Toward CNO Characteristics to Support Business/IT-Alignment

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Abstract. Increasing market dynamics rapidly change the business landscape. Collaboration amongst organizations is a common way to cope with these dynamics. Achieving a state of Business/IT-alignment (BITA) within Collaborative Networked Organizations (CNOs) appears to be a valuable endeavor. Therefore, this paper investigates CNO characteristics, as a basis, to incrementally design BITA artifacts that facilitate CNO-dynamism. Via a structured literature review and an expert session, we synthesized a list of 6 main and 22 sub-characteristics for CNOs. This list provides more detailed characteristics than we found in the literature. We also discuss the importance of the characteristic "Dynamic and self-regulating network" and the need for new BITA models that can cope with the dynamics.

Keywords: Business/IT-alignment, Collaborative Networked Organization, Characteristics, Dynamism.

1 Introduction

Collaborative networks have become a common organizational form in current dynamic markets. A CNO consists of multiple participants that collaborate to achieve common goals [1]. This field of CNOs is not new (1990s). However, studies used inconsistent conceptualizations of the term and a broadly accepted ontology currently is missing [2, 3]. CNOs emerge from the pressing need to innovate, change and collaborate and efficaciously deal with environmental dynamics. This need becomes even more pressing since the speed in which market and environment evolve is increasing [4, 5]. This increase of dynamism in the environment could increase dynamism within the CNO leading to creation, reconfiguration/(re)partnering and decommission. This requires intense collaboration within the CNO, something that is only possible through the extensive use of IT.

Achieving a state of alignment within these CNOs appears to be a valuable endeavor that could provide benefits on agility and performance [6]. However, extant literature on BITA predominantly focusses on uniminded organizations (opposed to networked organizations) and does not consider the network dynamics 'lens' [6-10].

Recently, both management and Information Systems (IS) research increased attention towards the adaptive and co-evolutionary nature of BITA [11, 12] and dynamic, multi-faceted processes to align IT and the business in constantly-changing business environments [8, 13, 14].

This research paper investigates CNO characteristics to develop a basis for our research project to create new BITA models that facilitate CNO-dynamism. The paper is organized as follow. Section 2 provides some background on the concept CNO and BITA. Section 3 describes the research methodology that was used. Section 4 describes the results and contains the list of characteristics. This paper ends with a discussion (section 5) and conclusion (section 6).

2 Background

2.1 Collaborative Networked Organizations (CNO)

Organizations operate in dynamic environments where stakeholders and their wishes quickly change and they continuously need to innovate, change and collaborate to cope with these dynamics [7, 15]. Under these conditions, collaborative networks are emerging. This is a transformation from a uniminded system, which has the form of a single autonomous legal entity, to a multiminded social model, that has the form of joint ventures or collaborative relationships [16, 17]. Collaborative networks manifest in a large variety of forms [1, 15]. Camarinha-Matos and Afsarmanesh [1] argue that a CNO is "constituted by a variety of entities (e.g., organizations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital, and goals". Literature describes different characteristics related to CNOs like: exploit fast-changing market opportunities; flexible, rapid, dynamic and reactive network; partnership among independent companies and the high dependence on IT [3]. These characteristics reflect the network, environmental aspects and the goal-oriented focus of a CNO. These characteristics could operate on different levels, which can be classified as: (1) Participants level, (2) Context level and (3) the Marketplaces level [18]. The current body-of-knowledge provides various examples of CNOs. However, despite valuable research effort, the vast majority of studies does not provide clear characteristics for these organizations.

2.2 Business/IT-alignment (BITA)

In a CNO, IT is directly used to manage the information exchange and communication between participants [1, 15, 19]. To manage the whole IT landscape, BITA is commonly used. BITA refers to applying IT in an appropriate and timely way, in harmony with business strategies, goals and needs and leads to an increase in agility and performance [6]. Henderson and Venkatraman [22] argue that organizations should embrace continuous adaptation and change to achieve alignment and business goals. As such, they argue that 'no single IT application – however sophisticated and state of the art it may be – could deliver a sustained competitive advantage' [20].

Recent studies support this view [6, 8, 12, 21]. However, how alignment is achieved within complex networks remains largely unaddressed [6-8], and mainstream concepts for BITA are developed for uniminded organizations [7, 22]. BITA models that recognize and can cope with CNO-dynamism do not exist yet.

