternative 3

General Assembly (GA)

The main governing body of the ECHO CNO is the General Assembly (GA), which consists of one representative from full member organisations. The GA decides on election and changes to the independent Directors of the Supervisory Board (SB), the Chair and Vice-chair of the SB, as well as the CLCs representation to the SB, the Mission, Vision, Strategy documents and financial documents.

The financial documents include the following agreements:

- Business Plan and Catalogue for services and products delivery;
- Grant Agreement with EU and national governments for funding of the ECHO CNO activities;
- Internal Grant Agreement between members for delivering outcomes designed in Grant Agreement.

The GA decisions are taken by the simple majority rule. All members have one vote.

The GA approves annual reports of the Management Board about membership and about plans execution.

The General Assembly is the final point of conflict resolution on issues related to network competences and members' status.

The General Assembly Meeting has two specific feedback sessions named Corporate and Academia Pitch and SME Pitch. All members depending of their size can participate to one of the sessions with 5 minutes pitch. The pitch is registered online before the meeting as an expose of ideas and issues that the member wants to present to the authorities or to the ECHO CNO governance and management.

Supervisory Board (SB)

The Supervisory Board (SB) is formed by 3 CLCs representatives elected by the GA, three independent Directors suggested by EU and member-states and approved by the GA, Chair and Vice-chair.

All decisions are taken by the simple majority rule.

There is no weighting of votes, except for the Independent Directors in SB. Each Independent Director has 2 votes in SB, thus having actual veto right for SB decisions if they anonymously agree – all three of them are voting in same manner. There is a resolution procedure which employs GA resolution.

The SB is involved in preparation of all strategic and financial documents and reports.

The SB approves candidate members' applications by CLCs proposal.

All members of the SB have a 2-year mandate.

Management Board (MB)

The Management Board (MB) is the executive committee of the ECHO CNO, led by its Chair, acting as CEO.

The MB consists of the Chief Research and Innovation Officer, the Chief Education Officer and the Chief Financial Officer (CFO), as well as the Head of Communications, Head of HR and the all CLCs Directors, except the CLCs elected in the Supervisory Board.

The MB is involved in preparation of all strategic and financial documents and reports.

The Chief Financial Officer (CFO) is responsible for auditing the financial status of the members.

Advisory Committees

The SB can establish non-permanent Advisory Committees on important topics as a forum for discussion and feedback.

The committees have to include one representative or observer from each interested CLC.

Co-Location Centres (CLCs)

Co-location Centres (CLCs) are established as non-for-profit legal entities in countries participating to the Digital Market Cybersecurity Innovation (DMCI) programme.

The CLC can be established from 5 members of ECHO CNO in the country and has to have legal status of non-for-profit organisation.

The CLC is the main actor at members' acceptance procedure and it is responsible for network competence level audit and maintenance.

Strategy Committee (CLC SC)

The CLC has a Strategy Committee which is formed by CLC members' representatives and has the right to elect the Director and CFO of the CLC.

The Strategy Committee develops ECHO CNO implementation strategy for the region, based on strengths and opportunities in most prospective for the region ECHO CNO's innovation areas in cybersecurity.

The Director, the Strategy Committee and CFO are responsible for preparing the Budget, Internal Agreement and Business Plan for the CLC. These documents are further negotiated and agreed with the ECHO CNO Management and Supervisory Board. The CLC can take resource allocation decisions within the approved budget and activities.

CLC Director

CLC has a Director, acting as a CLC's CEO.

The Director, the Strategy Committee and CFO are responsible for preparing the Budget, Internal Agreement and Business Plan for the CLC. These documents are further negotiated and agreed with the ECHO CNO Management and Supervisory Board.

The Director, together with the CLC SC are playing main role in membership support, approval and auditing.

Executive Officers

Other executive officers or external experts that CLC can appoint, including CFO and liaison(s) to the Groups of Interest projects, that are executed on network-wide level.

Partner Organisations

The Partner Organisations are the member organisations where the CLC's projects and activities are implemented and executed.

Groups of Interest

In addition to CLC, members and partners of the ECHO CNO can form Groups of Interests (GIs) which have same organisation as the CLC, but do not have obligation for member acceptance and do not have rights of representation to ECHO CNO central bodies. They have advisory role to the Supervisory Board and CLCs' Strategy Committees, providing insight, information and feedback to members for important developments and opportunities in cybersecurity domain fields of interest.

The GIs can also propose and lead programmes or projects to SB for activities in their specific field. The allocation of resources is made similarly to the allocation for CLCs' budget and activities.

Strategy Committee (GI SC)

The GI SC has the same role as CLC SC, but for the GI strategy and activities.

The GI SC consists of representatives from these members interested in the field of the GI.

GI Coordinator

The GI Coordinator has the same role as CLC Director, but without obligation for membership related procedures.

Executive Officers

Other executive officers or external experts that GI can appoint, including CFO and liaison(s) to the CLCs, that are involved in GI's projects.

Projects

Network-wide projects aiming to develop capabilities or to achieve goals of ECHO CNO in specific fields of the cybersecurity domain.

ECHO CNO Community

The ECHO CNO Community is formed mainly around the education and training activities of ECHO CNO – the Academy, the Factory and the Accelerator. There is a fast-growing group of alumni connected through the social media.

Alternative 4

Annual General Meeting (AGM)

Annual General Meetings is conducted in accordance with the Operational Framework.

Attendance and participation is limited to members. Members can invite guests, but the participation of the guest has to be approved by the BoD. Each member organisation shall be represented by its own Representative.

The rules for voting change with respect to the specific situation. In general, all matters, except as described elsewhere in these Bylaws, are decided by majority vote.

AGM makes all strategic decisions about ECHO CNO Mission, Vision, Strategy, Annual Plan, risk management, shared resource allocation. The AGM oversees the Board of Directors and it is supported by the Steering Board.

The AGM is also the final body for conflict resolution regarding membership issues.

The Hall of Fame

The Hall of Fame recognizes a selected group of visionaries, leaders, and luminaries who have made significant contributions to the development and advancement of the global security landscape.

Nominations are reviewed and screened to ensure they meet the nomination criteria and eligibility by the BoD and is approved at the AGM.

Steering Committee (StC)

Steering Committee (StC) is an advisory body to the Annual General Meeting – it oversees the executive activities of the Board of Directors.

StC Prepares analysis of the annual reports for AGM and provides operational advice to the BoD.

The members of StC are elected by the AGM.

The Board of Directors (BoD)

Board of Directors (BoD) is a group of 5 individuals responsible for general operating policy, procedures, and related matters affecting the network and its members.

The AGM elects the five members of the BoD for a 2 years mandate. A candidate must be nominated by petition of at least six members. A member may vote for no more than the number of open positions. The

five candidates receiving the most votes shall become members of the BoD. Ties shall be broken by random selection.

