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Supply Chain Management Research

ORIGINAL RESEARCH ARTICLE

Rhythmicity and integration: Integration challenges in customer-order-based supply chain strategies

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Abstract

Supply chain integration is often assumed to enhance coordination and effectiveness, yet everyday supply chain dynamics reveal persistent tensions between independence and interdependence among actors. This study examines these tensions by analyzing how industrial, marketing, and transportation actors coordinate within an integrated customer order supply chain. Drawing on Henri Lefebvre's rhythmanalysis, we investigate two eras of Volvo Cars' customer ordered production to investigate how temporal patterns, disruptions, and shifts in dominant logics of action shape integration outcomes. Methodologically, the study applies a situational case analysis supported by rhythmanalytical concepts to identify and interpret recurring rhythms, arrhythmias, and changes in coordination energy across actors. The findings show that integration does not guarantee effectiveness; rather, coordination is an ongoing accomplishment that must be continuously renewed as actors develop along their own logics. Differences in industrial, marketing, and transportation rhythms create temporal misalignments that influence customer orientation, cost orientation, and overall supply chain performance. Theoretically, the study contributes by introducing a rhythmanalytical perspective to supply chain integration, highlighting temporal dynamics that remain underexplored in existing research. Practically, the findings offer insights into how organizations can identify and manage rhythm conflicts to sustain effective coordination over time.

Keywords: Inter-organizational integration; Supply chain actors; Social approach; Case study; Temporality

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Citation: Borgström B, Andersson P, Hertz S, Mattsson L-G. Rhythmicity and integration: Integration challenges in customer-order-based supply chain strategies. *Supply Chain Manag Res*. 2026;1(3):025440010. doi: 10.36922/SCMR025440010

Received: October 31, 2025

Revised: May 21, 2026

Accepted: May 22, 2026

Published online: July 29, 2026

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1. Introduction

Efforts to increase integration and effectiveness in inter-organizational supply chains have been a major issue in supply chain management for several decades. The complex, ongoing process of supply chain integration is poorly understood. Supply chain integration has been explained in terms of stages, degrees, and mechanisms,[1,2] yet there is hardly a supply chain possible to label as fully integrated.[3,4] We propose that social processes are part of the problem to achieve a high degree of integration.[5]

A dominant perspective in the literature on supply chain management is to view the supply chain as a system that continuously produces and distributes a specific product to meet customers' requirements. The ideal supply chain can be viewed as a machine in which the parts are synchronized, delivering products at a steady rhythm. However, supply chains are more complex than machine.[4,6,7] They involve technical, social, economic, and environmental dimensions, as well as concerns that cause conflicts, ambiguities, and trade-offs, considering that many organizations are involved and the environmental conditions are heterogeneous and change over time.[3,5] Strategies aimed at increasing effectiveness in supply chains are therefore difficult to implement and might require adaptations when economic and other conditions change.[8]

A trend in several industries is to base production on customer orders rather than on demand forecasts. Offering the individual customer an opportunity to get a "customized" product is also considered an aspect of "customer orientation."[9] The customer becomes an important factor in the order chain. As an order giver, this leader differs from the manufacturer, who keeps a wary eye on the technical production chain. The customer engages in a dynamic, complex social setting.

Such a strategy, to base production on customer orders, was adopted by Volvo, a premium car producer, in the early 1990s and was implemented in 1993. Major changes in organization and performance of activities were required to implement the strategy in the supply chain, especially the temporal sequencing.[10,11] The strategy was in use for more than a decade. After a downturn in the business cycle and due to conflicting management objectives, the strategy became problematic. In good sales periods, the majority of production was customer-ordered: customers chose from various car configurations, and dealers sent their orders upstream for manufacturing. When demand diminished, a major concern became increasing sales volumes and reducing manufacturing costs by selling cars manufactured without specific customer orders.

Both customer orientation and cost orientation are considered the most critical priorities that precede supply chain process integration.[8] Dysfunctional practice of these thwarts the integration achieved.[12,13] Chen *et al.*[7] propose that driving down costs across supply chain processes, combined with customer orientation, impacts integration more strongly than focusing on a single orientation. A combination of these orientations depends on balancing needs and operative capabilities.

Despite the increasing emphasis on customer-oriented strategies within highly integrated supply chains, their effectiveness may vary across different economic transitions. This raises important questions regarding how supply chain integration evolves when organizations shift their priorities from customer orientation toward cost orientation during periods of economic uncertainty. To address these questions, we draw on literature that emphasizes the complexity of supply chain actors' "lived" experiences and conceptualizes supply chain integration as a temporally evolving process.[3,14-17] In particular, changes in contextual conditions may prompt actors across different stages of the supply chain to reassess and adjust their performance priorities. Such adaptations may not only reinforce existing customer-oriented practices but may also generate countervailing dynamics that challenge or reshape the dominant emphasis on customer orientation.[18,19]

The different tiers in a supply chain (e.g., retailing and manufacturing) have their own histories and practices, represent distinct spaces, and have distinct lived experiences and logics of action.[20,21] Thus, supply chain strategies are contextually embedded and locally situated. Rather than being stable, homogeneous, or predetermined, they continuously evolve through the interactions and practices of supply chain actors across different organizational contexts. Consequently, supply chain process integration is not a static outcome but an ongoing accomplishment shaped by actors' responses and adaptations to changing conditions. This raises an important question regarding how actors' enactment of changes influences the evolution of supply chain integration.[19] While supply chain research has extensively examined integration and coordination, the temporal dynamics of everyday coordination remain underexplored.[1-4,22,23]

In the current study, we introduce a framework that captures the temporal and spatial dimensions of everyday supply chain practices, i.e., reasoning based on the social and different supply chain rhythms rather than individual events of supply chain process integration.[24-27] The French sociologist Lefebvre[28] has developed a framework for a dialectical understanding of everydayness. He supplies a framework for investigating space, time, and energy configurations in the processes of everyday life, called rhythmanalysis. Based on our perspective on strategic development as an ongoing process rather than a predetermined system integration, we have selected Lefebvre's framework as our primary conceptual tool to analyze integration dynamics in the development of customer-ordered production in Volvo's strategy.