3 Research Methodology

Three steps can be recognized, respectively structured literature review, expert session and confrontation. The structured literature review is executed based on methods of Levy and Ellis [23], Armitage and Keeble-Allen [24]. The literature is processed by title & abstract selection, reading, comprehending, evaluating the literature until only relevant literature was left. Forward and backward searching is applied to the results to get additional literature. The quality parameters for this review were: (1) peer reviewed; (2) not older than ten years (not applicable to seminal papers); (3) written in the English language. No limitations to geographical locations were applied. We used EBSCO Host (Academic Search Elite, Business Source Premier and E-Journals) to acquire the literature. Some special interest journals were selected based on the "MIS Journal Rankings" list [25]. We built queries based on the three main research components (**Table 1**) and the above mentioned quality parameters. The following combinations were used: CS+CNO+BITA; CNO+BITA; CS+CNO; CS+BITA. Depending on the number (<100) of results, additional parameters (Year and Special Interest Journals) were added. Experts involved with this research project provided additional, recent, literature ([8, 26, 27]).

Table 1. Search queries on research components

Complexity Science (CS)	CNO	BITA
("co-evolution" OR coevolution OR "evolutionary theor*" OR "self organi?ation" OR evolution OR tension OR adoption OR emergence)	("networked organi?ation" OR "collaborative networked organi?ation" OR "collaborative networks" OR "netwok organi?ation" OR multiminded OR "business network" OR "virtual organi?ation" OR "virtual organi?ation breeding environment" OR uniminded OR multiminded)	("IT/business alignment" OR "IT/business strategy" OR "business strategy" OR "IT strategy" OR "IT governance" OR "enterprise architecture")

The team did an expert session using the Metaplan® method [28] and consists of three scientific researchers on the senior level and one Ph.D. researcher. All in IT, complexity sciences and/or BITA/CNOs field. All participants were given literature to prepare for the session, [2-6, 19, 22, 26, 27, 29-32]. The duration of the session was 2 hours.

The session was divided into the following phases: (1) Describe goal; (2) Individual brainstorm about characteristics of CNO; (3) Explanation of characteristics; (4) Group characteristics; (5) Review groups; (6) Map expert session characteristics

groups on groups from literature review; (7) Recap & finish-up. The characteristics from the literature review were not provided as preparation material. The team activity started with phase 3. As the first team step, participants had to describe their insights and ideas to the other participants. In phase 4, these characteristics were categorized, grouped and duplicates were removed from an overall CNO characteristics list. In phase 5, the characteristics and groups were incrementally reviewed and reformulated. During phase 6 the characteristics and groups from phase 5 were mapped on the characteristics from the literature review. This resulted in a set of relationships between the characteristics from the expert session and the characteristics from the literature review. Finally, phase 7 recapped the session and the results. The facilitator processed and distributed the results for validation to all participants.

In the confrontation, the characteristics from literature and the expert session were critically reviewed and compared. The identified relationships from the expert session served as a foundation for the confrontation. As the synthesis subsequently developed, studies and outcomes were read and reread to check all the relevant topics and interpretations. The final list of CNO characteristics was created by categorizing, combining, splitting, rewriting and restructuring the characteristics. This step within the confrontation process resulted in an ordered schema of main and sub characteristics. Characteristics could operate on different levels, being: Participants; Context; ECO-Systems [18]. We categorized the characteristics on these specific levels to synthesize our list. Traceability of these actions was logged during the process.

4 CNO Characteristics

The literature review resulted in a large amount of results (**Table 2**). Criteria were added to limit the results and focus on higher quality literature. This was done for the combination CNO+CS and BITA+CS. The search queries resulted in 108 articles that could be reviewed and used for forward and backward searching on the references. The highest results came from the combination BITA+CS. BITA is a broad researched area and by adding criteria, the results were limited to 52. Switching criteria did not have relevant effects on the articles included in the review.

Table 2. Results from literature review and additional quality criteria

Input	Results	Added Year	Added Journals
BITA + CNO + CS	5		
CNO + CS	162	120	4
BITA + CS	2.000+	1.543	52
BITA + CNO	47		

In most cases literature used the term “characteristics”, but “attributes” and “viewpoint” were also used. We did not exclude articles based on the usage of a different term. **Table 3** shows the synthesized common characteristics derived from this review, coded as L1-L12.