The BoD shall elect from its members the Chair and the Chief Financial Officer (CFO). The Chair shall also serve as a Chief Executive Officer (CEO) and exercise and perform any other powers and duties the BoD may assign. Officers shall serve one-year terms. A person may not serve as Chair for more than two consecutive one-year terms.

The BoD can decide alone on following issues:

- Resource decisions during the Fiscal year;
- Strategy, annual plans and actions;
- Different member categories for full representation of ECHO CNO;
- Sets up and dissolution of SIGs and Committees;
- Draft and approval of Bylaws;
- Membership fees;
- Resolution binding on all members;
- Mission statements and terms of references.

The BoD shall appoint the members and chairs of different committees and shall determine their operating procedures.

The BoD may appoint a Secretary who shall serve a term of one year. The Secretary is not an officer.

Membership fees will be set and reviewed annually by the BoD. The membership fee structure, due dates and other associated requirements will be determined by the Board of Directors and will be reviewed and modified as necessary on an annual basis to reflect current membership or financial issues. The fees will be determined by the Board of Directors but must respect the different categories of Members and organisational natures.

The membership fee structure must be approved or waived by a two-thirds majority of the Board of Directors.

Membership committee (MC)

The procedure for monitoring and auditing the goal compliance of participants is given in responsibility of the Membership Committee and to the BoD.

The Membership Committee supports membership application and the review processes.

The MC proposes a decision about applicant acceptance to the BoD. The MC also has responsibility for candidates' recruitment, membership recognition and for reviewing the membership condition.

The Secretariat

The Secretariat can be considered as an outsourced service to non-members experts.

The Secretariat's employed professionals are the general contact point of the ECHO CNO and they maintain the membership database, provide general guidance for (potential) members, serve as an administrative

point and maintain the Internet services, notably website and e-mail. The details of the role of the Secretariat are described in ECHO CNO's Operational Framework.

Advisory Board (AB)

The Board of Directors (BoD) shall appoint the members and the Chair of the Advisory Board and determine its operating procedures.

Directors are not eligible to serve on the advisory board.

Membership in the Advisory board is otherwise open and does not require any prior involvement with the ECHO CNO.

Permanent and Ad hoc Committees

For specific goals and tasks BoD can establish standing (permanent) or ad-hoc (temporary) committees.

BoD shall appoint the membership and Chair of permanent and ad hoc committees and shall determine their operating procedures.

The Chair and Chief Financial Officer

The BoD shall elect from its members the Chair and the Chief Financial Officer (CFO).

The Chair shall also serve as a Chief Executive Officer (CEO) and exercise and perform such other powers and duties as the BoD may assign.

Officers shall serve one-year terms. A person may not serve as Chair for more than two consecutive one-year terms.

Internal Risk Audit Team (IRAT)

Internal Risk Audit Team (IRAT) is responsible for preparation of all internal risk management documents. The Team supports the process of document approvals by the Advisory Board, Board of Directors and Annual General Meeting. The IRAT also has responsibility to support other bodies and officers in Risk Management processes.

SIG Steering Board

Special Interest Groups (SIGs) establish "SIG Steering Board" composed by Chair and representatives of SIG members.

Special Interest Groups (SIGs)

Special Interest Groups (SIG) exist to provide a forum where the ECHO CNO members can discuss topics of common interest.

A SIG is a group of individuals composed of member organisations and invited parties, typically coming together to explore an area of interest or specific technology area, with a goal to address common challenges by collaborating and sharing expertise and experiences.

Members who are interested in establishing a new SIG should contact the Secretariat. Each Member can propose a new SIG. Chairman of each SIG is elected each year by the members participating to the SIG.

Upon approval by the SIG chair(s), additional participants who are not ECHO members (experts or representatives of relevant organisations or bodies), can be invited to attend SIG meetings as observers, without voting rights.

Special Interest Groups are of following types:

- Working Groups: initiated by vote of the BoD and based on a charter proposed by a member. They address a particular problem or concern of interest to members.
- Standards Groups: initiated based on a charter and a vote of the BoD. They develop a standard for internal use or publications for external use.
- Discussion Groups: less structured groups, which allow discussion on a particular topic. Discussion Groups do not require a charter but will generally not receive any direct allocation of resources from the Network except support for groups' meetings.

In order to define priorities in Research and Development (R&D), raw proposal come from SIG groups to be evaluated and consolidated by the Advisory Board before presenting them to the BoD asking a specific meeting.

The BoD (also CEO and CFO) decide whether to approve the proposal, how much funds to allocate for it and the type of contractual agreement needed to be signed between members.

ECHO CNO Community

The ECHO CNO members and bodies can propose a solution or to make their own decisions on the following issues:

- To propose amendments to ECHO CNO Bylaws;
- Resigning from the ECHO CNO;
- Members can present in person their defence to the General Assembly before exclusion from Membership;
- Members' representatives are eligible to the BoD, SIG and to any of ECHO CNO Committees.

Annex 4 – Instructions for the on-line Questionnaire form. (Ranking the Criteria)

Receiving the Questionnaire

Each expert receives a personal e-mail from the Task Leader of T3.3/D3.2 (Georgi Penchev – IICT). The e-mail contains the following information:

- Brief information about the questionnaire form and the included survey;
- Link to the personal form for each expert;
- Attached file: Guidance for Governance Model Criteria Ranking.

Please, read the Guidance and then open the Questionnaire form, by clicking on the link provided in the e-mail.

The Questionnaire's groups and questions

The Questionnaire online form consists of five groups of information and questions as follows:

1. *Welcoming part*;
2. *Organisational Experience;*
3. *First Level of the Goal Hierarchy* – comparison of three criteria on the first level of Hierarchy;
4. *Three groups of questions* for pairwise comparison of criteria for each criterion on the second level of the hierarchy:
   - Effectiveness;
   - Network efficiency;
   - Adaptability.

All questions are mandatory and have to be answered before moving to the next question.

Ranking the criteria (Answering the questions)

The *Organisational experience* group consists of closed questions, which have to be answered by selecting one of the options according to your governance and management experience in network organisations. This information will be aggregated and used in sensitivity analysis of the results (see Section 2.4) and will not be shared with any other partner or expert.

All other questions within all other groups have to be answered by selection of one option from the ranks within the scale from 1 to 9.

It is important to follow these steps when answering the questions:

1. Read the explanation and description of criteria in comparison (left and right part of the table);
2. Remember the reason for comparison:
   - For comparison of the Effectiveness, Network efficiency and Adaptability – the first level of hierarchy – you have to compare criteria from the prospective of achieving the overall goal;
   - For comparison of each criterion on the second level – the comparison has to be done from the prospective of the criteria hierarchy upper level.

As an example: Comparison between *"Trust" and "Network-Level Competencies"* should be done against relative criterion importance for achieving **"Effectiveness"** of the ECHO Governance model.