The purpose is to understand how integration works as a process in a dynamic supply chain. First, we conceptually develop dialectical aspects of supply chain

integration. Second, we explore and rhythmically analyze the development of customer-ordered production. Finally, we interpret coordination as facilitating temporal order in terms of supply chain integration.

We aim to contribute to the current debate on integration in supply chain management literature in several ways. First, we showed two ways in which integration has been practiced in Volvo's customer-ordered production. Second, we identified and analyzed how social aspects had been operating within an integrated chain that drove it into another performance. Two distinct situations in a highly integrated supply chain illustrate dynamics central to the concept of supply chain integration. Third, we drew on the supply chain actors' simultaneous independence and coordination, as well as their need to act for adaptation and adaptability, thereby advancing knowledge of supply chain integration.

The remainder of the paper is organized as follows. Sections 2 and 3 introduce Lefebvre's rhythmanalysis and establish its analytical relevance for studying supply chain phenomena. Sections 4 and 5 develop the conceptual foundation by examining supply chain integration as a temporal order and considering the role of contextual conditions. Section 6 applies this perspective to analyze supply chain rhythms, actor logics, and the emergence of temporal supply chain integration. Section 7 concludes the paper by discussing the implications of a rhythmanalytical perspective for supply chain management research.

2. The main concepts of rhythmanalysis

In Lefebvre's introduction to rhythmanalysis, it is stated that "rhythm is the most concrete in arguments of becoming."[28(p3)] What Lefebvre[28] aimed at is a complementary understanding of action, one that "rides with the movement." Rhythm is in interaction between a place, a time, and an expenditure of energy.

Understanding rhythm is based on repetition and difference in everyday life, the mechanical and organic aspects of movement, and the interference between cyclical and linear repetitions. Rhythm, as defined by Lefebvre, seems natural and spontaneous. Yet rhythm is specific; musicians, for example, reduce it to counting. It is associated with measurable structures, such as beats, intervals, and temporal regularities. "Rhythm appears as regulated time, governed by rational laws, but in contact with what is least rational in human being: the lived, the carnal, the body."[28(p9)]

The body is central to this analysis because it embodies multiple rhythms that coexist and interact. These rhythms are distinct yet coordinated, demonstrating that harmony is not exclusive to musical compositions but can also emerge through the synchronization of different temporal patterns in everyday practices.[28]

> The eurhythmic body, composed of diverse rhythms—each organ, each function, having its own—keeps them in metastable equilibrium, which is always understood and often recovered, with the exception of disturbances (arrhythmia) that sooner or later become illness (the pathological state).[28(p20)]

Additionally, the surroundings of bodies are bundles of rhythms, by nature or by the social. In the analysis, rhythms are listened to as a whole and by reference to the analyst's rhythms. The rhythmanalytical results are based on temporalities and their relations within wholes. Data collection thus relates to listening and perceiving the present with the body and by recognizing representations, i.e., by their phases and recurrences.[28]

Movement is ongoing, and by imposing a rhythm, a social group can imprint a change in it. In an analysis, the following notions of rhythm are considered: polyrhythmia, eurhythmia, and arrhythmia. Polyrhythmia reveals a multiplicity of rhythms from the noticeable everydayness. Despite the multiplicity, each rhythm is unique. Eurhythmia is a unified rhythm that works together, while arrhythmia is a disordered pathological state. Rhythmanalysis is a way of thinking for exploring and expressing practice. It also provides a useful conceptual lens for examining aspects of supply chain integration that are not immediately observable, allowing us to shift attention toward the underlying rhythms, practices, and temporal dynamics that shape integration processes. For example, the secret versus the public rhythms: The secret rhythms are felt and relate to the said and the non-said, while the public rhythms relate to social celebrations or expressions. Another example, the fictional versus the dominant-dominated rhythms: The fictional rhythms relate to the imaginary, such as short-, medium-, and long-term calculations and estimations expressed in words, gestures, and learning processes. Dominant-dominated rhythms are completely characterized by an everyday or long-lasting effect.

Rhythmanalytical insights are for the sensible and affective, which are needed in management literature, as Czarniawska[9] argued, to free practitioners from the trap of the world they have constructed for themselves. Such insights convince that it does not exist "out there" objectively, but is constructed by people in a common effort.[29] The possibilities of sensible research are to make the problem smaller or better formulated.[30] Management literature of supply chains hails integration, such as the unity

of parts and the simplification of complexities. However, other complexities may add up; both the separate parts and the integrated unity are likely to change in various ways.[31,32] Rhythmanalysis is a way to understand the dynamics of the supply chain integration process, moving beyond mechanistic, linear, and blind approaches.[33] The quality of such a study is situational and context-dependent.[31]

3. Analytical relevance of rhythmanalysis

Rhythmanalysis adds to nonrepresentational theory (NRT) and is also labeled as the theory of moments. NRT offers an approach that prioritizes lived practices, affects, and temporal flows over stable represen tations.[34] Because rhythmanalysis similarly attends to how rhythms and moments shape everyday activity, it is often read in close connection with NRT. Introducing NRT in the theory section clarifies this link and supports our argument that rhythmanalysis complements traditional supply chain integration literature by shifting attention from generalized categories to the situated, rhythmic enactment of integration in practice. It complements the traditional supply chain integration literature, which aims to categorize and generalize how integration works. A recent application in management studies is about the emergence of a new venture.[35] In Verduyn's[35] analysis, the rhythms were those of two entrepreneurs (Mel and Bill) and the emerging venture. Mel refused the dichotomy between work time and leisure time and lived a natural, slow rhythm. Bill was busy in a goal-oriented movement and feared that the emergence of the new would fail. Bill's rhythm was shaped by external demands that imposed a mechanical, linear temporal order, in which each moment was oriented toward achieving a predefined objective. Bill made things happen at a high rate. The emerging venture was considered a possibility that aligns with the entrepreneurs' rhythms. It needed an emancipatory move—the emancipation of Bill's rhythm and of the repetition of interactions between Mel and Bill—to create the business. In Verduyn's analysis, time is not pre-given but enacted through the interaction of multiple rhythms, including those of the new venture, which challenges generally held assumptions of business creation. Opportunities were not discovered or tied to a time frame; they created themselves in interaction with other rhythms, which gave them space to grow.

