Chapter

Simplexity: A Hybrid Framework for Managing System Complexity

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Abstract

Knowledge management, management of mission critical systems, and complexity management rely on a triangular support connection. Knowledge management provides ways of creating, corroborating, collecting, combining, storing, transferring, and sharing the know-why and know-how for reactively and proactively handling the challenges of mission critical systems. Complexity management, operating on "complexity" as an umbrella term for size, mass, diversity, ambiguity, fuzziness, randomness, risk, change, chaos, instability, and disruption, delivers support to both knowledge and systems management: on the one hand, support for dealing with the complexity of managing knowledge, i.e., furnishing criteria for a common and operationalized terminology, for dealing with mediating and moderating concepts, paradoxes, and controversial validity, and, on the other hand, support for systems managers coping with risks, lack of transparence, ambiguity, fuzziness, pooled and reciprocal interdependencies (e.g., for attaining interoperability), instability (e.g., downtime, oscillations, disruption), and even disasters and catastrophes. This support results from the evident intersection of complexity management and systems management, e.g., in the shape of complex adaptive systems, deploying slack, establishing security standards, and utilizing hybrid concepts (e.g., hybrid clouds, hybrid procedures for project management). The complexity-focused manager of mission critical systems should deploy an ambidextrous strategy of both reducing complexity, e.g., in terms of avoiding risks, and of establishing a potential to handle complexity, i.e., investing in high availability, business continuity, slack, optimal coupling, characteristics of high reliability organizations, and agile systems. This complexity-focused hybrid approach is labeled "simplexity." It constitutes a blend of complexity reduction and complexity augmentation, relying on the generic logic of hybrids: the strengths of complexity reduction are capable of compensating the weaknesses of complexity augmentation and vice versa. The deficiencies of prevalent simplexity models signal that this blended approach requires a sophisticated architecture. In order to provide a sound base for coping with the meta-complexity of both complexity and its management, this architecture comprises interconnected components, domains, and dimensions as building blocks of simplexity as well as paradigms, patterns, and parameters for managing simplexity. The need for a balanced paradigm for complexity management, capable of overcoming not only the prevalent bias of complexity reduction but also weaknesses of prevalent concepts of simplexity, serves as the starting point of the argumentation in this chapter. To provide a practical guideline to meet this demand, an innovative model of simplexity is conceived. This model creates awareness for differentiating components, dimensions, and domains of complexity management as well as for various species of interconnectedness, such as the aligned upsizing and downsizing of capacities, the relevance of diversity management (e.g., in terms of deviations and errors), and the scope of risk management instruments. Strategies (e.g., heuristics, step-by-step procedures) and tools for managing simplexity-guided projects are outlined.

Keywords: complexity, complexity sciences, edge of chaos, emergence, heuristics, management patterns, simplexity, simplicity

1. Introduction

For several decades [1] complexity management represents a standard constituent of the generic management body of knowledge. This signals that complexity management is far from being a hype or a management fad [2]. Across numerous disciplines of natural, social, and systems sciences, the complexity approach serves as a holistic framework for various types of formal modeling [3–7]. It utilizes complexity as a key unit of analysis. The spectrum of approaches includes, for instance, mass production, risk management, international management, the design of hybrids (vehicles, learning methods, plants, materials, strategies, etc.), dynamic nonlinear systems, change management, descriptive statistics, conflict management, probability theory, catastrophe theory, chaos theory, dissipative structures, as well as fuzzy set theory and management.

Not all variants of "complex" or "simple" are denoted by exactly these terms. Quite often, terms like "sophisticated," "diverse," "maxi," "big," "mega" (e.g., megaproject management), "multi," "poly," "distant," "nontransparent," "full" (e.g., full service, full or fat clients), or "fuzzy" are used to delineate complexity. The "weak versus strong" wording, for instance, has an (ambiguous) connection to the complex-simple distinction: weak signals are in fact complex due to their hidden, ambiguous, conjectural, unclear, or fuzzy character. In contrast, there is no affinity between the so-called weak or strong ties and complex or simple ties. Likewise, "light" does not always mean "simple": "Light" versions in terms of minimal requirements for equity of start-ups are in fact simple. In contrast, "light" signaling a reduced amount of detrimental ingredients (tar in cigarettes, sugar in sodas, etc.) does not imply simplicity.

The management of complexity follows two antithetic paradigms: on the one hand, simplification, i.e., the reduction of complexity, and, on the other hand, complexification, i.e., the augmentation of complexity. Among scientists and practitioners, there is a manifest bias for the simplification paradigm, in terms of "taming," "cutting through," "killing," "overcoming," or "fighting" complexity. The mantra of complexity reduction [8, 9] is reflected in philosophical and methodological concepts like Occam's razor, ceteris paribus assumptions, austerity, dogmatism, order, parsimony or amnesty, and "one in, one (or two or three) out" rules for fighting red tape (bureaucracy), in management concepts such as concentration on core competencies, freezing specifications of products, averaging, summarizing, standardizing, off-the-peg products, eliminating items, filtering noise, streamlining, 0CX (zero complexity), closed innovation, closed shops, simple rules, less-is-more effect, preprocessing rules, reduction rules (e.g., "kernelization"), damping of oscillatory systems, churn management, funnels, stabilizing, homeostasis, equilibria, linearization, lean management, 80:20 rule, focusing, establishing regularities (e.g., on the timeline: rhythmic intervention and equidistant check-ups [10]), normal distribution, abstraction, practices following "simplify your life" guidelines or "Keep It Short and Simple" (KISS) slogans, as well as everyday phenomena such as using abbreviations, concise and brief descriptions "in a nutshell," or halo, primacy, and recency effects.

Nevertheless, a comparatively long list of complexity-friendly approaches such as mixes, product variants, customer segmentation, portfolios, open innovation [11], management by exception, double-loop learning, deutero learning, borderless organization, wisdom of crowds and swarm intelligence ("the many"), black swans [12], chance [13], multiplex relationships, informal relationships, creative destruction, 360-degree feedbacks, models of embeddedness, paradoxes (inventor's paradox, Icarus' paradox, anti-patterns, Red Queen effect, etc.), incomplete contracts, hybrid concepts like mass customization [14], coopetition [15], co-production, organized anarchy or hybrid clouds, production detours, triangulation as a measurement principle, intermittent reinforcement schedules, power law tails (e.g., the "long tail"), divide et impera strategies, blended learning, leagility, it takes three to tango-constellations [16], extended (mixed and augmented) reality, arborescent structures (binary, bifurcate, treelike, etc.), prosumers, frenemies, customized, personalized, turnkey or bespoke problem solutions, "thinking outside the box" slogans, and "breaking down silos" mentality, documents a plea for "embracing" complexity. In the same vein, complexity serves as the core of business models, e.g., in the shape of full service, diversification, mass personalization, derivatives, blue ocean strategies, or hyper-competition [17].

Both paradigms have evident drawbacks, partly owing to the superficiality of the implicitly underlying distinction between "bad" complexity and "good" complexity. Against the background of their respective strengths-weaknesses profiles, a mix or hybrid blend of the two approaches serves as a promising heuristic: Following the generic best-of-both-worlds logic of hybrids, the strengths of one second-best approach are capable of compensating the weaknesses of the opposite second-best approach to some extent—without just neutralizing "minus-operations" by "plus-operations." An optimistic blending scenario even allows for the accumulation of strengths. The term "simplexity" has been proposed to capture the essence of this simple-complex-hybrid [18–22]. Within the scope of patterns for handling complexity in conflicts, simplexity represents the opposite of tit-for-tat patterns which rely on "more-more" or "less-less" procedures.

Existing simplexity models [23–26] advocate, for example, simple infrastructures, rules, and heuristics [27–30] for optimizing complex systems. In addition to the explicit simplexity approaches, some models like divergent-convergent problem solving or sedimented change [31] implicitly deploy simplexity, e.g., in terms of less volatility obtained via more ambiguity. Along the lines of simplexity, the punctuated equilibrium concept [32, 33] mixes phases of continuous change (or even stasis) and discontinuous change in the evolution of social systems. In models of path dependence, episodes of minimal variance (diversity) follow episodes of high variance [34].