3. Analyse and decide which one from the two criteria in comparison is more important and how much importance it has.
4. Select the respective option within the answers' table, by following these rules:
    a) If the indicated with C1 criterion (left side of the table) is more important than the criterion indicated with C2, select form options left from the "1 – Equal";

	9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9	
C1:	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	C2:

    b) If the indicated with C2 criterion (right side of the table) is more important than the criterion indicated with C1, select form options right from the "1 – Equal";

	9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9	
C1:	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	C2:

    c) If both criteria are equal in importance, select 1 Equal;

	9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9	
C1:	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	C2:

    d) You can see/hide description of the C1, C2 criteria and the scale by clicking on respective links.

Annex 5 – Guidance for Governance Model Alternatives Development

Requirements for Alternatives Development

This section provides an overall description of requirements for achieving the expected results.

Expected results

The expected result is a document for Alternative Description, provided as the structure in the Section 5 (below) and as a template files in ECHO SharePoint. The document should not exceed the volume of 5-8 pages.

Style of writing

Avoid Bias

Avoid use of qualifications and epithets like **high** number of participants, **low** level of coordination, **good** practice, **long (complicated)** procedure.

It is **important** to leave judgement about alternatives to the experts. They will compare each alternative to each other. Thus, how high or low is the number of the participants is the matter of comparison between the alternatives.

Balanced text

When writing try to be as short as possible, as well as explicit as possible. The sections of the final document should be balanced as volume – try to fit description in maximum 0.5-1 pages per section.

Document File Space

The main directory for the activity of alternatives development is Guidance Alternatives Development. The directory contains the directory Guidance and five sub-directories for each partner.

Each partners' directory contains two templates – a word document template of structure of the final document and an excel file with development check list.

The five directories (except the IICT directory) also contain copy of the D3.1 analysis directory with documents used during the D3.1. Then look at the excel file named From_D3_1_Selected_CNOs.xlsx into the main directory and start from short description of each network, provided in this file. The one-line description contains link to the network website and additional information in various forms.

Networks' websites and on-line search

Usually websites of the Networks contain documents about the CNOs' governance and management, especially for activities about potential members and customers' engagement, organisation and expected competence level and behaviour of CNOs' member organisations.

Please, be thorough when looking at the websites, sometimes the governance and management documents can be shifted in background (within several links distance) by the marketing and PR posts and pages.

Do not hesitate to look on-line for news and data about CNOs' activities and news. This information can be very useful in assessment of the attractiveness of the CNOs', but check the news sources.

Remember your sources

The analysis of the CNO governance model according to the given structure in this Guidance can overlap some fields – as an example the level of competence certification procedures can be found in parts related to member acceptance procedures.

You can speed-up your analysis if you refer to source documents and specific section and articles for both field in excel check-list file. Within the template excel file in each partner directory named [Alternative_Number]_check_list.xlsx you will find the four columns named *References C1-4* and also 4 Sheets named C1-4_Ref. You can list your references for C1-4 in C1-4_Ref Sheets and then cite respectively in columns *References C1-4* in the main *Check_List* Sheet.

The Directory Documents contains documents referenced in Table 2.

See the example file in directory Guidance\Example*, the file* Alternative_Exmpl_check_list.xlsx

The purpose and the process of Alternative development

The goal is to develop and to describe an Alternative for ECHO Governance model based on analysis of existing relatively similar networks, as well as the identified ECHO needs and objectives. The goal is not to describe one or more CNOs, but to "extract" the most common characteristic of their governance model.

The purpose of the Alternative development is to identify the common preferences of the government model within three existing Collaborative network organisations (CNOs). Each alternative tasked for a Partner contains three existing CNOs. The selection of the Alternatives and their respective CNOs is given in next Section 4.

The analysis must follow the structure given in Section 5 bellow and following rules and steps for analysis:

1. Read an item in Section 5 structure. There are 8 main items with several points within the structure;
2. Search the documents and other sources for information and data;
3. Mark the existence or absence of rules, provide data or other information into the check list excel file for your Alternative;
4. Decide what to include in your description using the following rules:
   a. *Prevailing preference* – if all three or two of the CNOs has similar characteristics or governance procedures – describe them as Alternative preferences in Description of the Alternative;
   b. *The most developed CNOs* – chose the most developed procedures and organisational structures if there are differences between CNOs;
   c. *One preference* – if only one CNOs has information about the item in interest – use this information for the description.
   d. *(Updated) No preference* – if there is no information, data, etc. about the item of interest, then the development team can decide how to include information about the item considering the following two points:
      i. *The overall direction of the Alternative* and possible positive consequences for Alternative's ECHO Governance model if procedures, document or position are included. *As an example:* There are no information about Risk Management plans

or other documents. Nevertheless, if into the Annual Action Plan, there are provisions for actions feasibility assessment we can include information that the Risk Management activities are provisioned by the requirements of the Action Plan. And we can also suggest that Scientific Advisory board (or other CNO's expert body) provides feasibility analysis as a Risk Analysis activity.

If the Alternative's ECHO CNO gives more discretion to the regional (or sectoral) centres Risk Management activities can be included into the Alternative description as responsibilities for the RNBs.

ii. The complexity of the proposed procedures – if the procedures included are too complex, they can have negative consequences for the Alternative's governance model – bureaucracy and conflicts.
The description of items with no information will be discussed with the Task Leader.

5. Write the description into the word file for your alternative.

Please, look at the Guidance Example directory check list (excel file) and description (word file). The description file contains notes how the information was selected.

The alternatives short list. Partners tasked for the development of the alternatives

The classification of the 92 CNOs analysed in D3.1 shows grouping of the networks within two main dimensions - the type of funding sources and degree of centralisation. Additionally, these networks were analysed from the perspectives of members' representation in governance and management bodies, as well as from their voting rules.

Having these considerations of most preferred forms of business and governance models we can assume that the networks should be selected for further analysis by these dimensions. Therefore, four alternatives have to be placed within the following categories:

1. **H**igh degree of **f**unding centralisation and **b**usiness and **g**overnance decision centralisation (**HH**);
2. **H**igh degree of funding centralisation and **m**iddle business and governance centralisation (**HM**);
3. **B**alanced funding and **a high** degree of business and governance centralisation (**BH**);
4. **B**alanced funding and **a middle** degree of business and governance centralisation (**BM**);

Additional preference for selection is the representation and voting rules. They should be relatively similar within each alternative – broad or full representation with simple majority voting rule. This preference is not mandatory, but preferable.

Final preference for network selection is the presence both of the central governance network body (hub) and regional (or sectoral) centres. This preference is mandatory and is related to required structure by R630.