Table 3. CNO Characteristics from literature review

#	Characteristic	References
L1	Decentralized decision-making unit/non-Hierarchical	[2-5, 22, 30-32]
L2	Lack of a consistent strategy across participants	[2, 4, 5, 22]
L3	Dynamic and self-regulating network	[2-5, 22, 26, 27, 30, 31]
L4	Highly rely on IT	[1-5, 15, 19, 22, 26, 27, 32]
L5	Equality between the participants	[2, 3, 31, 32]
L6	Shared knowledge, capabilities, risk. High amount of trust.	[2, 3, 26, 27, 30-32]
L7	Evolution and continuous interaction with the environment	[2, 22, 26, 27, 30]
L8	Autonomous participants	[1-5, 15, 26, 27, 30-32]
L9	Geographically distributed	[1, 15]
L10	Heterogeneous operations (culture, social capital and goals)	[1, 3, 15, 31]
L11	Common goals between participants in a fast-changing market	[1, 3, 15, 30-32]
L12	Co-creation of customer solutions	[26, 27, 31]

Esposito and Evangelista [3] describe several shared characteristics: Exploit fast-changing market opportunities (L11); Share costs/risk, skills and core competencies (L6); Flexible, rapid, dynamic and reactive network (L3); Partnership among independent companies (L8); Temporary relationships (L3); Collaborative/Cooperative relationships (L5, L11); Extensive use of ICT and computer networks (L4). Esposito and Evangelista [3] mention a clash within the literature in the field of management. One part of the literature focusses on hierarchical structures and others on so-called holarchical structures. They state that "In the holarchical VE, partners act as a single business entity and the self-organisation approach is the main coordination mechanism". In this quote, VE can be interpreted as CNO. This clash is visible in the model of Camarinha-Matos, Afsarmanesh [15] where hierarchical structures could map to long-term strategic partnerships and holarchical structures to goal oriented networks.

Dekkers [22] pays attention to CNOs from a manufacturing perspective and states that an important difference between monolithic companies and CNOs is the absence of a central decision-making unit (L1), the lack of a consistent strategy across all the agents (L2) and the capability to reconfigure the network (L3). Concha, Espadas [19] address the need for specific ICT solutions (L4) to make sure participants can communicate with each other within the dynamics of a collaborative network.

Walters and Buchanan [2] state that: CNOs are not hierarchical but participants are equal within the network (L5); The network is dynamic and self-regulating (L3); There is knowledge sharing within the network (L6); The network is evolving and constantly interacting with its environment (L7); It's a learning organization (L6).

Camarinha-Matos, Afsarmanesh [15] mention the following common characteristics for CNOs: Networks composed of a variety of entities which are largely autonomous (L8), geographically distributed (L9) and heterogeneous in terms of their operating environment, culture, social capital and goals (L10); Participants collaborate to (better) achieve common or compatible goals (L11); the interaction among participants are supported by computer networks (L4).

Weber [30] researched the supply chain agility of CNOs. In her study, she synthesized the following characteristics for CNOs: Loosely related group of companies formed to enable collaboration towards mutually agreed on goals (L1, L8, L11); Focus on adaptability, flexibility and the ability to react quickly to changes in the market (L3, L8, L7); Substantial cost reductions, higher productivity and greater satisfaction of both employees and customers because they provide the means to create greater focus and integration (L6).

Van Alstyne [31] synthesized the following characteristics from literature: A network organization maintains permeable boundaries either internally, among business units or externally with other firms (L3, L5, L8); Management is less hierarchical (L1); deriving its authority more from expertise than from rank (L1, L6); Higher degree of intangible, local, or specialized know-how (L6, L10); Communication is direct and point-to-point rather than "through channels" (L1); knowledge of emerging problems and opportunities may arrive via multiple loose associations or weak ties (L3); Resources are specialized and customizable within a given product or service scope (L11); less vertically integrated than their hierarchical counterparts (L1); Purposeful agents may establish ties to other agents and organizations (L1, L3); Tasks are more project and less functionally driven (L11); Differentiated products (L11, L12); integrated staff conception and line executing (L1); local concerns are more locally addressed and thus owned (L1); High degree of trust and commitment between parties; sharing risk (L5).

Rahman and Bhattachryya [32] also mentioned characteristics for organizations: They have a shared vision and goal and/or common protocol of cooperation (L8, L11); They cluster activities around their core competencies (L6); They work jointly in teams of core competence groups, to implement their activities in a holistic approach throughout the value chain (L1); They process and distribute information in real time throughout the entire network, which allows them to make decisions and coordinate actions quickly (L4); They tend to delegate from the bottom up whenever economies of scale can be achieved, new conditions arise, or a specific competence is required for serving the needs of the whole group (L1) Also Rahman and Bhattachryya [32] mention the characteristics: Autonomous participants that collaborate in VO (L8). Shorter lived organizations focused on a common goal shared among participants (L11); Sharing risk, knowledge and capabilities (L6).

There are different views in the literature on these collaborative networks like a business process management point of view [26, 27], social view [16], manufacturing view [22]. The characteristics used within these different viewpoints overlap.