Verduyn's[35] analysis was based on the relation between work time and natural time. Lefebvre[28] argued that this opposition, and others such as repetition/difference, mechanical/organic, discovery/creation, cyclical/linear, continuous/discontinuous, quantitative/qualitative, should include a third element, measure. The measure makes a tension in the dialectical and, sometimes, contradictory oppositions. Lefebvre[28] argued that the analysis of movement did not isolate an object, a subject, or a relation. It sought to grasp the moving yet determinate complexity of the real contradictions (Table 1).

The analytical model (Table 1) offers a polyrhythmic exercise to understand movement in unique rhythms and together with other rhythms. Different rhythms unite with others in the everydayness. Diverse rhythms are slow or lively in relation to us and take on different notions that might be sensitized, such as dominant-dominated rhythms that are entirely made up to achieve an effect beyond them. For example, the buyer tells the supplier that market conditions require a yearly price reduction to be included

Table 1. Movement with a repetitive bundle of rhythms (polyrhythm)

Rhythm characteristics		Measure is the tension between oppositions, whether rhythms strengthen each other (eurhythmia) or weaken each other (arrhythmia) in a polyrhythmic scenario.
Linear	Cyclical	Whether rhythms measure up in eurhythmia or arrhythmia
Mechanical	Organic	Organic consumer demands are manifested and established in customer-ordered production strategy and interpreted into mechanically created orders in the production line that facilitate a cost-focused production strategy.
Continuous	Discontinuous	Continuous focus on customer demands (continuous rhythm characteristics tuned to specific customers) vs making deals of cars from the yard that undermines relationships between sales actors, such as dealers and consumers (discontinuous rhythm characteristics).
Quantitative	Qualitative	Production that is promoted by sales targets(quantitative rhythm characteristics) rather than knowledge of the consumers' wants and needs (qualitative rhythm characteristics).

in the contract. In the linear, mechanical everydayness of the supplier, the demand creates a dominant rhythm that the supplier can make up for, or that reflects the organic, cyclical state of the market. The imposed rhythm is measured in the everydayness of the supplier with eurhythmic or arrhythmic performance.

There is a difference between rhythms. Each has a repetition in time and space and an expenditure of energy.[28] Sensing rhythm gives an understanding of differences and of movement, which is a main contribution to supply chain integration literature. Eurhythmic or arrhythmic repetitive flow might be self-increasing, which might be managed by a superimposed state of health, i.e., normed everydayness by coordination. Next, we describe the analytical procedures undertaken in the study and discuss the measures adopted to ensure the trustworthiness of the analysis.

4. Integration as temporal order in supply chains

Even though supply chains are integrated in the sense that they involve cooperation to create an efficient and effective order-to-delivery process, they are far from the theoretical open system ideal in which objectives are aligned, communication is open and genuine, and risks and rewards are shared.[13] Supply chains involve concerns that lead to conflicts, ambiguities, and trade-offs, given that numerous organizations are involved and their conditions are heterogeneous and change over time.[11,23] Research on complex phenomena—such as the organizational and sociomaterial processes that shape supply chain and logistics practices—cannot rely on traditional quality criteria such as validity, reliability, and generalizability. These criteria presuppose stable, bounded, and linearly functioning systems.[32,36]

The supply chain might be considered a loosely coupled system, yet parts are tightly coupled.[3,11,37] Supply chain process integration is actually a set of continuous restructuring activities that can only achieve a temporal order.[7] The different tiers in a supply chain have their histories and practices, represent different spaces, and have different lived experiences of other tiers.[38] In turn, these local processes, together with an understanding of more global processes, represent the process of achieving goals and also how these goals are determined.[35] In short, there are different logics of acting. Whether intentionally or unintentionally, even small changes in the everyday practices of the integrated supply chain might renegotiate relations and spatial practices due to tight couplings.

The complex, ongoing process of supply chain integration is poorly understood, even though it has been explained in terms of stages, degrees, and mechanisms.[14,15] There is hardly a supply chain that can be labeled fully integrated.[11,13] We propose that social processes are part of the problems in achieving a high degree of integration.[5,23] This raises questions regarding the conditions under which loose coupling emerges within supply chains and the processes through which such states are produced and maintained. A dialectical understanding of contradictory forces may provide a more comprehensive explanation of these dynamics.[38] For example, integration involves a combination of interdependence and independence. Both forces are simultaneously active in the same system[38] and may be understood by focusing on practices rather than representation.[34]

Fabbe-Costes and Jahre[11] challenged the prevalent notion of optimization in the supply chain management literature. The optimization objective is a consequence of the systems view prevailing in the supply chain management field, where all components are understood as a whole but still need to be adapted to one another. Fabbe-Costes *et al.*[12] critically examine "what is the whole" in terms of system boundaries and likely integration problems on the basis of trade-offs between adaptation within the system and adaptability to possibilities beyond the system. Continuous development makes "the whole" change; Fabbe-Costes and Jahre[11] identified an irreducible conflict between adaptation through tighter couplings, which support system stability and efficiency, and adaptability through looser couplings, which support system flexibility. "Adaptation requires tightening and adaptability requires loosening between elements in a system."[3(p65)] In this way, supply chain integration is a balancing process and a process of restructuring.[7]

In everyday life, people produce and reproduce temporal structures to guide and coordinate their ongoing activities.[36] Temporal structures are social and provisional structures that might be modified to improve industrial, organizational, and societal effectiveness. For example, implementing a just-in-time inventory system involves shifting the temporal structure to coordinate from the supplier's production and delivery schedules to the buyer's demand cycle. The demand cycle gives an alternative temporal structure to the rhythm. Temporal structures are created and used to give rhythm and form to everyday work practices.[36] Because of their social and provisional nature, modification is not always by intent.