BDI – Alternative 1 (HH)		
High degree of funding centralisation and business and governance decision centralisation		
Code	*Short Name*	*Full name*
Cyb002	STO	NATO Science and Technology Organization
Oth001	GEANT	Gigabit European Academic Network
Oth027	CapTechs	EDA Capability Technology Areas
ESI CEE – Alternative 2 (HM)		
High degree of funding centralisation and middle business and governance centralisation		
Code	*Short Name*	*Full name*
Inc005	EIT-Digital	European Institute of Innovation and Technology (EIT)-Digital
Cyb043	AUSTCyber	Australian Cyber Security Growth Network
Inc008	ICE71	Innovation Cybersecurity Ecosystem at Block71 (ICE71), Singapore
GT – Alternative 3 (BH)		
Balanced funding and a high degree of business and governance centralisation		
Code	*Short Name*	*Full name*
Cyb017	FIRST	Forum of Incident Response and Security Teams
Cyb019	APWG	Anti-Phishing Working Group
Cyb033	ISAlliance	Internet Security Alliance
RHEA – Alternative 4 (BM)		
Balanced funding and a middle degree of business and governance centralisation		
Code	*Short Name*	*Full name*
Cyb013	ICS2	International Information Systems Security Certification Consortium
Cyb032	ISACA	Information Systems Audit and Control Association
Oth017	IAPP	International Association of Privacy Professionals

Table 48: Partners, Alternatives selected and CNOs

The analysis of *the type of CNOs* for each alternative *shows similarity* among them. The number of existing CNO's members of each Alternative was shortened to three members.

The name of the Partner tasked to develop the alternative and the name of the alternative are given in Table 48.

The Development of the alternatives

The most important for the analysis and development of the alternatives are the legal documents for the Networks. The charters, decisions, reports issued and approved by the central or regional governance bodies of the CNOs. Publications as news, media releases and other are treated as secondary sources with less stability of the information.

Please, start from the documents used within the D.3.1. and further search for documents and news. Do not forget to save them as a sources name and references.

Writing the description of the Alternative

The alternative description **is an abstraction of CNOs preferences**, but is oriented toward possible **implementation of ECHO Governance model**. Therefore, do not mention the CNOs' names into the description.

In the Description you can use phrase like: *The ECHO Governance model has following governance bodies …,* but do not mention, discuss or compare the CNOs members of the alternative.

Do not try to be exhaustive, especially when describing procedures or organisational structures and roles. The detailed analysis of procedures and models is the job for the next deliverable D3.3. Governance model description.

Here, we try just to indicate (or to describe in very brief) the presence or the absence of procedure, unit or role within the analysed network organisations. This is enough information for the evaluation of the networks' governance model alternatives.

In the Section 5 "Detailed structure and guidelines" following two main level of details are used:

- **Indicate [the fact] …**

  This means that you need just to provide a statement about presence or absence of the fact.

  Example

  Required level of details:

  Indicate the prevailing voting rules – simple majority, qualified majority, consensus or other for the three networks. As an example: *The network uses simple majority rule in their governance bodies.*

  OR

  Indicate that there is no prevailing rule: *There is no preferred rule for voting within the governance bodies of the network. The appointment of the management board is done by simple majority, for financial decision the qualified majority is required and for the network strategic document have to be approved by full consensus.*

- **Describe in a brief [procedure, rule or aspect of governance] …**

Example

Required level of details: Describe in brief what are the rules for representation of network members in main network decision bodies:
- o Central Network Body (CNB);
- o Regional or sectoral Body (RNB).

Description: All network member organisations appoints one representative to the Regional Centre, who have voting rights. Observers without rights to vote can be appointed to the RNB by each identified network stakeholders. The status of observer for the organisation is given by the RNB.

Each regional (sectoral) centre provides one representative to the CNB, selected by simple majority vote by all RNB members.

Comparison to the ECHO current Governance operating model and to the Commission Proposal (R630)

Read the following parts of the ECHO First Annual Report[D4]:

- Section 2.1. Regulation 2018/630 – pp. 14-22;
- Chapter 3. Current Operating Model – pp. 33-43;
- Section 5.11 Leadership and alignment with 2018/630 – pp. 63-67.

The Annual report considers the GM suggested for European Cybersecurity Industrial, Technology and Research Competence Centre and the Network of National Coordination Centres, as well as the Current Operating Model (COM) of ECHO.

Consider the differences and similarities between your alternative for ECHO Governance model and these two models as it is described below.

In description be as brief as possible, just identify the main similarities or dissimilarities between described GM within the alternative and these two models.

Assess the efforts needed for transforming the two models to the alternative's GM.

Here **qualification can be used**, but according to the following levels of efforts:

- Strategic effort – transformation needs changes in strategic aspect and needs overall consensus of the network members;
- Operations related efforts – changes concern networks operations and can be done by a governance or management decision of existing bodies;
- Tactical decisions – needs changes in short term activities, that can be decided by the management.

Example: The implementation of the Governance model described in this alternative requires long-term efforts, which has to rearrange existing sectoral centres to national-level regional centres. It requires also significant change at the central level – the representation rules to the General Assembly and the Governance Board have to be changed accordingly.

The description in this section has to be coordinated and reviewed by the Task Leader.

Checks and communication of issues

Task leader of T.3.3. will check the weekly progress of documents and can initiate online meeting with the partner.

Partner can ask by e-mail or by on-line meeting with the Task Leader further guidance or advise if any issue appears during this activity.

Structure of the final document. Explanation and requirements

Scope, diversity and management of complexity

A) Describe in very brief the goals about the scope and diversity of the network:

- Size: Big players, SME, both; individuals or organisations or both;
- Legal status: Public, private or both;
- Clusters: One or several IT sectors;
- Geography: Geographically concentrated or spread.

B) If the Network is aimed at high diversity of participants, please describe the management approach for diversity. Usually the diversity is managed by clustering participants in centres and groups. Please indicate these structures:

- Regional centres;
- Sectoral centres
- Groups (regional or sectoral) within these centres.

D) Indicate the structure and hierarchies of the centres/groups as follow:

- Regional Centres includes and manages sectoral groups;
- Regional Centres has no sectoral groups;
- Sectoral Groups includes and manages regional sectors;
- Sectoral groups have no regional centres.

Number of participants and attractiveness

Number of participants

A) Describe in brief the goals of the Network about number of participants: small, medium, big or large number.

B) Indicate the number of participants. If there is available data, describe structure of participants – as industry sectors, as ownership (public or private) and as geography.

C) Indicate the growth rate of the Network participants for the period with available data.

Calculate it by the starting vs. last year with available information by the following formula:

$$participants\,growth(\%) = \left(\frac{Participants_{lastyear} - Participants_{firstyear}}{Participants_{firstyear}} - 1\right)100$$

If there are no available data – make an informed guess about the speed of expansion of the Network. Please, refer to the sources.

(C1) If data about the growth rate is not available, please indicate the period of existence of the Network – more than … years, etc.

D) Indicate an estimation in general about the spreading of the network– countries, regions, sectors, etc.

Stakeholders, customers and potential members engagement

A) Documents. Please indicate the existence of the following documents (answer the question: Is there are …?)