In the expert session, the participants provided in total 37 characteristics (**Table 4**) coded as M1-M37. In most cases, the characteristics could be related to the literature review. At the end of the session, consensus was achieved on the characteristics, groups and relationships to characteristics from the literature review. M1; M2; M3; M7; M18; M19 are new characteristics. M1, M29, M35, M37 were mentioned multiple times by the experts. Also, relationships between characteristics from the experts were established. We agreed that there was a relationship between M2 and M3, M2 and M4, M4 and M5, M5 and M6. These relationships fit within the topics of modularity, interaction levels and the level on which modularity is described. M18 is relat-

ed to M17 and M19, which are related to adaptation and evolution of the CNO. Lastly, the experts concluded that M27 has a relationship with M28 (Panarchy life-cycle follows a Möbius-strip movement).

In phase 6, most of the characteristics from the expert session were related to L3 (9x), L1-L6-L7-L8-L11 (5x). Characteristics L2 and L5 did not have any characteristics attached from the expert session. This could be related to a different interaction maturity level as described by Camarinha-Matos, Afsarmanesh [15], Camarinha-Matos and Afsarmanesh [29]. In their articles, they describe a lower interaction level called "cooperation" or "coordinated network" where organizations do not have these characteristics.

Table 4. Characteristics from expert session

#	Characteristic	#	Characteristic
M1	Long-term/short-term	M20	IT is an integral part of collaboration
M2	Level of collaboration (business, information, tech)	M21	Infrastructure
		M22	Essential capabilities (IT, strategy, communication)
M3	Maturity (integrated/connected)		
M4	Modular (loosely coupled)	M23	Trust basis
M5	Many-to-many relations epistatic relations	M24	Distributed capabilities
		M25	Complementary partnerships
M6	Interaction patterns (int./external)	M26	Sharing of resources
M7	Size CNO (# orgs, #employees, #revenue)	M27	Panarchy life-cycle (adaptive cycle)
		M28	Möbius-strip organization
M8	Control function	M29	(in)Dependence from partners
M9	No mandatory central org. struct.	M30	Location/time zone
M10	Control of the network (central, decentralized, hybrid)	M31	Culture
		M32	Diversity
M11	Collaboration fixed/dynamic	M33	Common goals within the networked organization
M12	Dynamic partnering (join/leave)		
M13	Change/adaptation	M34	Goal(s)
M14	Complex landscape of organization	M35	Product vs. service-orientation (product/process)
M15	Networks can change in volatility	M36	Individual org. cannot achieve the shared goals
M16	Environmental turbulence		
M17	Non-linear	M37	Developments/manufacturing vs co-creation (customer)
M18	Emergent		
M19	Multi-level effects		

The confrontation resulted in 6 main characteristics (**Table 5**) coded as N1-N6. In this process, characteristics were rewritten, combined, and split up into multiple characteristics. For instance, N1 was created from the characteristics L11, M33, M34, M36, L12, M37, all these characteristics are related to common goals between participants. L6 was split up into N2.1, N2.2, N2.3, N2.4. N2.4 was combined from L6 and M23. Both are related to trust within the network. Another example is N2.5 that was

combined from M20, M21, M22, L4 because all these characteristics were related to the fact that "IT is an essential capability". The groups, being: (1) Participants; (2) Context; (3) Marketplaces [18], provided some guidance in the process.

We noticed that the characteristics from the literature review were in most cases on a higher abstract level than characteristics from the expert session. We also noticed that the characteristics from the literature review were not directly linked to each other, but by combining the results from the expert session, relations manifested. A relationship is visible between the cluster around IT (L4) and the cluster related to capabilities, risk and trust (L6) via M22. This relationship shows that IT can be seen as an expertise of a participant, and resulted in the combination of the two characteristics in N2. A relationship is also visible between the cluster around dynamics within the network (L3, N3) and continuous interaction with the environment (L7, N5). Where the first is categorized in (2) Context and the latter in (3) Marketplaces. This shows the relationship between the internal dynamics within the network and the external dynamics within the environment that both influence the CNO. The relationship between the clusters around dynamics within the network (L3, N3), CNO hierarchy (L1, N1) and participant autonomy (L8, N4), show the independent and autonomous nature of the participants. This is in line with the definition of CNO provided in Camarinha-Matos and Afsarmanesh [1].