In summary, temporal structures of integration both shape and are shaped by people's actions.[36] As these change, they might become incompatible, such as multiple and interdependent temporal structures. The ongoing constitution of multiple temporal structures in people's everyday practices might undermine, erode, and even

counteract the deliberate strategy in practice.[8] In a supply chain, a plurality of rhythms coexist. The rhythm is related to the movement of strategic alignment. Lefebvre[28] uses rhythm as a tool of analysis to examine and re-examine a range of objects.[10] While the introduction outlined the need to approach supply chain integration through the temporally situated and rhythmically produced everydayness of operations, the existing literature reveals a rather different emphasis. Taken together, the existing literature predominantly conceptualizes supply chain integration through structural, relational, and technological mechanisms that aim to align actors, processes, and information flows. These studies tend to treat integration as a relatively stable condition that can be achieved through coordination, shared goals, and system design. At the same time, a parallel stream of research highlights how everyday practices, local priorities, and competing organizational logics introduce variation, friction, and ongoing negotiation.[37] Despite these differences, the supply chain literature lacks a coherent account of how integration is practically accomplished in the flow of daily work, particularly when actors navigate multiple temporal demands and shifting operational conditions. What remains underexplored is the temporal and rhythmic dimensions of coordination—how rhythms are produced, collide, and are managed in practice—and how these dynamics shape the possibilities for achieving integration.

Against this backdrop, there is a need to examine integration as a rhythmic and temporally constituted process, focusing on how actors practically enact and sustain integration amid competing logics and temporal regimes.

5. Contextualization

In this paper, we conducted a rhythm analysis of supply chain integration to consider social aspects. Our methodological approach was grounded in a postqualitative orientation,[24,25] which did not treat interviews as discrete data points to be coded and categorized, but as situated encounters that participate in the production of the phenomenon under study. Rather than applying a predefined coding scheme, we worked with the material through iterative, abductive movements[26] that sensitized us to temporal patterns, frictions, and rhythms in the everyday practices of supply chain integration.[27]

Rhythms of the supply chain are sensitized. Our senses were developed through a thorough understanding of the case, i.e., partly the specific case of supply chain integration in relation to customer-ordered production and partly the actors' worlds.[2] The approach is in line with Gammelgaard's[16] call for theory development by interpretative analysis, understanding, and contextual knowledge by a qualitative method with the researcher close to the process studied. The actors' approach is distinct from the dominant schools in logistics research, namely the analytical school, which builds on positivism, and the systems school, which builds on systems theory.[16]

The interpretative analysis facilitates the illustration of what supply chain integration implies in everyday life, because, according to Lefebvre's[28] framework, space, time, and energy are engaged. The illustration is based on a longitudinal process study of an implemented supply chain strategy, namely customer-ordered production.

To situate the empirical context, our case study concerns a major difference in the implementation of customer-ordered production strategy between 1993 and 2008. It focuses on the effects that different actors encountered due to varying degrees of customer-ordered production. The different actors in the supply chain experience difficulties due to their varying and changing situations, i.e., a situation with full implementation of lean and agile objectives for customer-ordered production and another in which sales-volume/cost-orientation objectives were added. Both customer orientation and cost orientation are well-known typical antecedents to the restructuring of supply chain integration,[7] which implies that the case is exemplary to understand supply chain integration dynamics. An understanding of the case is developed by interviews with actors, documents, and participation in meetings. The customer-ordered production strategy involves actors that are engaged in, and bounded by, the order-to-delivery process of a new car; a rather stable, interconnected set of actors.[5] The actors are in many aspects heterogeneous, but in relation to the customer-ordered production, three types of social groups emerged from the empirical material. The groups are based on actors' different business logics.

In the new-car supply chain, rules and procedures for buying, selling, and distributing new cars involve customers, dealers, and sales companies, which we typified as marketing actors. The manufacturer (with, among other things, product development, purchasing, planning, and ordering) and suppliers are assemblers, whom we defined as industrial actors. Logistics providers, hereinafter referred to as transporters, facilitate interaction between industrial and marketing actors. We propose that the three social groups exhibit within-group similarities and between-group differences in their lived rhythms.

Rhythmanalysis is a tool that facilitates the inclusion of the complexity of supply chain actors' "lived" experiences and of supply chain integration as temporally ordered engagements with differences and tensions in the everyday.

This has consequences for the evaluation of research in terms of rigor and relevance. Mentzer,[30] in a rigor-and-relevance special issue of the *Journal of Supply Chain Management*, outlined three research goals that set different evaluation standards. The first and second are common in supply chain research: maximum generalizability to a chosen population and maximum precision in operationalization of concepts. The third, maximum realism of context, resembles what Czarniawska[9] denoted as making the problem smaller or better formulated. Thus, our focus is on the third perspective, which emphasizes the social aspects of supply chain integration. Mentzer[30] specified that it might be achieved by addressing modern issues with classic perspectives. First, exploring the dynamics of a highly integrated supply chain is appropriate because contradictions and tensions can be reasons for the lack of supply chain in practice that are not readily explained by supply chain management theory.[11,13]

The social perspective is useful for expanding theory through interpretations and understanding of aspects of the issues being studied.[16] The complexity of supply chain networks and social aspects calls for alternative ways to examine these issues.[6,28] However, the approach is rare in the supply chain management literature; therefore, we explain the factors in the study that enhance trustworthiness, referring to Lincoln and Guba's[29] criteria.

Rhythmanalysis offers a way to incorporate the complexity of supply chain actors' lived experiences and to approach supply chain integration as a temporally ordered, tensionfilled everyday practice. This has implications for how rigor and relevance are evaluated. Mentzer's distinction among three research goals—generalizability, operationalization precision, and contextual realism—clarifies that our study aligns with the third. This goal resonates with Czarniawska's[9] argument that research should make problems smaller and better formulated. Our ambition is therefore to deepen understanding of the social and temporal aspects of supply chain integration rather than to maximize generalizability or measurement precision. As contradictions and tensions in highly integrated supply chains are not readily explained by dominant supply chain management theory, classic sociological perspectives offer analytical value. The complexity of supply chain networks and their social dynamics calls for such alternative approaches, even if they remain rare in the field. To demonstrate trustworthiness within this tradition, we draw on Lincoln and Guba's[29] criteria, which guide our account of credibility, transferability, dependability, and confirmability in this study.