- *Strategy and plans for stakeholders' engagement;*
- *Report on stakeholders' engagement or satisfaction;*
- *Draft contractual documents for members describing rights and level of engagement.*

B) Please indicate whether these Documents are public or close – for the governance and management use only.

B1) If information is available – please give a very brief overview of Reports for stakeholders or customers satisfaction. If not – indicate that there is no publicly available estimation on Network attractiveness

C) Describe in a brief procedure of stakeholders and potential customers and members rules for engagement.

Network competences and certification procedure

Note: The aim of this section is to provide answers of the following questions:

- Does the Network impose any specific burden of the competences level? If we suggest that Network has three levels – (1) Community(ies), based on industry sectors or on regional principle, (2) Regional (sectoral) centres established within regions or sectors and (3) Central network hub
- How competences are evaluated and approved?
- How many requirements there are?

A) *Indicate are there requirements for specific competences for participating the Community, Centres or the Central Hub. Are these requirements are based on standards and are there specific procedure for competence evaluation?*

B) *Describe in brief the certification of competences as follow:*

- Are there central authorities for network-wide competences planning and approval – e.g. Advisory Scientific Board, Certification Commission, etc.

- How competences are approved on the regional or the sectoral level?
- How competences are approved for Community members of the Network?

C) If there are a procedure for monitoring and auditing of competences, please indicate:

- Who is auditing the competences;
- When – regularly or by request;
- What are the consequences if the audit is negative;
- Who judges over the procedure – the authority(ies) involved?

Maintaining network goal consensus

Note: There are three tasks for description of the means used for maintaining the Network goal consensus as follows:

- *First task* is to indicate and describe the horizon of the network-wide goals and obligations – are they of long, short or ad-hoc type.
- *Second task* is to describe the procedure of goals agreement.
- *Final, third task*, is to answer the questions about the network participants' obligations to accept and to follow the network-wide goals, as well as the consequences if the participant does not follow these obligations.

A) Indicate the prevailing perspective for collaboration – short, long, ad-hoc;

B) Describe in brief the procedure of setting-up the network-wide goals as follows:

- Who decides on Mission, Vision and Strategy;
- Who can propose network-wide goals and documents?

C) Describe in brief how participants engage the goals as follow:

- By detailed contracts agreement signed per year or more;
- By general document for entering the Network.

D) Describe in brief the procedure for monitoring and auditing the goal compliance of participants, from following prospective:

- Are there rules for monitoring and auditing the goal compliance;
- Who and when can decide on reports;
- Are there any consequences for the participants?
-

Maintaining trust within the Network

A) Describe in brief what are the rules for representation of network members in main network decision bodies:

- Central Network Body;
- Regional (or sectoral) Body.

B) Indicate the rules for voting – simple majority, qualified majority, consensus or other.

C) Indicate are there any weights of votes – rules like "golden share", vote rights are related to the size of organisation or to its financial contribution, etc.

D) Describe in brief internal transparency in following aspects:

- Access to and dissemination of strategic documents, monitoring and auditing reports;
- Information about network members' profiles, certification and activities.

E) Describe in brief (if any) specific procedures for conflicts resolution between network members. If there are no such kind of procedures, please indicate their absence.

Centralisation and horizontal links

A) Evaluate the level of centralisation by the following criteria:

- Decisions are made in a single process for the CNB;
- Decisions on main 'issues' (capabilities) are coordinated within the CNB;
- Decisions are coordinated among some CNO member organisations (variable configurations; possibly ad-hoc) or RNB;
- No coordination, i.e. each CNO member decides independently.

B) The reasons for evaluation have to be supported by a brief description of the following aspects:

- Can a participant decide to collaborate on their own projects? If so, are there any rules or pools of network resources?
- Does such collaboration have to be approved by the Network authorities?

Risk management and shared funds

Note: Risk Management is considered from the network-wide prospective in all of its stages – from Analysis to Planning to Monitoring.

A) Indicate are there following documents and bodies:

- *Rules and bodies for risk identification, management and monitoring*
- *Risk Management Strategy;*
- *Specific bodies for the development of risk related documents.*

B) Indicate existence of any reserve funds for risk events.

C) Describe in brief how the risk management documents are disseminated. Are there specific reports about the risk management?

Note: Shared funds are the amount of money specifically dedicated to implementation of network-wide goals or activities. These funds can be shared among participants for execution of collaborative projects, organisation of events and other network related activities. Usually shared funds are collected from participants, but can have also the outside network sources.

A) Indicate the existence of shared funds.

B) Describe in brief their management as follows:

- *Fund sources and rules for their collection (if any);*
- *Rules for applicability – who can apply for use – network members, non-network organisations or both;*
- *Who approve the funds' use;*
- *Who monitor and report the use of the shared funds?*

Comparison of alternative's governance model, ECHO current operating model and the governance model proposed by the European Commission (Optional)

Note (Updated): Description in this part is optional, but recommended.

ECHO Current Operating Model

A) Asses differences from the following aspects:

- Similarity or dissimilarity of structures and rules;
- Presence or absence of levels – central, regional or sectoral;
- Membership rules, access to the network and certification of network competences;
- Partnership and customers' relationship management.

B) Access the efforts needed to transform ECHO Current Operating Model to the GM proposed by the alternative.

2018/R630 Regulation of the European Commission

A) Asses differences from the following aspects:

- Similarity or dissimilarity of structures and rules;
- Presence or absence of levels – central, regional or sectoral;
- Membership rules, access to the network and certification of network competences;
- Partnership and customers' relationship management.

B) Access the efforts needed to transform the GM proposed by the alternative to the R630 Model.

Annex 5.1 – Example based on national level CNOs (annex to the Guidance)

Names of the Collaborative network organisations

The Alternative is developed on the basis of analysis of the Collaborative network organisations (CNOs) given in Table 49.

Reference	CNO Short Name	CNO Name
[C1]	AISA	Australian Information Security Association
[C2]	RENIC	Spanish Network of Excellence on Cybersecurity Research
[C3]	CNIT	National, Inter-University Consortium for Telecommunications (Italy)
[C4]	ECHO	ECHO Project analyses, deliverables, documents

Table 49: CNOs used in alternative development

Reference documents and websites

The following documents have been consulted for the generation of this document:

Reference	Document Title	Document Reference
[C11]	CNO 1 Document 1	
[C12]	CNO 1 Document 2	
[C21]	CNO 2 Document 1	
[C31]	CNO 3 Document 1	
[C32]	CNO 3 Document 2	

Table 50: Reference documents

Glossary of acronyms

Acronym	Description
CNO	Collaborative Network Organisation
CNB	Central Network Body
RNB	Regional Network Body
BoD	Board of Directors
SC	Scientific Committee
AM	CNO's Associate Membership
CEO	Chief Executive Officer

Table 51: Glossary of acronyms, initialisms and abbreviations

Alternative Description

Note:

The alternative and description in this document are developed only as an example. The fifth combined alternative tasked to IICT will be developed and presented within the planned activities of D3.2 together with other four alternatives.