Table 5. CNO Characteristics

#	Characteristic	#	Characteristic
N1	Common goals between participants within a fast-changing market (co-creation)	N4	Autonomous participants
		N4.1	Non-hierarchical determined control function for the network (centralized, decentralized, hybrid)
N2	Complementary partnerships, shared & distributed capabilities		
		N4.2	Modular (loosely coupled)
N2.1	Shared knowledge	N4.3	Lack of a consistent strategy across participants
N2.2	Shared capabilities		
N2.3	Shared risk	N4.4	Equality between the participants
N2.4	High amount of trust	N4.5	No geographical limitations on distribution of the organizations
N2.5	IT is an essential capability		
N2.6	Level of collaboration (business, information, technology)	N4.6	Diverse/heterogeneous operations in culture, social capital and goals
N3	Evolution (change/adaptation) and continuous interaction with the environment	N5	Dynamic and self-regulating network
		N5.1	Dynamic partnering (join/leave, fixed/dynamic, short/long)
N3.1	Adaptive cycle (Panarchy cycle)	N5.2	Complex landscape of organization
N3.2	Environmental turbulence	N5.3	Many-to-many relations epistatic relations
N3.3	Emergent behavior		
N3.4	Multi-level effects	N5.4	Interaction patterns (int./external)
N3.5	Non-linear effects	N5.5	Maturity (integrated/connected)
		N6	Size CNO (#organizations, #employees, #revenue)

5 Discussion and Future Research

Ever increasing market dynamics and turbulence rapidly changes the business landscape and ecosystem of organizations. CNOs are a common organizational form to cope with environmental dynamics [1, 4, 5]. Participating organizations need to efficaciously adapt and co-evolve with the dynamics within the network and the environment. The synthesized characteristics (**Table 5**) try to capture these dynamics.

From literature we understand that CNOs highly rely on IT to collaborate within their network of participants [1-5, 15, 19, 22, 26, 27, 32] and that IT systems are a core element of high-performance configurations [33]. According to El Sawy, Malhotra [33] a complex configuration of multiple elements could lead to higher performance and thus strategic sustainable advantages. Current BITA models do not specifically address this CNO-dynamism and are predominantly focused on unminded organizations opposed to CNOs [6-9]. Also, IT is an important enabler within CNOs, and IT systems are a core element of high-performance configurations. We therefore argue that CNOs could benefit from BITA models that could increase agility and performance [6]. Therefore, we continue our research to synthesize and design BITA models. We argue, based on the outcomes of this study, that these types of models should fit the dynamic nature of CNOs, the environment they operate in and acknowledge that IT systems facilitate rapid creation, reorganization or decommissioning of CNOs in these turbulent and dynamic times. This dynamics "lens" fits the characteristic group "N5 Dynamics and self-regulating networks". By combining results from the SLR and expert session to one set of characteristics, we try to assist researchers to examine CNOs and CNO-dynamism. In our future research, we will specifically use the characteristic group "N5 Dynamics and self-regulating networks" to design BITA models to facilitate CNO-dynamism.

Obviously, this study has several limitations. First, by executing a SLR, with clear constructed queries, qualitative journals and multiple indexes, we tried to achieve a broad view on the research topic. Nevertheless, literature could be missed due to these particular parameters and the addition of parameters could limit the results. Second, bias, i.e. the inclination to hold a particular perspective, among experts could be an issue since the authors of this article took part in the expert session. We think this effect is limited due to the fact that we used a systematic expert review and validated the characteristics against the characteristics found in the literature review. Finally, no additional validation currently has been performed on the outcomes of this research, i.e. the list of characteristics. This will be part of our future research. We do think that the constructs, like CNOs and their characteristics, are sufficiently valid by using high-quality literature, an expert session and the structured confrontation of the two results.

6 Conclusion

Outcomes of this paper contribute to IT and CNO literature through three key findings which raise several theoretical and managerial implications. First, extant (IT) literature does not adequately address and explain how CNO-dynamism is facilitated through the use of IT-resources and capabilities. Hence, we argue that the design of adequate BITA models is an important step in order to explain how CNO-dynamism can be supported. Moreover, these insights could be beneficial for executives and business managers in practice in order to drive organizational and collective CNO efforts that would increase agility, performance and ultimately competitive advantage.

Second, the complex multi-faceted interrelations and interactions among the many stakeholders and (IT) resources can only be investigated through a methodological 'lens' that explains non-linear dynamics among the many interacting agents and components [34].

Third, the current study synthesized a list of 6 main characteristics (**Table 5**) that can assist researchers to examine CNOs. Via the creation of characteristics for CNOs, we observed that there could be a relationship between complexity science and CNO-characteristics. Future research can investigate and identify specific configurational and contingency alignment patterns within the CNO-context.

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