The structure of the explanation of data and analysis follows a post-qualitative logic in which the empirical context is first situated before the analytical reading unfolds. For clarity, all analytical steps—including first-order insights and the interpretation of logics and rhythms—are presented within a unified section (Section 6).

6. Analysis

The in-depth understanding of the case stems from prolonged engagement with the specific order-to-delivery process and with individual actors in the supply chain. The implementation of the strategy in the supply chain, 1993–1994, was investigated over a period of three to four years, with more than 40 interviews with key staff in the change process and its documentation. The strategic development of the same process was studied over a period of about five years, starting in 2003, through more than 20 interviews, attendance at meetings, and other activities. In this longitudinal study, we understood the lived experience of the actors to such an extent that we may conduct a rhythmanalysis, thereby providing insights grounded in interpretation. Throughout the analysis, we have critically questioned not only the conceptual apparatus but also the understanding of the case to learn about the nature of integration.[6] These circumstances are a good basis for the credibility of results.[2] The empirical account that we enclosed was described in "logics to act" and how these worked in different situations to represent the localized strategy. The rhythm of the parts and the whole can be transferred to other examples of supply chains. This is another criterion for trustworthiness.[2] Without reducing the value of the other criteria, we posit that reflexivity is a cornerstone in the rhythmanalytic study. The inclusion of this qualitative tool in supply chain integration research opens new avenues for interpretation.[1]

A rhythmanalysis of the lived complexity of supply chain integration processes considers social aspects through exploration and analytical interpretation. It explores spatial–temporal processes. The interpretation is a way to discuss and appreciate the complexity of an integration process, including tensions, by sensitizing the ongoing process and appreciating its energy and movement through repetitions (normal and abnormal). It is far from an attempt to speak on behalf of individuals or organizations, but rather a way to understand multiple rhythms that move at their own pace.

Temporal processes are influenced by various rhythms. In Verduyn's[35] case, linear, cyclic, work, and natural rhythms are under investigation. Her case of business venturing is an in-depth account of the rhythms of two founders and the business itself. It seeks to understand an ongoing, dynamic process: the emergence of a new venture. She identified one founder's rhythm as emancipated, free,

slow, and idle. The other's rhythm is mechanical, linear, repetitive, and purposeful. The business has a rhythm of its own, aligned with the venturers' rhythms, and unfolds naturally. Such social processes are seldom interpreted in supply chain management research.[28] In our analysis, we investigated the temporal processes, including eurhythmia and arrhythmia, to understand integration processes in practice, especially about temporal alignment in the supply chain.

The unit of analysis is the routine repetition that is considered linear and cyclical. A daily routine is a repetitive organization of time, and Lefebvre[28] distinguishes between cyclical events, such as dawn or spring, and linear events, such as the repetition of the same activity. The cyclical and the linear are relative to each other in the sense that one becomes the measure of the other. The cyclical generally has measures based on multiples of twelve, and the linear often has a mechanical measure based on the metric system of decimal multiples. The rhythmanalytical perspective sees them together, sees the polyrhythm, sees rhythms strengthen and weaken each other. Thus, the relation among rhythms might be eurhythmic and/or arrhythmic.

> Rhythms unite with one another in the state of health, in normal (which is to say normed!) everydayness; when they are discordant, there is suffering, a pathological state (of which arrhythmia is generally, at the same time, symptom, cause, and effect).[30(p16)]

The rhythm we focused on was the three social groups: the industrial actor, the marketing actor, and the transport actor. In the analysis, these were measured in two situations: (i) the ongoing repetitive activities that are coordinated in the supply chain, and (ii) a situation in which a plurality of objectives is lived.

6.1. Interpreting logics and rhythms of a supply chain

As stated at the outset, the empirical case builds on a study of a strategic change in Volvo's supply chain.[20,21] Volvo Cars adopted a strategy to base production on customer orders in the early 1990s and began implementing it in 1993. Major changes in organization and performance of activities, including sequencing aspects in the supply chain, were required to implement the strategy. However, the strategy subsequently became problematic, particularly during an economic downturn with substantially reduced car demand.

We caricature the supply chain into three general business types that live in different worlds, not only different organizations but in different value systems in which a specific logic of action is appropriate. These caricatures meet because they have to coordinate along the order-to-delivery process of customer-ordered production. There is a body of literature that has developed logics of action into institutional logics.[39] To support the relational analysis, we examine actors' logics of action and define them as follows: (i) the industrial actor that enacts a world of interconnected production systems that are huge investments that are better utilized, (ii) the marketing actor that enacts a world of sales that are intangible investments in relationships rather than in physical investments, and (iii) the transporter that provides services that bridge production resources of industrial actors, as well as the production system and the sales location; vehicles and warehouses are their production resources that need to be utilized. In the case of customer-ordered production, these actors follow different logics of action.[4] First, we include the industrial logics that are informed by a specific industrial, production, and assembly logic. Second, the marketing logics include the importer's, the local dealer's, and, in our case, the final user's. Third, the transportation logics prevalent in physical distribution involve actors such as logistics service providers and transporters. The industrial logic involves different people, activities, and resources across firms that manufacture and assemble parts, systems, and, finally, cars, actors that are interdependent through the order-to-delivery process.

The role of the customer order in the strategy concerns the industrial action required before and after an order: Is a car built in response to an order, or is a stock of cars used to match the order? This signifies the translation of customer orders to production orders. In the inception of customer-ordered production at Volvo Cars, it was decided that no car would be assembled unless it was customer-ordered, an idea that is well known in the industry but difficult to practice. Customer-ordered production replaced the traditional way of producing in the automotive industry to efficiently utilize the production capacity. The world of Volvo Cars' order-to-delivery differed from the world of other car makers. The implemented customer-ordered production relies on flexibility in the order-to-delivery process (short lead times, precision, and less tied-up capital).