Scope, diversity and management of complexity

The Governance Model (GM) in this alternative is aimed at providing R&D excellence in cybersecurity on the national level.

The Network is limited to one country and its cybersecurity organisations and professionals.

The R&D activities are not limited to a specific ICT sector or cybersecurity domain.

Members are individuals from universities and from research organisations. The universities and research organisations are considered as network's centres, which have to certify and support the individuals.

Notes about description and information selection:

Important: These and following sections' notes are written just for the example. Do not include them into your alternative's description. Write the description as it is for only one CNO – the ECHO Project, not for the three CNOs included in analysis. We are developing alternative for ECHO Governance model.

All three CNOs have the same goal – C2 and C3 has R&D excellence in cybersecurity as a goal, so we have *preferred preference.* The C1 added training and "building the capacity of professionals", which do not contradict to the C2&3 goals.

All three networks are limited to national research organisations and professionals and they have no limitation in regard ICT or cybersecurity sectors.

The first look at C2 and C3 shows that they are organised as network of organisations – strictly universities and research laboratories. Nevertheless, both networks have also people from these organisations referred as members. The membership of individuals is provided only for people from the network participating organisations. Therefore, the network members – universities and research laboratories – can be considered as centres (or groups) for certification of individual members.

The C1 has only individual membership, but it has to be certified through the individuals' achievement in cybersecurity R&D. The membership is bound to regional branches (groups) of C1. This rule does not contradict the prevailing preference of other two CNOs.

So, for this Alternative we have:

Collaborative national network of universities and research laboratories, considered as a centre in the network, certifying and supporting the individual members.

Main goals are Research Excellence in Cyber Resilience and contribution to continuously improved education and training in Cyber domain.

Regional groups are considered as an option from organisational perspective as a middle level between centres/individuals and the National level.

Number of participants and attractiveness

Number of participants

The suggested organisation of the network, is restricted as type of members. Members can be universities and research organisations. There is no limit how many individuals from each member organisations can participate to the network.

The ECHO National Research Network on Cybersecurity (E-NRNC) is a CNO and aims at uniting of the most of the universities and R&D organisations in the field of cybersecurity. The individuals participating are large number and are measured in several thousands.

Organisation is limited to R&D (and support to E&T), as a target area and members, but it is spread geographically over all country's regions.

Stakeholders, customers and potential member engagement

E-NRNC has a Partnership book to attract new members and maintains Customer engagement strategy with well-developed Customer Satisfaction Program as well as Stakeholders Annual Conference.

The customer satisfaction survey and report are made on annual basis and focus on the following issues:

- evaluation of the research laboratories and the network administration work;
- response times for services;
- assessment of the degree of resolution of administrative practices, especially in the opinion of the members of the Scientific Council and of the Board of Directors;
- identifying the cybersecurity "critical issues".

In regard to membership, there is a Partnership book, explaining the members' terms and conditions, FAQ sections and brochure, document describing how the CNO engages potential members.

Notes about description and information selection:

C2 and C3 are limited as a type of organisations and not limited as a number of individual members.

C3 is established in 1995, C2 in 2013, C1 in 1999. We can consider two of them as very stable organisations – with period of existence of average more than 10 years. C1 and C3 provide the number of participating individuals – 5500 and 1190, so we assume that "several" thousand individuals are an excellent level of attractiveness for the alternative's CNO.

All existing CNOs are geographically spread over the countries' territory.

All three CNOs do not have strategies for engagement of potential members, customers and stakeholders.

There is only one survey for customers' satisfaction survey provided by C3, so here the rule for "one preference" was applied (see Section 3 from the Guidance).

Network competences and certification procedure

The E-NRNC network competences are in the centre of the members' accession. The E-NRNC has its own Eligibility Criteria document, developed by the Scientific Committee and approved by the General Assembly. The document provides requirements both for the candidate organisation and individuals. The requirements for a candidate organisation are based on management and ICT related standards. Specific rules are added for staff availability, educational degrees and training.

The level of capabilities is considered by central governance bodies of the Network – first they are approved by the Scientific Council (SC) and then the Board of Directors (BoD) take the decision to accept the candidate as a member. The BoD Secretariat maintains register of the member organisations with information about their status, competences and associate individual members.

The competences level and member accreditations are monitored regularly on a 5-year basis by specifically appointed Accreditation Commission by the BoD.

The competences and membership can also be audited by request. Sanctions are applied in case of violation of the Network rules, ethic code and deterioration of members' capabilities. The sanction can be a notice to the member or expulsion.

The sanction procedure can be initiated by signal from other members or by SC. The procedure is centrally controlled by the SC and BoD. Final decision is made in General Assembly if member appeals the procedure.

Notes about description and information selection:

The procedures described here are common for all three CNOs at general.

The C2 has the most developed procedure with written Eligibility criteria.

Maintaining the network goal consensus

The E-NRNC is led by long-term goals of reaching excellence in Cybersecurity research and providing technical advantages for ICT sector on the national level as well as support to the continuous improvement of E&T in Cyber.

There are three levels of network-wide governance and management as follows:

- Governance and Coordination (strategic level) comprised by General Assembly (GA);
- Governance and Control (strategic/operational level) – BoD, Advisory Board and Scientific Committee, Finance and Audit Committee;
- Executive (operational / tactical level) – Executive Team, led by Chief Executive Officer, supported by Secretariat and Technical Committee;
- Services (tactical level) – centres of the network / individuals, working on projects or providing defined in the Catalogue services.

The goals and tasks for the Network-wide operations within each year are set-up by the BoD and are monitored by the operational/tactical level bodies. The BoD approves and monitors the Annual Action Plan. The GA elects the BoD and the BoD elects the CEO.

The Executive level bodies are responsible for execution of the Action Plan. The action plan is divided by specific "missions", which can be considered as a project organisation for delivering the Action Plan's tasks. Missions are formed by a leading member organisation and members – other member organisations or individual members.

The ad-hoc activities and "missions" formed among members are also possible and are encouraged by the strategic documents. The ad-hoc mission of members should be coordinated and approved by the BoD.

All member organisations can propose strategic, operational and executive level goals and missions, the approval is made by respective organisational levels.

Activities are reported by the CEO to the BoD and approved or corrected. All consequences are described and managed by contractual agreements of the parties – the ECHO NRNC and the members.

Notes about description and information selection:

The procedures described here are common for C2 and C3, as CNOs with primarily organisational members, which certify and control the CNO individual members. The C1 has the same structure, but regional. All goals and activities for individual members are permitted and managed by regional branches.

The C3 has the best description of the procedures related to the goal's compliance. It can be argued that the procedure of the C3 envelopes procedures of C1 and C2.