The underlying blending approach is not just delineating the coexistence of simplicity and complexity. Moreover, simplexity stands for connections between the two paradigms, both cause-effect relationships (e.g., simplicity causing complexity), and means-end relationships like simplicity mastering complexity. In mathematical or sciences models (chaos theory, catastrophe theory, bifurcation theory, etc. [35, 36]), research on "order out of chaos" and "chaos out of order" [37] characterizes specific linkages between complexity and simplicity.

At first glance, some hybrid concepts like glocalization (characterized by the slogan "Think global, act local") also belong to the cluster of complex-simple models. However, glocalization factually represents a predominantly complex approach since the underlying formula correctly reads "Think global, act multi-local."

2. Simplexity: state-of-the-art review

Unfortunately, prevalent models of simplexity not only suffer from common infancy problems typical of all innovative and particularly of paradoxical approaches. Their utility is deeply impaired by fundamental misconceptions. Existing models of simplexity mainly recommend the solution of "complex" problems by simple means. Yet, the underlying creed "simple rules for complex organizations" goes along with several inconsistencies.

A coherent notion of complexity or simplicity is missing. Whereas simplicity is specified in terms of numbers of rules, hierarchical levels and specialists, semi-structures, clarity, unambiguity, and persistence, the complexity of decisions or organizations is only vaguely specified (big business? high-tech business? diversified portfolios? global players?), quite often not relying on the same unit of analysis as simplicity.

A distinction between formal and content-specific ways of modeling problems and solutions is not stringently deployed. For the modeling of companies and their environment, primarily system theory has made us familiar with the distinction between formal modeling (elements, relations) on the one hand and content-specific modeling (brands, employees, computers, compensation, corporate culture, etc.) on the other hand. However, existing simplexity approaches do not differentiate between "complex tasks" (formal modeling) and "difficult tasks" [38] (content-specific modeling) nor between "simple" and "easy". "Difficulty" denotes the overall challenge of solving problems, e.g., bootstrapping is difficult due to a restricted availability of money, skills, and knowledge. For levels of extreme difficulty, terms like intractability, dilemmas, wicked problems [39, 40], super wicked problems [41], mission impossible, or death spirals have been proposed.

In contrast, "complexity" only captures the formal aspects of a challenge, such as ill-structured problems, multitude, instability, unpredictability, ambiguity, and uncertainty. Difficulty, e.g., as a feature of matrix structures, normally implies complexity. However, formal modeling has to make complexity explicit, in matrix organizations, for instance, in terms of the number of matrix managers required, two-line system, or conflicts. This also applies to priority sequencing rules (e.g., random selection or longest processing time). Likewise, the concept of antifragility [42], also a mix of difficulty and complexity, is based on specific stressors, mistakes, or shocks that cause better performance. Within a formal complexity-focused modeling, this concept is labeled "complex" since the achieved improvement is counter-inductive or paradox. In the same vein, "feasible," "viable," "intangible," "cheap," "disproportionate," and other notions cognate to simple (or complex) require some refinement as for their implicit complexity. Thus, the performance of a plan B depends on its content. Through the lens of complexity management, it depends on alternatively relying on two different plans A and B. In analogy, organizational "tents and palaces" differ with respect to their missions, from a complexity angle with regard to their respective stability.

The complexity-focused versus difficulty-focused modeling also applies for mindfulness, a concept that foremost serves as a potential to handle difficulty [43]. Coping mindfully is accomplished by focusing on the essentials such as the bottom-line problem(s). However, complexity approaches per se do not provide guidelines for prioritizing or ranking according to relevance.

Along these lines, the specific threats spotted in a SWOT analysis of strengths, weaknesses, opportunities, and threats (e.g., new entrants, substitutes, bargaining power of customers, bargaining power of suppliers, competitive rivalry) are difficult whenever appropriate strengths to cope with these threats do not exist.

In this case, a complexity-based modeling informs about the number of threats, level of imbalance of power, surprise, misleading signaling of competitors, and further complexity aspects.

Likewise, single-loop, double-loop and triple-loop learning differ with respect to the learning content (actions, rules, learning method). The wording signals that they also differ from a complexity point of view with respect to the diversity of learning modes.

Conversely, focusing on the one, i.e., most restricting bottleneck, may be considered as simple. Yet, spotting this critical bottleneck in a sea of bottlenecks, covering, for instance, possible political, economic, social, technological, environmental, and legal constraints diagnosed via a PESTEL analysis, is truly difficult. In the same vein, decomposing a problem into subproblems makes problem solving easier but simultaneously also more complex given the additional task of integrating the partial solutions.

Finally, as a nonacademic exemplification, "living in summertime" is easy ("fish jumping," "cotton high"). Whether it is simple (transparent, unambiguous, predictable, non-chaotic, etc.) has to be clarified via some formal modeling. In analogy, the frequently addressed "writing of a short letter" is primarily difficult because elaborating and focusing the content takes time. In addition, it is "complex" since a complex input (lot of time spent on writing) goes along with an ostensibly simple output (short letter).

The lesson learned from these examples reads: The lack of differentiation between complexity-focused modeling and content-specific modeling, typical of prevalent simplexity models, most likely turns any model into some complexity reasoning and concurrently "complexity" into a platitude.

In existing models of simplexity, there is no stringent differentiation between complexity load and complexity potential, i.e., resources deployable to cope with the respective complexity load. Actually, organizations may be (as well) considered as complex owing to the scope of their resources, their versatility, technical capacities, and dynamic capabilities (ambidexterity, change readiness, etc.). Including potential into the notion of complexity explains, for instance, that in times of Big Data capabilities [44], the complexity-triggered risks of information overload or paralysis by analysis may have to be reconsidered. The extension of complexity-based modeling also makes clear that so-called small worlds are not genuine "simple" worlds: even though one node "simply" needs a handful of immediate ego-centered connections, its worldwide connectedness requires a complex relationship potential provided by the totality of all nodes.

The ample evidence of high performance (when working with simple rules, semi-structures, or fast and frugal heuristics) provided in prevalent models signals optimism bias and meliorism. Failure due to following simple rules is hardly ever addressed. Consequently, groupthink (e.g., self-censorship) which is simple but not high performing is disregarded. This also holds for activities following, for instance, the arm's-length principle or the forward-backward scheduling in project management which are complex but performing.

The trade-off between effectiveness and efficiency is underestimated when arguing that simple rules "work." Complex "detours" in management like the "divide and rule strategy," step-by-step implementation, decomposition of tasks, decomposition of time series, or the involvement of third parties (impartial conflict managers, bartering, clearing houses, election monitors, etc.) are effective although not necessarily efficient.

Effectiveness is frequently cut down to adaptability, flexibility, fluidity, adjustment, or agility. This bias results in neglecting "compatibility," "interoperability," "standardization" (e.g., the company language, non-discrimination policies), as well as "economies of scale and scope" as relevant performance criteria.

The focus on structure in prevalent simplexity models goes along with a rudimentary notion of infrastructure. In addition to structure and routines (i.e., the traditional core of governance), infrastructure comprises human capabilities (e.g., empowered "complex practitioners," "comps"), self-organization, information technology, and trust. Furthermore, structure or infrastructure do not necessarily constitute disabling and restricting constraints, e.g., of repertoire and options, but may serve as enablers (e.g., of more latitude, degrees of freedom).

Hybrid entities (apart from complex-simple hybrids such as organic-mechanistic mixes), like public private partnerships, mixed top-down and bottom-up coordination, prosuming, coopetition (e.g., generic and brand-name drugs in the same corporate portfolio), chaordic systems, leagility, or the mixed push-pull control of supply chains, represent—despite their effectiveness—alien elements in the majority of prevalent simplexity models, most likely due to their complex genes.