Customer-ordered production represents a logic of action embedded in the everyday practices of the actors involved. It constitutes the baseline situation through which we conceptualize customer-ordered production as enacted in practice. The contrast that emerged was a situation in which the marketing actor could not help but quietly change behavior, i.e., still within the practices of customer-ordered production. In short, sales challenges were introduced to increase sales volume. In the marketing

logic, the new situation could be accommodated without additional investment. However, the industrial and the transportation logics are different. The contrasting situation is what we describe as plural enforced objectives.

6.1.1. The industrial logic rhythm characteristics

Everyday life related to a technical production system: A timid comment from a manufacturing manager at Volvo at the outset of customer-ordered production expressed worries because the coming week's production was yet to be planned and was unknown. This was a source of anxiety and was different from the experience of other manufacturing managers in similar firms. Planning is a central activity for the industrial actor seeking to avoid material shortages, high inventory levels, and transportation costs, while promoting stability. Planning takes account of a homogeneous and mechanical time; day and night shifts involve similar activities. Orders and deliveries are coordinated with others' schedules and plans. Time is an exact sequence—deviations in the daily rhythm are not because of natural causes but because of breakdowns. Human needs disrupt the repetitive rhythm.

Customer-ordered production in use: Customer-ordered production made the supplier increase responsiveness by, among other things, a multi-skilled workforce that was flexible in time and that adjusted working hours to the needs of a variety of jobs. The flexibility to handle different engine variants extended the activities possible within the order-to-delivery time. The suppliers had adapted to short lead times and changing demand by assuming that volume would be fairly stable and that the composition of the volume might change to a certain degree. Related to planning are costs. Each time sequence has a high price tag due to resource constraints, hence the importance of resource utilization. The production system is considered a costly machine with potentialities that engineers can improve. Within this logic, time becomes an economic resource: "time is money." Consequently, cost considerations continuously shape the decisions and actions of industrial actors.

Plural enforced objectives: The industrial actor is cost-focused. In addition to demands for predictability in terms of quality and delivery time, different ways to reduce costs are key to development. Demands arising from the economic downturn influence the rhythmic structure through managerial directives. Besides the cost orientation, the industrial actor responds to customer orders from the market actor. Orders are the energy for the production system. The fact that forecast-based orders, driven by sales challenges, took charge implied another pattern in demand. The costs of responsiveness increased. At the same time, cost-orientation programs and measures, such as head counting, reduced the potential ways to address responsiveness problems. Organizational functions of the car assembler are specialized and contribute to the order-to-delivery process in different ways. Purchasing, for example, works closely with operational outputs such as quality and delivery reliability, as well as with the strategic costs of materials—it is part of the rhythmic structure of the industrial actor. The purchasing function did well in line with managerial directives to lower costs through global sourcing. Different functional responses affect the rhythm. For example, the degree of purchasing far away slowed down for cost reasons, shaping the flow of materials as transportation time increased. The industrial network is global and highly coordinated. In addition, it is complex, and most of the people involved cannot fully understand the existing interdependencies among the resources in use. Obviously, there are differences in the rhythms of customer-ordered and forecast-based production across intra- and inter-organizational actors at the business and operational levels in the industrial network, and in numerous ongoing rhythms. Importantly, the linear rhythm driven by the mechanical production system dominates the differences in rhythms.

6.1.2. The marketing logic rhythm characteristics

Everyday life related to the customer: With a gesture of resignation, a manager of the sales company commented on the development from customer-ordered production to hunting sales challenges: "It has become ice-cream and balloon sales! And such sales are 'easy' but neither the customer nor we get what we want!"[5]

Customer-ordered production in use**:** Customer-ordered production was considered needed in a premium-brand business model in which the cars and accessories involve advanced product development in a relentless search to match the evolving demands of customers. Customers are willing to pay for the value they decide upon themselves by choosing different options. Dealers are knowledgeable parties guiding the customers' choices. The dealers' showrooms are in close connection to spaces that customers and non-customers visit. Dealers want to attract people to interact with them more or less regularly, not only to sell the next car, but also because post-sale services and extras are profitable. Meetings with customers and dealers are often temporary, first in the showroom, and then the service of facilitating a new car might be by phone. A dealer expressed satisfaction that the company car purchase for a family firm nearby was handled over the phone in an easygoing manner. The dealer knew the products offered and the customer demands. The customer wanted to use a new car. Another dealer expressed that the interaction with

the customer and the virtual car configurator was fantastic because the customers became fairly good salespeople themselves, and the dealer was more of a facilitator.

There are no new-car stocks; only showroom examples, combined with short order-to-delivery times, facilitate the sales process. A sale is a prolonged set of sequences, a decision process that can take a couple of months.

Customers are individuals who share time in the sense of day and night. In their interaction with dealers, there is the extension of time offered by the internet, such as the car assembler's website that facilitates the decision process through a car configurator and also offers evaluations by automotive institutions. When the car dealer closes in the evening, the customer continues the search and might return with more detailed questions. The cyclical rhythm of customers relates to the natural. It relates to increasing knowledge, to an experience not only of knowledge but also of life, experience of shifting demands with age and situation. Time is not money, but opportunities to meet those demands. Dealers' time is related to others', such as colleagues discussing experiences, being with customers to prepare or execute a sales agreement, and interacting to determine the next move. The repetition is determined, but always has a new beginning.

Plural enforced objectives: New management directives enforced sales challenges in order to get higher sales volumes. The old saying that dealers need to be pushed in order to actively sell was used to justify the changes.

Dealers responded to sales challenges by excessive use of late changes in orders and quick sellers, i.e., a standardized set of options offered at a special price during a limited period, in order to attract people to come and sign a contract. Ordering stock in combination with late changes to options was a way to match a customer to an order. This created a chaotic demand pattern and numerous negotiations with the industrial actor.