Maintaining the trust within the network

The main instrument for maintaining the trust within the ECHO NRNC are the contractual agreements between the CEO and each organisational or individual member.

Each candidate organisation submits its application for Full Membership (FM) or for Associate Membership (AM). The SC and BoD consider the application according to the Eligibility Criteria document and procedures and decides whether to accept or to reject the application. If the decision is positive the ECHO CEO and candidate member negotiates on contract agreements, which includes the terms of participation for the candidate.

Each individual member also signs contract with ECHO CEO through the member organisation to which he or she applies for individual membership.

The members with FM have the right of one representative to and one vote in the GA. The associate members have an observer without voting rights in the GA. The AM can be considered as more loose contractual agreement with less obligations and rights than FM. The idea of the AM is to form a specific group of associated stakeholders.

Both representatives from full and associate member organisations can be proposed and elected in all governance and management bodies. The representatives have to be also individual members of the ECHO NRNC.

All of the decision of the GA requires simple majority of the votes, except decision related to changes of the ECHO main regulation, dissolution and establishment of new Advisory boards or specific Working group, which requires qualified 2/3 majority of votes.

The internal transparency is assured annually by the BoD's report to the GA on the Action Plan. The status of the members is provided and updated through the register of the member. The E-NRNC decisions and plans are disseminated through web portal named "ECHO NRNC Internal Area", accessible for the members.

The regulations dedicated to conflict resolution and arbitration between members follow the National practices – BoD, GA, court.

Notes about description and information selection:

The main source of this description is the C2 regulation, because they are most explicit.

All other CNOs has similar procedures, but C1 is oriented more to its individual members and C3 has its emphasis of universities and research laboratories as sectoral centres as main points of the decisions. Nevertheless, all three CNOs has central decision-making units and C2 has also RNBs, so there is no contradiction among studied CNOs of the alternative.

Centralisation and horizontal links

The following ECHO CNOs' procedures and decisions are centralised within the BoD:

- acceptance of organisational members (both with FM and AM);
- common CNO's projects, activities and actions;
- required network and members' capabilities;
- services provided by the CNO;
- availability of personnel for services;
- shared funds used for financing the network-wide activities.

All member organisations, acting as centres, have the right to make their own decisions within the centrally agreed parameters.

All member organisations can make horizontal links with other member organisations, establishing ad-hoc consortiums on the basis of mutual agreements. If the consortium is established for execution of a project related to the ECHO CNO (E-NRNC) goal or activity planned within the Action Plan, then the consortium can be funded by shared fund and has to be monitored and reported by the BoD to the GA.

All individual members can form expert groups the support from ECHO CNO. The activities of the expert groups are monitored by one of the member organisations, which is acting as supporting organisation. The group's activities are agreed, monitored and reported by the member organisation to the Executive Board.

Risk Management and shared funds

There are no specific strategic documents, rules or reports explicitly dedicated to the risk management for the ECHO CNO, except the availability of human resources. On the network-wide level the Annual Plan and allocation of resources are estimated by the Scientific and Advisory Committees. The BoD decides on final resource allocation for activities suggested by the Annual Plan (BoD endorses the proposal of the CEO and GA approves the proposal).

The availability of human resources is considered in relation to cybersecurity threat emergencies. The regulation accepted by the GA provide rules which has to be followed by each member organisation.

The shared funds are formed from membership fees, government subsidies and grants from external organisations. The membership fees are used for supporting the individual members' travels and expenses for mission and for participation to meetings, as well as for funding of the network's activities and missions in Annual Action Plan. These funds are monitored by the CEO and are reported to the BoD.

Main portion of the share funds consists from government subsidies and grants which are received by the network. The grant funds are dedicated to execution of tasks and missions and are managed by the groups and member organisations. The BoD is the main body which monitors the spending of these shared funds. The BoD reports to the GA and to the sponsors organisations.

Notes about description and information selection:

All three CNOs do not have any specific risk management related documents. There are no any risk management elements or phases (analysis, planning, monitoring, etc.) mentioned within the documents.

C2 and C3 has the same shared funds and fund sources and the same relatively vague description of the rules for spending the funds. All decisions are given in discretion of the governance and management bodies or to the ad-hoc consortiums formed from the CNOs' organisations for receiving the grants. The control and the monitoring (if present) from the CNOs of this consortium agreement is on low level and is considered as responsibility for the members.

Comparison of alternative's governance model, ECHO current operating model and the governance model proposed by the European Commission

The alternative for ECHO Governance model differs significantly from the Current Operating Model (COM) of the ECHO Consortium.

The COM is formed along the ECHO Project goals and working packages and is focused on providing the coordination of the consortium planned activities. The most important areas (or functions) for the COM can be seen in the structure of the ECHO COM at the highest central level.

ECHO COM has no regional or sectoral branches as the ECHO CNO described at this alternative.

Despite of the differences the ECHO COM can be transformed relatively easy to the ECHO CNO alternative. There are ECHO COM General Assembly and Project Management Board. The committees of the ECHO COM can be assigned as expert bodies, supporting the Board of Directors and Chief Executive Officer with his executive team for day-to-day activities management and coordination with regional or sectoral branches can be formed. The working packages of the ECHO COM involved in development of the ECHO services can be transformed to a sectoral branch.

The differences between ECHO CNO described in this alternative and the model proposed by the EC 2018/R630 Regulation are not significant at general. ECHO CNO model has the strategic level central bodies and procedures similar to these required at the Regulation – focus on NCC and the network considered as a Cyber Community. The accreditation could be easily transferred from ECHO NRNC to the ECC if required. The organisational members of the ECHO CNOs can be considered as national centres and the individual members as a Community.

In addition, the associate member organisation can be considered also similar to the Regulation's Community.

In the same time, the described model of the ECHO CNO alternative is less centralised from the R630's model on the regional level.

The transformation of the alternatives' governance model for ECHO CNO will require significant changes for synchronization on the regional level with the governance model proposed by R630

Annex 6 – Governance Model Alternatives Assessment Questionnaire How-to

The purpose

The main goal of the current activity of WP3/T3.3 is to assess the identified alternatives for the ECHO Governance model (GM) against each criterion within the criteria framework. The criteria ranking was the previous activity in which you had taken part by answering the Questionnaire on Criteria Ranking.

Here, during the alternatives assessment **we are not concerned** about the weights and priorities of the criteria. We have to **compare each alternative against each other** in order to assess which alternatives is better than others **in relation to each criterion**.

In our case we identify five alternatives and we have nine criteria. Thus, the following algorithm has to be followed:

1. Look at the criterion **"Level of Trust"** and answer the following *6 questions*[51]:
   1.1. **Alternative 1** or **Alternative 2** is better in regard to the first criteria ('Level of trust");
   1.2. **Alternative 1** or **Alternative 3** is better in regard to the first criteria ('Level of trust");
    …
   1.10. **Alternative 3** or **Alternative 5** is better in regard to the first criteria ('Level of trust");
2. Look at the criterion **"Number of Participants"** and answer the following 6 *questions*;
    …
9. Look at the criterion **"Risk Management"** and answer the following *6 questions.*

In all 9 question groups of the Questionnaire **you have to decide which of the alternatives** is **more preferable** against each other alternative, by answering pairwise comparisons.