Finally, the focus on opportunities leads to neglecting risks and the infrastructure for risk management. However, the inherent plea for self-organization requires underpinning infrastructures to cope with some downsides of self-organization such as non-compliance, discrimination, shadow economy, plagiarism, corruption, managerial entrenchment, moral hazard, bootlegging, and reactance.

3. Architecture of simplexity

3.1 Meta-complexity

In addition to the inherent inconsistencies delineated above, prevalent models of simplexity underestimate or even ignore the meta-complexity of their core basic concepts: management and complexity. As a consequence, the handling of complexity degenerates into a truism, a pseudo-guideline, or a misleading compass. The following sections contour the implicit meta-complexity of the architecture.

In addition to the complexity of complexity management, a closer look at the complexity concept reveals several architectural features of meta-complexity. Actually, there is no such thing as "the" monolithic complexity. The following sections deal with the variety of building blocks (components, domains, and dimensions) and their connectedness. Strictly speaking, any reference to "complexity" should be specified by three coordinates, i.e., component, domain, and dimension.

3.2 Complexity of managing complexity

Simplexity approaches have to accommodate themselves to the generic complexity of managing complexity. Across the board, the three generic building blocks of management processes, i.e., objectives, context, and instruments, are marked by complexity in terms of multitude, diversity, ambiguity, and instability. The scope of performance measures, i.e., effectiveness and efficiency, is not just a matter of multitude, i.e., a complex multi-criterion system, but also of trade-offs between criteria. Furthermore, objectives are subject to changes: Levels of aspiration vary in accordance with success or failure (e.g., from maximizing to satisficing). Moreover, factors like the installed base effect or the volatile weighing of performance criteria cause instability of pursued performance levels.

The complexity of the context, particularly the environment of an organizational entity, is a constituting feature of prevalent management models. Standard models of environmental analysis screen various domains of the context. As a rule, the screening discovers divergent trends in different domains, e.g., imbalances of power on procurement markets may differ from those on sales markets. Portfolio analysis, for instance, is marked by ambiguity with respect to the supposed differential controllability of the two portfolio dimensions, e.g., market growth versus market share. Instability in the shape of turbulent environments is commonly considered the touchstone of professional management.

Last but not least, meta-complexity also characterizes the instruments of complexity management, as a rule hallmarked by multitude, diversification, and hybrid mixes. A core challenge for managing complexity is ambiguity due to an overlap of emergent and engineered variants of complexity. For the understanding and the handling of this overlay, generic hybrid or mixed management concepts like rational heuristics [45], bounded rationality, ecological rationality, logical incrementalism, guided evolution, bricolage, patching, or controlled chaos have been conceived. They combine the "reconstruction" of emergent complexity phenomena (evolution, behavior) and the purposeful "construction" of "optimal" complexity-focused concepts (development, action).

Reconstruction relies on understanding emergent complexity-related patterns such as coevolution, ecological rationality, path dependence, the transitivity principle ("enemies of my friends are my enemies"), regression toward the mean, central tendency bias (in survey-based data collection), viral dissemination, rules of thumb, frozen accidents, percolation, ripple effects, heuristics out of the "adaptive toolbox" of individuals (e.g., recognition heuristic, representativeness heuristic, naïve allocation), chunking, framing, stereotypes, antifragility, Brooks' law, the simplicity paradox, and other unintended consequences or paradoxes as well as trends and hypes. In fact, models of emergent simplexity quite often deal with irrationality, dysfunctionalities, misfits, and paradoxes, e.g., handling of cognitive dissonance, amnesia, neurotic defense mechanisms, bipolar disorders, or adverse selection. The Darwinian model of evolution composed of complexity augmenting "variation and reproduction" and complexity reducing "selection and retention" represents a seminal emergent simplexity pattern.

The construction of (optimal) complexity is based on means-end models of standardization, commoditization, industrialization of services business models, carry-over parts, elimination (e.g., of negative aspects), smoothing, averaging, linearization, accelerating or decelerating of change [46], hiding, or camouflage. Thus, some complexity-driven cyberattacks like email bombing aim at overwhelming the capacity of servers. In pricing, more transparency (i.e., less complexity) can be obtained by partitioned pricing and less transparency (i.e., more complexity) by drip pricing.

To sum up, the resulting hybrid management models of simplexity management consist of a fusion of emergent building blocks (i.e., context and unintended effects or side effects such as collateral damage and externalities) and engineered building blocks (i.e., means and ends): The winner-take-all phenomenon—creating, for instance, the so-called GAFA world, i.e., dominated by players like Google, Apple, Facebook, and Amazon—perfectly illustrates the hybridity of simplexity management; it combines emergent complex processes (e.g., by facilitating network effects) on the (multi-sided) demand sector (i.e., more customers) with simplifying the supply sector (i.e., fewer vendors, quasi-monopoly). Likewise, congestion models (such as traffic or network congestions) combine emergent building blocks (e.g., queueing delays) and engineered ones, e.g., congestion avoidance.

3.3 Multicomponent architecture

Unlike prevalent approaches which consider complexity solely as a load, stress, hardship, or evil, an unbiased approach differentiates between two components of complexity [47]: A straining complexity load and a valuable complexity potential that can be used for handling this load. The spectrum of complexity potential comprises both hard factors (e.g., Big Data analytics, warehouse management software for chaotic storage, data highways, memory capacity, network capacity with a different reach of wide area networks and local area networks, facilities, transmission capacity, Internet infrastructure, built-in flexibility, delay-tolerant networking, upward compatibility, slack, float, buffers, space, safety stocks, commons, complex adaptive systems, traffic system capacity, capital, project budget, patents, claims, etc.) and soft factors such as complexity competencies [48]; open culture (shared values and beliefs); self-organization; intelligence; entrepreneurship; conflict tolerance; forbearance; patience; role flexibility; versatility; ambiguity tolerance; single-loop, double-loop, and triple-loop learning; mindfulness; trust; "loopholing" (finding and exploiting loopholes); meta-competences; and dynamic capabilities [49].

One has to keep in mind that a complexity potential captures merely formal features of the resources in question (e.g., available worktime, high availability of servers), not all aspects of the asset, e.g., not skill or will factors of individuals.

All interactive systems, i.e., communication, exchange, supply chains, value nets, competition, conflict, or teams, entail domains for each player involved, e.g., each stakeholder of a company. From a complexity point of view, every domain comprises two components attributed to the respective actor. As a consequence, concepts that look similar through the complexity lens, e.g., "second sourcing" and "dual sourcing", have to be distinguished as "customer-driven risk management" versus "manufacturer-driven risk management," respectively.

Without an attribution to actors, the differentiation between load and potential is factually impossible since the complexity potential of one party may constitute a complexity load for the other party: Hence, a plan B represents a potential for the respective planning player but a load other players have to cope with. Likewise, in distributive conflict constellations, claims and negotiating faculties of one party constitute a load for the opposite party. In the same way, customer lock-in represents a potential for the vendors but a latitude-narrowing load for the customers.

In integrative conflict management, neutral third parties are characterized by a specific profile of components: On the one hand, their complexity load consists of the diverging interests of the conflicting parties. The complexity potential on the other hand contains skills for detecting and emphasizing communalities, e.g., shared superordinate goals.

The component architecture requires the clarification of some fuzzy basic concepts: in the case of "diversity," this clarification identifies this notion either as a complexity load (e.g., different standards, lack of communalities, tension, Babylonian confusion) or a complexity potential (e.g., scope, interdisciplinarity, source of creativity) depending on the respective context.

The two-component model goes along with several patterns of simplexity (Section 4.3). Many of them rely on a blend of reducing load (simplification) and augmenting potential (complexification). Thus, in simplexity-oriented conflict management, models combine de-escalation strategies, i.e., the investment in reducing discrepancies between involved parties or decoupling parties on the one hand with establishing conflict tolerance as well as promoting integrative strategies of negotiating (for win-win situations) on the other hand. In the same vein, post-merger integration combines dismantling of discrepancies and establishing of more commonalities.