The challenges encouraged dealers to take on stock, which needed to be sold. Sales are off the shelves due to quick decisions. This has implications for the customer. The rhythm of customer orders differs from that of volume numbers. It is a cyclical, individual rhythm of customers, rather than one related to capacity utilization (of the industrial actor) and monetary bonuses.

6.1.3. The transportation logic rhythm characteristics

Everyday life related to physical distribution: The logistics service providers' knowledge of transportation options is unquestioned. They used to be an integral part of the car assembler and now work more or less as sole providers, coordinating the transporters. Reliability and costs are important performance indicators that they enact. Thus, schedules arranged according to sequences or predetermined delivery times form their everyday routine, despite the fact that weather might interfere with their tasks, traffic might limit their accessibility, or other natural causes might create disturbances.

The service providers want to be innovative facilitators that connect the supply chain. Coordination and development of transportation for both distribution and supply are key issues; they argue and claim they know the industrial logic. In fact, they have, to a great extent, been developing the systems that customer-ordered production relies on.

Customer-ordered production in use: The order-to-delivery process of customer-ordered production relates to manufacturing practices but also to transportation principles: full trailers, milk rounds, and precision in deliveries of new cars. Transportation of supplies to the assembler and cars to dealers is regulated by rules and agreements. Costs and fill rate hold the daily work in their grip. The logistics service provider facilitates customer-ordered production by streamlining transport to meet production demands—the supplier, the logistics service provider, and the buyer have agreements on the services offered. The logistics service provider coordinates transport but uses transporters to execute the operations.

Plural enforced objectives: Late changes in orders are a problem in the production chain, but also in transportation. Changes to order options might mean more goods on one route and fewer on another, because the supply chain is specialized. For example, one engine is produced in England, and another in Sweden, and a late change might imply one additional transport operation and one less-than-full truck operation. Late changes in orders imply that transporters need to handle frequent changes, which is not possible. The logistics service provider coordinates transports, not the transporters. The transport supply chain is constrained by transport system capacities, and transporters need to resist change due to agreements with logistics service providers. The transport interface is based on planned cut-off times, planned transports, and pre-booked transports that, in turn, are facilitated by a stable, forecast-based production.

Service providers adapt to specific needs and drive development in transport, but resist short-term changes to the order-to-delivery process and try to impose them. Service providers are adaptive and proactive, but their progress relates to technical solutions. The needs caused by order changes are not their business. More flexibility, they fear, will lead to rising costs and environmental problems.

6.2. Rhythms in concert

There are different rhythms among supply chain actors that together form polyrhythmic energies. There are, for example, linear and cyclical or mechanical and organic rhythm characteristics that, according to our research model, strengthen each other (eurhythmia) or weaken each other (arrhythmia) in a polyrhythmic scenario.

- Two eras in Volvo Cars' order-to-delivery process: Table 2 summarizes the two situations that are useful for understanding the dynamics of supply chain integration. The first situation is eurhythmia related to ongoing activities aligned to customer-ordered production. The implementation was a major change, but the problems encountered were handled iteratively and systematically. The change was inescapable.

The second situation is the arrhythmia related to a change in the marketing logic. A change in one part of the interdependent chain influences the relation, the rhythm, and the composition. In the order-to-delivery everydayness, there are regulated ongoing activities, and their repetition, place, and time bring rhythm. Then, in a situation where new management directives enforce the plurality of objectives on one or a few actors involved, there is a tension between the everydayness of each actor and the whole supply chain. The rhythms are based on the actors' logic and are used to strengthen or weaken the polyrhythmic scenario. Arrhythmia is not due to multiple objectives, as was also the case in the eurhythmic situation. It is rather a question of energy for all actors or only for the marketing actor.

Rhythm has space, time, and energy: Table 3 reflects on the importance of rhythms of the actors and the composition of rhythms. The industrial actor's logic relates to a linear, mechanical, continuous, and quantitative repetition in everydayness. The marketing actor's logic relates to the cyclical, organic, discontinuous, and qualitative characteristics of everydayness. The transportation logic is partly organic, discontinuous, and qualitative, as evidenced by its strategic solutions for the supply chain, and partly operational, continuous, and quantitative, in terms of truck schedules in everyday life. The supply chain is polyrhythmic, and rhythms are definable to a specific subset that dominates the action. The number of rhythms against each other is less important than the measure and performance, e.g., eurhythmia or arrhythmia, that give renewed energy.

There is a difference between, for example, industrial

Table 2. The polyrhythmic supply chain on the basis of two eras in Volvo Cars' order-to-delivery process

Situation	Rhythm of the industrial actor	Rhythm of the marketing actor	Rhythm of the transportation actor	Rhythms in the polyrhythmic supply chain
Customer-ordered production in use	Planning involves homogeneous and mechanical time. Activities are coordinated in schedules and plans.	Basically, sales are cyclical. Activities relate to premium-brand interactions and customer-oriented relationships. Customer-ordered production fosters organic, high-quality knowledge sharing among users and dealers in sales, and between dealers and the sales company in planning.	Logistics service providers were born and bred out of the automotive industry. They understand industrial logic and deliver solutions through experience and innovative ideas. Full trailers and milk rounds are coordinated practices that are outsourced to transporters.	Eurhythmia: ongoing adjustments and evolving rules of conduct.
Plural enforced objectives	The workforce was adjusted to "fake" customer orders, but the customer-ordered production procedures did not accommodate demand swings arising from sales challenges. In addition, quantitative measures and programs are implemented, including management-by-objectives (headcount and costs).	The imposed sales challenges imply a linear, mechanical, continuous, and quantitative natural sales model. These volume challenges shifted the organic sales cycle rhythm to a superimposed sales volume-per-period rhythm. Dealers decide to order to stock, with peaks at the end of the period. In addition, the dealer-sales company's forecast process shifted from an organic, iterative, qualitative approach to a number-crunching approach.	Transporters are hindered by contracts and physical space in meeting the demands that arise from sales challenges. In operations, transporters are used for low-cost transportation and cannot adapt to short-term changes in demand.	Arrhythmia: a pathological state in the supply chain with different types of atypical problems arising for all actors. Potentially, the change in rhythms is less troublesome than the lack of communication about symptoms, causes, and effects.