The scale of the assessment is the well-known scale from the previous activity – from 1 (Equal important) to 9 (Absolutely preferred).

All 9 question groups (and their 6 comparisons) are structured as on the Figure 45 below.

	9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9	
A1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A2
A1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A3
A1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A4
A2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A3
A2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A4
A3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	A4

Figure 45: Questions about comparison of the alternatives

---

[51] The number of pairwise comparisons is calculated by the formula $\frac{(n-1)n}{2}$. In our case the number of comparisons are $\frac{(4-1)4}{2} = 6$.

Interactive help

In order to compare alternatives, you need to know the criteria's and alternatives' preferences, as well as the AHP main objectives. Information about these three aspects of the comparison are available interactively on each question's page.

The interactive help content will appear as **modal windows**. Modal windows are not pop-ups, so you do not have to agree on their use. Modal windows contain iframes with html pages stored on the Questionnaire's server.

Criteria links

You can see the description of each criterion below the question. You can open the criterion description by clicking the left mouse button on the link with criterion name, as it is shown on Figure 46.
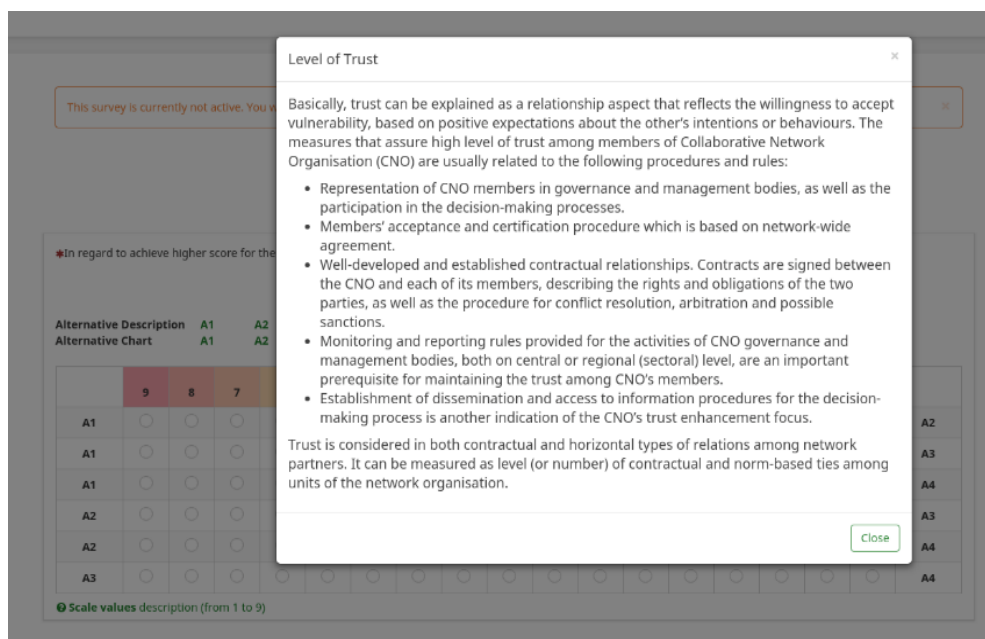
Figure 46: Modal window for the *Level of Trust* criterion

The How-to and Guidance links

There are other two links below apart from the link to the criterion description – links to this How-to and to the Full Guidance, as it is shown on Figure 47.

Figure 47: Links to each alternative's description and chart

When the modal window for the links are open, please click on the Menu icon ☰ (upper right corner) in order to open navigation and to see the structure of the document.

The alternatives' descriptions and organisational charts

There are also 8 links which open the description and the chart of each alternative.

When you open an alternative's chart you can see a short description of each organisational body. Tooltip with record about the body will appear when you hovering the mouse cursor over the body, as it is shown in Figure 48.
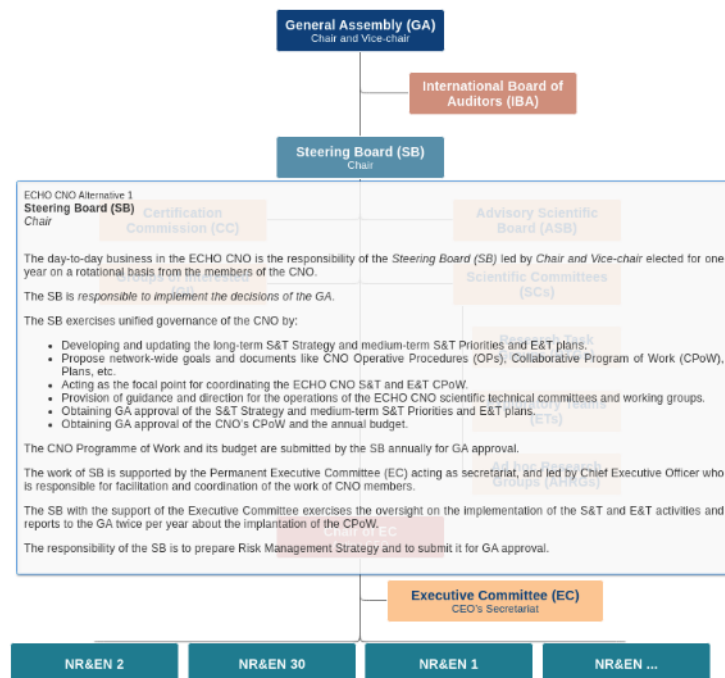
Figure 48: Tooltip for organisational charts

The Scale for assessment

You can see in any moment the Scale for alternatives assessment by clicking on the link *"Scale values description (from 1 to 9)"* below of the question table.

Assessing alternatives against the criteria (Answering the questions)

All 6 question in each of the 9 question groups have to be answered by selection of one option within the scale from 1 to 9. All questions are mandatory.

It is important to follow these steps when answering the questions:

1. Read the description of the two alternatives in comparison (left and right part of the table);
2. Remember the reason for comparison:

To decide which of the alternatives in comparison
is more preferable in regard to the criterion.

3. Analyse and decide which one from the two alternatives in comparison is more preferable and how much preferred it is.
4. Select the respective option within the answers' table, by following these rules:
   a) If the indicated with A1 alternative (left side of the table) is more preferable than the alternative indicated with A2, select form options left from the "1 – Equal";

9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9
○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○

   b) If the indicated with A2 alternative (right side of the table) is more preferable than the alternative indicated with A1, select form options right from the "1 – Equal";

9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○

   c) If both alternatives are equal suited in regard of the criterion, select 1 Equal;

9	8	7	6	5	4	3	2	1 Equal	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○