3.4 Multidimension architecture

An in-depth analysis reveals that complexity itself constitutes a multi-facet construct covering several dimensions [50]. One-dimensional concepts which alternatively focus on either size (e.g., number of stakeholders or iterations, mass production) or uncertainty (e.g., randomness, discontinuity) are incapable of capturing all relevant aspects. Even two-dimensional models like the Duncan matrix (complexity and dynamics) [51], Stacey matrix [52], and the Cynefin model or three-dimensional approaches like the diversity-ambiguity-turbulence model do not embrace all facets of complexity. More useful are four-dimensional models like the so-called VUCA-world model (volatility, uncertainty, complexity, ambiguity), IBM's four Vs of Big Data (volume, variety, velocity, and veracity), or the four-dimensional model of multitude, diversity, ambiguity, and dynamics [47]. Examples of high complexity illustrate both complexity load (lists on the left sides) and complexity potential (lists on the right side) in **Figure 1**.

Quite often, each of the four categories covers several complexity aspects as sub-dimensions. So, in time series analysis (e.g., of climate data), it is assumed that dynamics consist of one or several systematic patterns (global warming trend, seasonal fluctuations, long term cycles, etc.) and of random noise (e.g., extreme and erratic weather). As outlined in **Figure 1**, the whole spectrum of exemplifications of complexity can be construed and explained by a combination of four dimensions of complexity. This umbrella concept unifies the prevalently separated modeling in terms of complicatedness, multitude, dynamics, uncertainty, and complexity. Consequently, when applying the four-dimensional terminology, the terms "complex adaptive system" or "complex dynamical systems" [53, 54] have to be paraphrased by referring to two dimensions of complexity, e.g., by "diverse and adaptive/dynamic systems."

For a better comprehension of the meta-complexity challenge, the four dimensions are consolidated in **Figure 1** to two "archetypes": The two dimensions of the "both-and" or "conjunctive" or "additive" complexity can be consolidated to

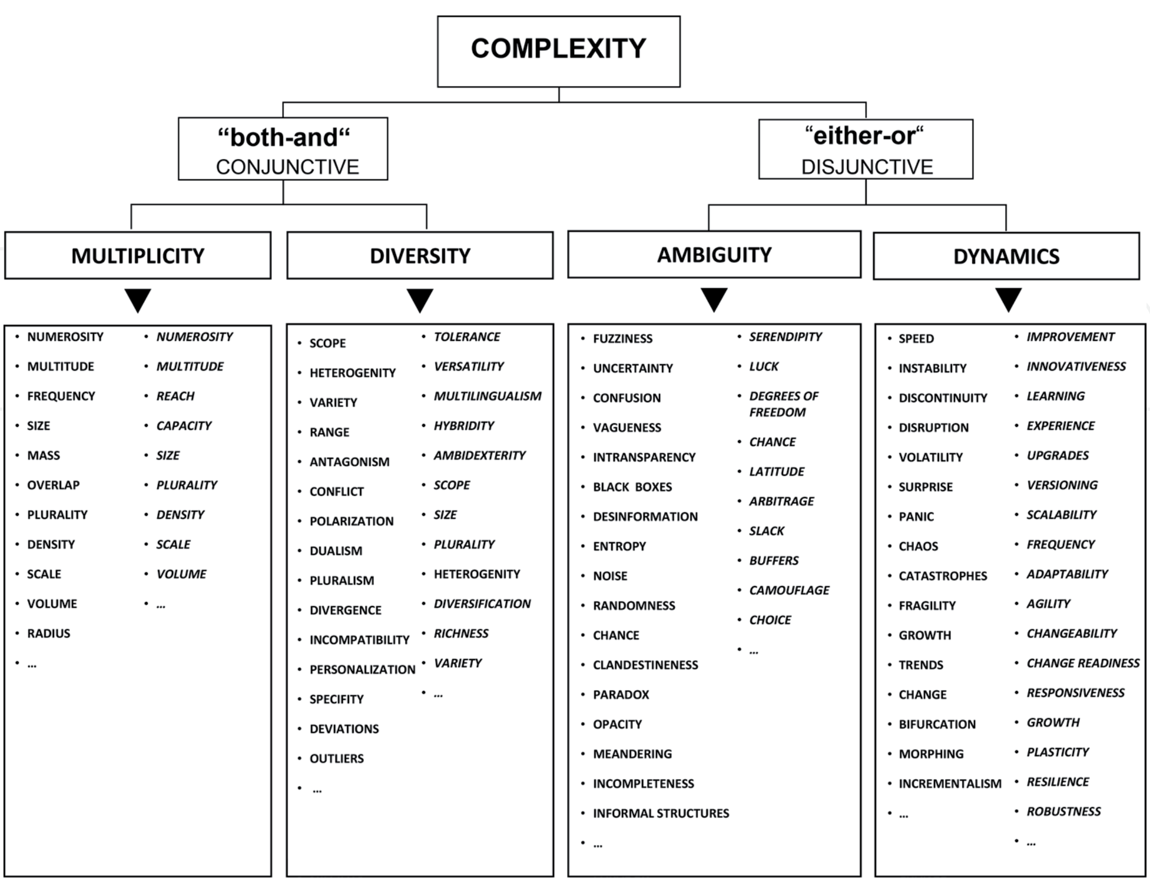

Figure 1.
Dimensions of complexity.

diversity, since diversity implies at least two items (i.e., numerosity), likewise the two dimensions of the "either-or" or "disjunctive" or "alternative" complexity to dynamics, since dynamics—like ambiguity—also diminishes the identity of an entity over time. In analogy, complexity potentials to handle big numbers or heterogeneity can be packed to an integration potential, correspondingly the capabilities to handle fuzziness and volatility to a flexibility potential [55–59].

This compact two-dimensional approach allows a specific differentiation between "simple" and "complex" complexity: An extremely complex complexity load results from an accumulation of diversity and dynamics. The simultaneous coexistence of additive complexity (short: diversity) and alternative complexity (short: dynamics) characterizes hyper-complexity [55, 60]. This challenge transcends the mere propagation of complexity across the four dimensions, e.g., the propagation of volume into variety, diversity into ambiguity, or ambiguity into volatility.

Consequently, one should consider that the umbrella term "complexity" houses two significantly different species of complexity: So, one variant of complex organizational structures is characterized by many and fine-grained regulations, typical of hierarchies. Another variant relies on few and ambiguous regulations (e.g., opening clauses, incomplete contracts, delegation). However, against the background of manifold interconnections between the dimensions (Section 3.6), complexity does not consist of two strictly separated islands. In fact, the connections, e.g., in the shape of complexity propagation across dimensions, serve as bridges between these islands. For example, due to inter-dimensional connections, hybrids are usually characterized by two rather different categories of complexity features: diversity ("fusion of two worlds") and ambiguity ("lack of identity").

In contrast to this complementary accumulation on the load component of complexity, there is a considerable risk of a conflict between the concurrent availability of an integration potential (for handling diversity) and a flexibility potential (for handling turbulence). Awareness for this imminent conflict comes, for instance, from the so-called organizational dilemma according to which diverse team configurations facilitate flexibility (e.g., creative problem solving) but inhibit integration in terms of reaching consensus. In the same vein, unrelated diversification (i.e., a high level of diversity in the shape of conglomerate diversification) supports flexibility (e.g., risk management) but does not generate synergy (i.e., integration). In contrast, related diversification serves as a source of synergy, though not being capable to support risk management.

Nevertheless the resolution of this conflict seems feasible, for instance, by deploying simplexity concepts. Thus, some sophisticated pricing systems like two-part tariffs [61] manage to mix integration (by means of a fixed price component reflecting ordinary average costs or consumption) and flexibility by a variable price component for deviations. Likewise, mass customization delivers both integration (cost-efficient manufacturing of standard modules) and flexibility (customized configuration of modules).

3.5 Multi-domain architecture

Meta-complexity requires a holistic approach covering several domains of complex phenomena. Domains are defined in the shape of specific actors (stakeholders in value adding networks, individual and collective actors such as teams or coalitions, etc.), populations (swarms, crowds, customer segments, etc.), temporal units (periods, episodes), spatial units (terrains, countries, geographical regions, etc.), levels in hierarchical systems such as product-trees and organizations, knowledge domains (e.g., know-that, know-why, know-how), organizational units (companies, departments, divisions, projects, committees, etc.), and domains of diversity such as gender, age, language, and ethnicities as well as performance domains (e.g., the perspectives in a balanced scorecard). Unfortunately, standards for domain demarcation, either horizontal or vertical, are missing. This gap is responsible for another facet of meta-complexity. Anyhow, the common reference to "the" (turbulent) environment as "one" domain lacks differentiation since different domains of environment show different complexity aspects, e.g., the upstream domain versus the downstream domain of a supply chain.

In general, inter-domain simplexity is the result of the increasing complexity load in one domain in conjunction with a compensatory decrease in a separate domain in order to avoid an increase of the overall complexity load. Thus, standardization in procurement and production (simplicity) is frequently fused with personalization (complexity) in marketing.

3.6 Interconnectedness

Meta-complexity is not just a matter of multicomponent, multidimension, or multi-domain constellations. In addition to this coexistence of the building blocks, the architecture also encompasses various connections between them [62]: Just like light creates shadow, mass and diversity (frequently labeled "complicatedness") constitute a driver of the significantly different features of complexity, i.e., ambiguity and dynamics, traditionally viewed as complexity in the narrower sense. Prevalent approaches like matrix-based concepts of complexity ignore these varieties of derivative complexity by assuming an orthogonal configuration of the respective dimensions (e.g., diversity and turbulence).

Connections between the building blocks of complexity are logical or empirical as well as emergent or engineered. Logical connections between dimensions arise from the fact that alternative complexity logically implies additive complexity: So, ambiguity as well as change is based on a heterogeneous set of items. Likewise, flexibility requires multiplicity and diversity, e.g., in the case of dual sourcing, hedging, or plan B. Finally, all complexity dimensions imply multiplicity.

The landscape of interconnections encompasses connections within one component, one dimension, or one domain and between two or more components, dimensions, or domains. In addition to two-stage connections, there are typical multistage inter-dimension as well as inter-domain connections. Multidimension connections result from a multistage proliferation, e.g., reduced group size logically going along with less diversity, more identity, and less fluctuation. Multistage inter-domain connections are characteristic of conflict management, e.g., in the shape escalating or de-escalating, of several sequential tit-for-tat interactions or of the triggering of follow-up conflicts possibly involving additional parties. Bidirectional connections (e.g., feedback loops) may yield spiraling effects such as death spirals or the spiral of trust evolution.

Intra-component connections (across domains) deal with interconnected complexity loads (e.g., jobs and follow-up jobs) or complexity potentials (e.g., automation, outsourcing). Exemplifications of intra-dimension connections are (1) dynamics relying on multiple patterns of change, in the case of climate change, for instance, trends, i.e., global warming, and random erratic weather, (2) the linkage between the numerosity of nodes and of edges, and (3) multiple diversity, e.g., the endeavor to reach a simultaneous balance with respect to gender, age, ethnicities, and nationality in committees. Conflicts and follow-up conflicts as well as cost overruns and delays in managing projects illustrate the essence of intra-domain connectedness.

Some inter-component connections warrant a congruence of complexity load and potential. Thus, Say's law of markets assumes that supply volume creates its demand volume, whereas Keynes' law states that demand creates its own supply. In contrast, the so-called pig cycle model is characterized by the imbalance of demand volume (load) and supply volume (potential) caused by lags in the adjustment process. Remanence constitutes another example of an unbalanced constellation caused by latency: Even though jobs or projects (load) have been finished, extant human resources, facilities, and machinery (potential) cause (remanent) costs. Learning or experience curves deal with another load-potential connection, i.e., the improvement of skills and knowledge (potential) as a result of learning by doing or repetitive execution of jobs (load).

Fragility constitutes an emergent simplexity pattern between load and potential: An increasing complexity load, e.g., in the shape of ruinous competition, stress, or avoidance-avoidance conflicts, impairs coping capabilities due to the degeneration of muscle, disabling of capabilities, or panicking.

Inter-dimension connections occur predominantly as simplification or complexification patterns. Thus, the number of members in social networks triggers diversity, possibly yielding both positive and negative network effects. Likewise, ambiguity may cause volatility or oscillations.

As is generally known, systems management emphasizes the inter-domain connections between two formal domains: the number and scope of elements (e.g., companies in a supply chain or supply network) and the multiplicity or diversity of relations (e.g., flows of information, of merchandise, and of money). Against this background, the focused dealing with the complexity of a single enterprise, market, business unit, department, period or episode, etc., detached from other systems or subsystems, is necessarily bound to underestimate the actual scope of the respective complexity challenge or potential since it neglects the inter-domain connections.

Moral hazard in complexity parlance assumes a complex nontransparent situation regarding the attribution of outcomes to activities of an individual as member of a collective (team, community, insurance entity). The lack of transparence motivates and enables an individual member to exploit the complexity of a system to increase his individual utility at the cost of the other members which creates inequality (diversity) among the members.

The following examples illustrate the simplexity-based variants of connections between domains:

- The law of large numbers implies simplexity: numerosity (e.g., many trials) creates less uncertainty, i.e., better estimations.

- In adverse selection, a nontransparent situation, i.e., a factually skewed diversity of clientele against the background of an assumed balanced diversity, paradoxically creates the homogeneity of the clientele: the selection process reduces the diversity of factual customers, unfortunately adversely to the intentions of the provider of the service in question.

- Information flow analysis with a complexity focus captures diversity like media breaks (e.g., digital to print media) and dynamics in the shape of error propagation across domains, both across departments and along supply chains (e.g., bullwhip effect). In the same manner, complexity-focused material flow analysis deals with delays, inventories, just-in-time sourcing (complexity load), and diversity of multimodal and intermodal transportation systems (e.g., last mile delivery, railroad combined transport) as complexity potential.

- Inter-level connections within multilevel systems (e.g., organizational hierarchies, product trees, global, regional, and national standards systems) concern top-down dissemination (e.g., control and command, compliance) and bottom-up dissemination (suggestions, good practices, benchmarks, etc.).

- In business relationship management (e.g., supplier relationship management), a balance is required between the domains of interdependency (e.g., reciprocal exchange, sharing, distribution of property rights) and integration (e.g., standards, solidarity, trust).

- Border management, i.e., relocating borders between two (or more) domains as well as merging or splitting existing domains, aims to achieve more interdependency and integration inside certain domains than between different domains. Border management is accomplished, for instance, via mergers and acquisitions, joint venturing, spin-offs, carve-outs, sourcing (insourcing-outsourcing), customer segmentation, decoupling the push-domain and the pull-domain of a supply chain, regulating access to information, and radically switching from closed to open innovation. In multilevel entities, e.g., corporations comprising the domain of a holding company and the domain of subsidiaries, the relocation of borders frequently results in centralization or decentralization.

- From a simplexity angle, insourcing, at first glance a pattern of simplification by means of reducing dependence on suppliers, constitutes in fact a simplexity pattern: the reduction of interdependence with external suppliers goes hand in hand with a higher demand for proprietary resources and internal coordination.

4. Multilevel architecture of simplexity management

4.1 Spectrum

The building blocks of simplexity-focused management originate from a management architecture composed of an abstract-generic paradigm level, a pattern level, and a concrete-palpable parameter level. Paradigms of simplification, complexification, or simplexity have an ample extent combined with a poor specification, whereas parameters (e.g., processes and tools of diagnosing, planning, implementing, measurement) have a narrow extension coupled with high specification. In between, patterns (e.g., punctuated equilibrium, sedimented change, transitivity principle, priority rules for modifying complexity load or potential, attractors) are marked by a medium range of application as well as a mean precision. Paradigms and patterns serve as frameworks for the application of parameters.

4.2 Paradigm of simplexity management

The two-component model serves as a guideline for a balanced handling of complexity: Neither merely reducing nor solely augmenting complexity but aligning complexity load and complexity potential represents the suitable heuristics for handling complexity.

According to the generic fit-performance model, the fit, match, balance, congruity, or congruence of complexity load and complexity potential helps approximating the optimal system performance. This also includes temporal congruence, i.e., the synchronization of load and potential. The congruence approach comprises both the notions of requisite complexity (e.g., Ashby's law) and requisite simplicity.

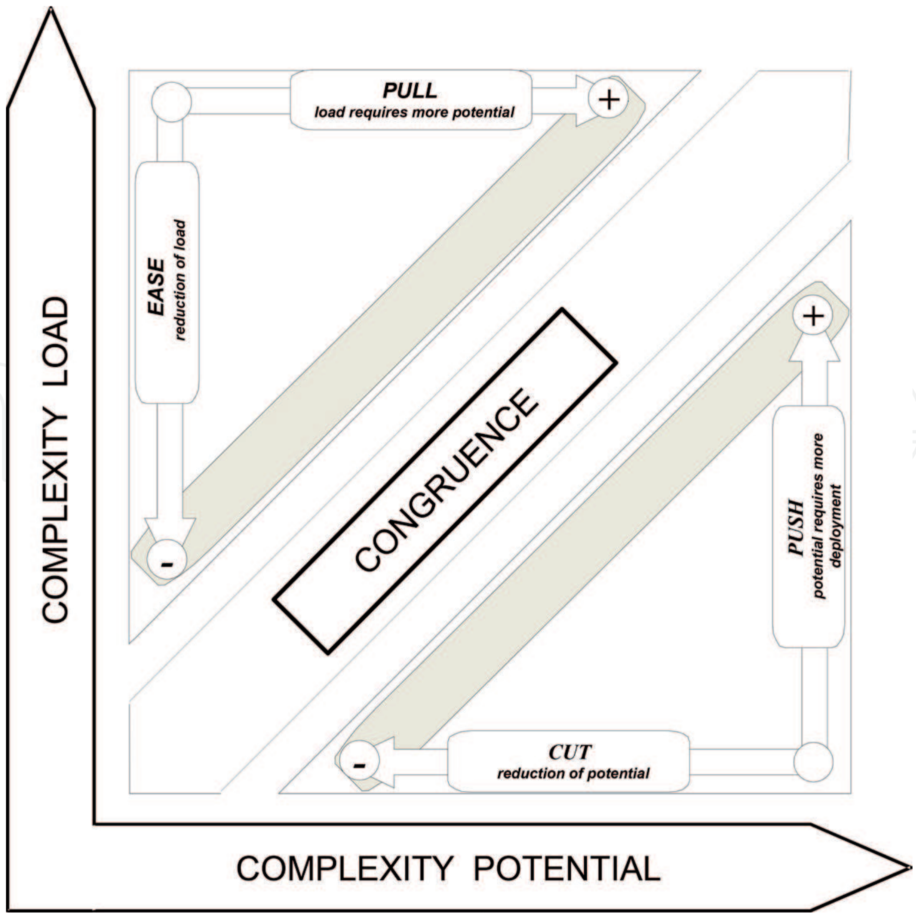

Figure 2.
Alignment of complexity load and complexity potential.

The underlying idea of congruence bears a specific ambiguity: As illustrated in **Figure 2**, congruence represents a corridor, not just a line. The corridor concept partially intersects with the Ashby space [63]. The corridor encompasses slack constellations, i.e., slightly more potential than load, as well as stretch constellations, i.e., slightly more load than potential. As a consequence, this tolerance approach deviates from the stringent (temporal) alignment applied in just-in-time strategies. The corridor implies the existence of tolerable imbalances in terms of slight overload ("stretch" to mobilize potential), as well as slight surplus, e.g., "slack" to respond to unexpected increases in complexity load as well as so-called tit-for-two-tats strategies in conflict management, allowing the opponent to defect from the agreed upon strategy twice which requires a tolerance potential on the side of the "forgiving" party. Finally, the corridor leaves space for contradictions and paradoxes like escalating commitment [64].

The idea of load-potential congruence is elucidated by the following examples:

- In dealing with systems of (linear) equations, congruence (warranting solution) is reached if the number of unknowns (complexity load) equals the number of equations (complexity potential).

- The paradigm of sensemaking [65] fosters a congruence by reducing the complexity load (primarily in the shape of the unknown) to a level that makes sense, i.e., is comprehensible with available knowledge (potential).

- Several hybrid concepts of organization are capable of furnishing a hypercomplex congruence, i.e., both an integration and flexibility potential as response to a blended load of diversity and dynamics. Thus, in strategic management holdings, the corporate center (shared services) is in charge of integration, whereas the subsidiaries (business units) are in charge of flexibility. In a similar way, "decentralized centralization," i.e., centers of competence installed in units or nodes of decentralized organizational entities (corporations, networks, etc.), delivers both integration and flexibility. Likewise, franchise systems or a cooperation between a big (pharmaceutical) corporation and a small (biotechnology) start-up yields integration and flexibility. Finally, the slogan "small within big is beautiful" conveys the conjunction of integration and flexibility.

- Congruence-focused simplexity management is efficient since it eliminates excess complexity both in the load component (e.g., an overlap of self-organization and intervention, overlapping of competences) and in the potential component ("waste").

- As for effectiveness, e.g., in terms of creativity and adaptability, the congruency between high levels of load and of potential delineates the notorious "edge of chaos" which actually constitutes a "region of chaos."

- Conversely, incongruence causes the risk of complexity-driven failure: Thus, a lack of synchronization of load and availability of potential may engender delays, inventories, or unpunctuality. In the same vein, so-called super wicked problems are characterized by the fact that the time (load) available for solving the respective problem (e.g., damping the greenhouse effect) is shorter than the time needed to develop countervailing strategies of problem solving, e.g., reaching a consensus on climate laws or proactive measures like a carbon tax [41].

- In interactive contexts, the inherent existence of two loads and two potentials requires differentiated investigating into congruence or incongruence. So, a complexity view of so-called asymmetrical information between two actors (e.g., principal and agent) is characterized by a discrepancy of two complexity potentials: The actor having an informational advantage (agent) augments his potential by disinformation, e.g., hiding, camouflage, faking, misleading signaling, and creating ambiguity. This increases the incongruence with the principal's potential.

- Competition goes hand in hand with typical interrelationships between the complexity components of the two actors involved. Thus, in a two-competitor constellation, the complexity potential of competitor I (e.g., surprising) most likely creates a complexity load ("threat") for competitor II which causes incongruence. In contrast, cooperative interactions merge the respective resources and equally the complexity potentials.

Whenever the relationship between the actors is unclear which economically corresponds to the hybrid constellation of coopetition, load-potential relationships are also ambiguous, like in the case of so-called good competitors.

4.3 Patterns of simplexity management

4.3.1 Patterns of blending and assignment

Simplexity management operates on two categories of patterns: (1) blending patterns which answer the question: "How can simplicity and complexity be mixed?" and (2) assignment patterns that clarify which component, domain, or dimension serves as an arena for simplification and which for complexification.

For blending simplicity and complexity, a scope of several patterns of blending is available. Awareness for this scope comes, for example, from blending exploitation and exploration according to the pattern of contextual ambidexterity or the pattern of structural ambidexterity. Again, this spectrum of amalgam, multilevel, sequential, sectoral, subsidiary, and situated patterns of blending options [66] illustrates how meta-complexity is underestimated in existing simplexity approaches that normally assume a "one and only" blending pattern.

Within amalgam mixes the blending is performed in a "total" fashion, yielding new genuinely hybrid frameworks that incorporate both genes of their parent paradigms. For instance, two-part tariff pricing operates with prices simultaneously composed of a fixed (simple) and a variable (complex) component. The multilevel blending pattern combines, for instance, a simple (stable) macro-level with complex (dynamic) microlevels. In a similar fashion, the blended Water-Scrum-Fall model [67] relies on a disciplined (simplified) handling of project specification and release, which serves as a framework for (complex) agile scrum processes in the design phase of the project.

In the case of sectoral and sequential blending, complexity managers pick different paradigms to apply them in distinct sectors, i.e., dimensions, components, and domains (areas, episodes, etc.) of the entire problem solving process: Along these lines, mass customizing is based upon standard modules (simplicity) in conjunction with creating a customized configuration of these modules (complexity) [14]. In the same vein, the unfreeze-move-refreeze pattern of attitude change relies on a sequential blending of complexification episodes (unfreeze, move) and simplification episodes (refreeze). So-called hybrid systems are capable of mixing continuous incremental changes ("flowing") and discrete dynamic behavior ("jumping"). By means of the outlined blending patterns, simple and complex strategies can be contingently assigned to different segments of the context, e.g., the intra-company context versus external targets.

Subsidiary blending, another blending pattern familiar from management by exception, combines a default (standard) approach (e.g., simplification) and a fallback approach (e.g., complexification). Thus, time pacing may serve as a default, event pacing as an exception. Finally, blended menus offer simplification and complexification as alternative options for ad hoc choices. As for problem solving tactics, the situated choice is between simple straight procedures (e.g., immediate performing) and complex detour procedures (e.g., rest before performing, problem decomposition). Likewise, path constitution comprises a "complex" path breaking option or a "simple" path dependence option [34].

4.3.2 Component-focused simplexity patterns

The cluster of assignment patterns locates simplicity and complexity in the load or the potential component. In unison with the simplexity paradigm, simplexity pattern clarifies ways of obtaining a congruence of complexity load and complexity potential via appropriate assignment strategies as portrayed in **Figure 2**.

Some of the patterns rely on strategies of complexity reduction, i.e., ease strategies reducing the complexity load and cut strategies reducing (idle) potential. Along these lines, more (less) slack represents the appropriate response to more (less) turbulence.

Inversely, strategies of complexity augmentation cover pull strategies ("complexity load requires more potential") and push strategies ("complexity potential requires more deployment"). Thus, in team development, norming, i.e., consensus, cohesion and commitment to rules (pulling potential), serves as a response to conflicts in the storming stage (pushing load). Likewise, practicing high-frequency trading requires sophisticated algorithms as technical infrastructure.

Blended pull ease—as well as push cut—strategies constitute the simplexity patterns, operating on two diametrical modifications of complexity load and complexity potential in the pursuit of load-potential congruence.

Thus, strategies of conflict management for developing more potential (tolerance, third party involvement, etc.) in conjunction with less load (decoupling of parties, providing proprietary assets, reduced claims, etc.) follow this pattern. In the same vein, flexi-time models usually rely on a compromise between three stakeholders of worktime, i.e., customers, employers, and employees. The divergence of interests, i.e., extended availability, avoidance of overtime payments, and work-family balance, is mitigated by deploying potential-enhancing devices (e.g., customer self-service, working remote) and sophisticated compromises like glide time.

Also in a pull-ease mode, so-called blue ocean strategies rely on designing innovative business models (pulling potential) that avoid competition (easing load).

In contrast, outsourcing relies on cut-pull strategies: In comparison to insourcing, outsourcing requires less investment in production activities but more investment in transaction activities.

4.3.3 Dimension-focused simplexity patterns

The landscape of patterns contains various proliferation patterns, i.e., more-more or less-less strategies. According to this logic, multitude and diversity trigger major changes in response (dynamics), e.g., when red lines are crossed, quota fulfilled, or critical values (e.g., break-even points) reached. Similarly, according to Gresham's law, the multiplicity of currency generates diversity in terms of a differentiation of functions ("store of value" versus "medium of exchange") between "good money" and "bad money." In the same vein, democracy combines the majority rule (multitude) with the protection of minority rights (diversity). In addition, the landscape is characterized by several simplexity patterns.

Thus, so-called incomplete contracts require only a modest investment of time for conclusion (simplification) but go along with frequent renegotiations (complexification). Optimal lot sizing (achieved by balancing ordering costs and inventory costs) through the lens of complexity relies on choosing between many small quantities and few big quantities. Likewise, the optimal dosage of change relies on choosing between many small steps (incrementalism) and few big jumps (low multiplicity in conjunction with high rates of change), at the extreme, a single "big bang."

Sedimented change, i.e., the overlay of an old and a new regime, combines less volatility obtained via more ambiguity. Likewise, backward compatibility of software versions as well as transition periods (e.g., for the redesign of the energy portfolio) helps avoid abrupt change at the cost of more concomitant ambiguity. Standardization (simplification) constitutes the backlash to an increasing number of elements (complexification). Amalgam hybrids such as intrapreneurs or prosumers are marked by a high diversity in just one single domain.

4.3.4 Domain-focused simplexity patterns

Complexity-oriented managers are more familiar with handling inter-domain complexity or simplicity patterns than simplexity patterns: Thus, the handling of errors (deviations) such as the increasing complexity load caused by the bullwhip effect requires more complexity potential, e.g., integrative supply chain cooperation or hybrid push-pull strategies for controlling value adding processes. Another complexification pattern results from the fact that the respective requirements of vendors and customers concerning the duration of the "fuzziness or nontransparency phase" in the life cycle of a product or service normally diverge. This discrepancy goes along with various complexity patterns. So, manufacturers want to freeze product specification as soon as possible (in order to avoid costs of parallel developments), in contrast customers as late as possible, i.e., just-in-time for use. Compromises are based on postponement [68, 69], modularization, or prosuming, i.e., product finalization by the customer, for instance, by finishing a vanilla box. Likewise, late cancelations (risk of no shows) can be handled by overbooking in conjunction with cancelations fees. Some travel agencies want to keep, for instance, their hotel accommodation services or carriers opaque, i.e., prefer late specification, whereas some customers want transparent specified offers as soon as possible. Price discrimination, i.e., a price reduction for partly transparent services (so-called opaque pricing), constitutes an appropriate strategy to find a compromise.

In addition to the sketched complexity patterns, the following examples illustrate the logic of domain-focused simplexity patterns:

In organizational design we encounter various simplexity patterns covering two domains: Thus, the dismantling of hierarchies (reduced vertical span of hierarchy levels) is accompanied by an increase of the horizontal span of management. Furthermore, simplexity patterns support the optimal dosage of change: In change management projects, simplexity patterns help obtain an optimal dosage of change pacing by combining "complex" event pacing and "simple" time pacing of change initiatives [10].

Multilateralization implies the propagation of the number of nodes (n) into the number of edges (e.g., n(n-1)). However, this complexification pattern is not universal: There are various strategies to damp the numerical increase of edges; hub-and-spoke networks, for instance, are characterized by an increase of nodes (due to logistics on a global scale) but harness the number of connections between these nodes. Likewise, simplexity-focused negotiating between multiple parties (e.g., players in value nets) operates on selected multi-bilateral interactions in lieu of multilateral network-shaped interactions.

Complex overreactions (in the form of panic, actionism, "law and order" attitudes, bureaucratization, etc.) to "simple" stimuli like stress of competition or weak signals of disorder represent a complexity escalation comparable to the "butterfly effect" or bifurcation in chaos theory. In the same vein, complex (chaotic) bifurcations in the shape of disorientation may also be the paradoxical consequence of ample but contradictory information such as contradicting first and second opinions or suspicion of fake information. In contrast to prevalent models of decision-making such as the attention, interest, desire, action (AIDA) formula that convert more knowledge into focused action, action is inhibited by a confusing knowledge base, a paradox commonly labeled as "paralysis by analysis."

In managing mergers and acquisitions, a merger (i.e., upsizing) is frequently accompanied by a demerger (downsizing), e.g., whenever the upsizing violates a ceiling (critical value) like market power. Subsequent episodes (temporal domains) are sometimes characterized by simplexity patterns in contrast to proliferation patterns. This holds for path dependence, i.e., episodes of randomness followed by episodes of regularity and stability. In analogy, the escalation of conflicts with external parties (increased diversity) is capable of de-escalating internal conflicts (reduced diversity) via increasing solidarity.

The development of more competence for self-organizing accompanied by less formal organization (intervention, planning, controlling, etc.) constitutes the simplexity logic behind empowerment, agile management, and various leadership approaches.

Collusion, i.e., a species of cooperation among competitors in terms of a reduction of the intensity of conflict (simplification), provokes various conflicts (complexification) in other affected domains, i.e., with antitrust authorities, with competitors that are not members of the cartel, and with (negatively) affected customers.

Likewise, the so-called freemium pricing models apply standard low prices for basic products (simple diversity) and price discrimination for premium products (complex diversity).

Patterns of harmonizing capacities (e.g., airline capacities and airport capacities, power generation and power transmission capacities) frequently use simplexity patterns, first and foremost a combined upsizing and downsizing of capacities. Short-term optimization efforts align capacities to the bottleneck domain by dismantling idle capacities. Long-term optimization involves investment in the upsizing of bottleneck sectors.

The determination of the so-called customer order decoupling point (demand penetration point) between the push and the pull control domains of a value chain relies on simplexity patterns: A switchover from make-to-stock to make-to-order strategies, for instance, goes along with curtailing the push domain in favor of expanding the pull domain.

Change in management quite often relies on a mix of learning (enrichment of the behavioral repertoire) and unlearning (simplification of the behavioral repertoire) [70].

In conflict management an empowerment of the conflicting parties reduces the need to involve third parties or to practice organizational escalation.

The so-called rolling planning deploys a sophisticated simplexity pattern that combines detailed short-term plans with aggregate (rough-cut) long-term planning.

4.4 Parameters of simplexity management

Within the outlined framework, i.e., the congruence paradigm and the component-, dimension-, and domain-focused patterns, parameters provide a more palpable orientation for deploying simplexity, primarily by further specifying blending patterns and assignment patterns. On this level, each blending pattern is quantitatively specified by fixing the proportions of blending: In sequential blending the duration of the simplification and complexification episodes substantiates the qualitative blending. 50:50 proportions stand for a balanced blending, while an 80:20 ratio indicates the dominance of one category, typical of subsidiary blending. The same logic applies to push and pull proportions in value chain management, make and buy proportions in blended procurement, and the contractual fixing of shares by mutual agreements in managing conflicts. The specification of assignment patterns delivers numerical change rates, appropriate levels of decomposition (for instance, sentences, words, syllables, and letters in linguistic parsing), and optimal numbers of reinforcements.

The parameter level of simplexity management comprises (a) processes (measuring, representation, diagnosing, planning, implementing) and (b) corresponding methods, tools, skills, hardware, and software to support these activities.

Measurement provides some metrics of complexity. The spectrum comprises counting (numerosity), N/K ratios (number of elements/number of connections per element) [36], statistics of central tendency (mean, median, mode), variance, range, standard deviation (variety), probabilities and entropy (fuzziness), and volatility (dynamics). Yet, as a rule, complexity can only be measured on ordinal scales, differentiating "more" and "less" complexity. This also holds for the underlying concepts of "congruence" and "incongruence."

The representation of simplexity patterns relies on several media of verbal representation (papers, narratives, storytelling, parables featuring Icarus, Red Queen, David and Goliath, etc.), numerical representation (median, variance, homogeneity indices, sensitivity indices, number of factors extracted in factor analysis, data mining, etc.), and visual representation, e.g., metaphors (e.g., chameleons, Janus head, organizational tents and palaces, icebergs), maps (mind-mapping, road maps, heat maps, canvases, etc.), and charts (e.g., matrices, arborescent structures, diagrams, graphs, fitness landscapes).

Diagnosing the antecedents, varieties, and consequences (e.g., in-congruence) of simplexity strategies requires collecting weak signals (for proactive complexity management), screening (supported by gamification in the shape of signaling games and screening games), target-performance comparisons, benchmarks, radars, scenario analysis, gap analysis, and forecasting methods.

Planning, i.e., searching for or approximating optimal size, optimal conflict intensity, or optimal change rates, is based on operational heuristics [71]. The spectrum covers qualitative rules of thumb, intuition, educated guesses, best practices, plausibility, trial and error, as well as some quantitative methods, e.g., computational heuristics based on simulation. Holistic planning across several domains requires meta-heuristics rather than local search heuristics. Thus, so-called tabu search improves efficiency by avoiding coming back to previously visited solutions that already turned out to be blind alleys.

Implementing the hybrid concept of simplexity into a context consisting of the communities of simplifiers and complexifiers requires a communication-based "selling," going through unfreeze-move-freeze-processes, training, as well as stepwise procedures, e.g., piloting [66].

5. Conclusions

A major lesson learned of this introduction to simplexity is the need of a holistic (i.e., complex) handling of complexity. Against the background of the multi-component, multi-domain, and multidimension architecture of complexity, any characterization of an entity as "(very) complex" or "simple" is inadequate. Hence, the prevalent piecemeal approaches are incapable of capturing the essence of the complexity construct. So, it remains unclear whether "complex organization" refers to complexity load, complexity potential (or the connection of the two components), additive complexity or alternative complexity, or an entire system versus just certain areas (domains) of the respective system. In other words, a holistic characterization of complexity must be based on (at least) three coordinates.

Unlike several complexity-focused heuristics, simplexity does not primarily constitute an iterative heuristics on the parameter level that supports some fine-tuning in search of the optimal degree of complexity, for instance, iterative downsizing-upsizing in search of the right size of a business unit or resource management that develops from insourcing via outsourcing to backsourcing. In fact, simplexity consists of an idiosyncratic paradigm that clarifies not only the denotation but also the connotation of complexity beyond the crude antipodes of "bad complexity" (mess, disorder, etc.) and "good complexity" (latitude, momentum, etc.). Moreover, the simplexity framework contains manifold patterns that are helpful in dealing with the varieties of complexity.

The heuristic power of this framework is not exhausted by just remodeling implicit approaches like moral hazard and push-pull control in terms of complexity.

In fact, the approach furnishes a better understanding and better design than prevalent modeling. The paradigm enables compensating the weaknesses of simplification and complexification beyond merely coping with taming or exploiting complexity.

Despite these strengths, inherent deficiencies of the simplexity framework propose various lessons that have still to be learned. The lack of appropriate metrics is a major drawback of simplexity reasoning, especially when it comes to "estimating" congruence or incongruence. Moreover, the different alleys to obtain congruence in **Figure 2** have to be evaluated to answer the following question: What determines whether contractionary strategies (ease, cut) or expansionary strategies (push, pull) represent the optimal pathway to congruence? In different contexts these strategies will go along with different costs or time lags, e.g., reducing load in comparison to strengthening potential or downsizing potential.

Another critical drawback has already been repeatedly addressed: Unfortunately, complexity management in general and simplexity in particular go along with a substantial meta-complexity. Hence, the manual for the simplexity-product is quite extent and may impair practicality. The well-known ambivalence of being fascinated and confused by complexity might turn into perplexity given the meta-complexity of the simplexity framework.

This leads to a generic dilemma between an approach effective, but complex on the one hand and acceptable on the other hand. Any attempt to implement simplexity will have to find a compromise between these oppositional objectives. It can be achieved by a mixed effort to (a) improve the meta-potential in the context, i.e., awareness, capacities, and skills for handling simplexity and (b) assimilate the paradigm to available capabilities and readiness. Fortunately, the concept entails several built-in options of developing a "simplexity light" version to further acceptance without questioning the essence of the model. To accomplish such a simplification of simplexity, the congruence corridor can be widened, i.e., by accepting varieties of minor misfit of complexity load and complexity potential or even prioritizing efficiency of complexity management: This would justify the situated deploying of non-hybrid models of complexity handling, most likely focused on the simplification of complexity load. All the strengths and weaknesses considered, adopting the simplexity framework realistically means relying on a "perpetual beta."

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