Table 3. Rhythms, space, time, and energy

Reflection	Rhythm of the industrial actor	Rhythm of the marketing actor	Rhythm of the transportation actor	Rhythms in the polyrhythmic supply chain
Reflection of spaced time	The mechanical production system's continuous rhythm is decisive for cost performance. Time is sequenced and equals money.	Work time is intertwined with natural time. Dealers' opening hours and the national sales companies' web-based configuration tools are adjusted to users' natural time and discontinuous decision process. Time is lived.	The transport system's reliability is key. Its continuous rhythm is decisive for cost performance. Time is sequenced and equals money.	The actors' rhythm subset is defined as one slow and natural, and the other two are more intensive and mechanical. The customer-ordered production opportunities converge to reinforce the movement.
Reflection of energy that is in customer-ordered production, coordinating	Flexibility is achieved through many minor projects that involve people's working time, routine for securing materials, and shorter lead times, among other things.	Customers are willing to wait for delivery and pay for value as they learn of premium attributes. The dealer and the customer create the product together. The sales model for customer car orders is facilitated by information technology, but is qualified in the meeting.	Flexibility is achieved through extensive coordination because nature and traffic demand an organic, discontinuous, and qualitative approach.	

logic and marketing logic, and changes over time. Table 2 compares two situations: ongoing activities regulated by customer-ordered production and situations in which one actor adapts to a logic not anticipated by the others. The integrated working procedures are the same, but the action differs. Table 3 reflects the actors' rhythms. Each actor has a temporal space, or, if one prefers, a time, in which a kind of action is natural. Energy is present in the form of coordination within the integrated customer-ordered production process and in the actions of the actors. The differences are between the situations per actor and among the actors in each situation. The same coordination in the renewed situation is problematic. Volume challenges are imposed on the market actor, who coordinates and infuses a different energy in the integrated customer-ordered production process. Arrhythmia causes continuous operative problem-solving.

Continuous coordination in the integrated chain: How is supply chain integration, in this case a highly integrated order-to-delivery process, related to coordination? In the first (harmonious) situation, the customer-order-production-regulated activities became repetitive due to ongoing adjustments to the rules of conduct. The other situation is one of recession and of a discordant order-to-delivery process, in which additional objectives of costs and sales volumes are added to customer-ordered production objectives. The industrial actor worked intensively to reduce costs, while the marketing actor prioritized sales volume over customization objectives. The difference in the everydayness of these actors influenced the transportation actor. More flexibility was needed to accommodate changes in transport needs driven by sales volume challenges. Each actor adjusted to the situation, but the rules of order-to-delivery conduct did not evolve in the same way. The supply chain came into arrhythmia. The differences between the situations per actor lie in everydayness and its repetition (Table 2). An integrated supply chain works as long as differences in repetition are managed. As the lived practices differ from previous ones, there is a need for adaptation. The adaptation might be necessary but problematic for supply chain integration, because one actor's logical action influences the integrated process and the others involved, potentially leading to a more arrhythmic supply chain. Adaptation to new circumstances requires continuous coordination to maintain an integrated supply chain.

The ongoing coordination needs to account for the differences. In a state of suffering, of arrhythmia, Lefebvre[28] argues that symptom, cause, and effect are generally concurrent. This comes from time, space, and energy. Eurhythmia or arrhythmia is the energy of individual rhythms. Table 3 describes each actor's time allocation and the coordinating energy used for customer-ordered production. Time is spaced in the meaning that each actor has ties to resources, which is a lived web of relations in which time is made sense of, for example, the mechanical production system usage rate and time, customer inspiration and time, and transport conditions and time. Thus, the actors act in different worlds that are coordinated for the sake of customer-ordered production, both explicitly through contracts and implicitly through knowledge of others' worlds and calculations of what drives customer-ordered production.

The spaced time and coordinated energy include the

slow and natural and the intensive and mechanical, making up a rhythm of customer-ordered production in the supply chain. The rhythm is closely connected to decisions made in one part of the supply chain or to differences in conditions in another. The outcome of an integrated supply chain depends on balancing to maintain eurhythmy. Rhythm might foster understanding of differences, but coordination implies knowledge not only of the other actors' worlds but also of their coordination within those worlds. Therefore, the order that is possible to coordinate for the sake of customer-ordered production is temporal.

The necessity of temporal integrative work, i.e., adaptation and coordination as ongoing accomplishments, to achieve successful supply chain integration, is a novel contribution to the supply chain management literature. More importantly, from a management perspective, the key question is what enables the transition from an arrhythmic state toward eurhythmia. The next section combines insights from rhythmanalysis with the literature on loosely coupled systems to better understand these implications.

6.3. Once integrated, always integrated

6.3.1. Coordination and independence

The ongoing coordination, which includes an important energy element, contributes to earlier research indicating that supply chain integration is a continuous restructuring process based on a firm's strategic priorities.[7] It is commonly redirected in a way that sacrifices the supply chain in favor of short-term functional targets.[19] There are always plural targets influencing supply chain practice, but the energy related to how they work varies. The implementation empowered customer-ordered production with energy that involved all actors. Over time, the marketing actor released another logic that meant sales challenges were enforced on top of customer-ordered production. Other actors played along with customer-ordered production and were unaware of these challenges in relation to ongoing activities. In contrast to Godsell and van Hoek,[19] we argue that both eurhythmia and arrhythmia are possible outcomes: eurhythmia by energy that is heard above others, and arrhythmia by enforced energy that does not encompass all those involved.

In the supply chain, there is both coordination and independence. Industrial actors' rhythm is homogeneous and mechanical, while marketing actors operate in a more natural, discontinuous rhythm. Integration is problematic because the social actors' worlds differ in terms of time, space, and energy. In supply chain process integration, transporters bridge production processes and sales. In all, differences are not only between the different actors, but also each actor's world and rhythm change in relation to the earlier situation and in the new situation between the different actors. First, the order-to-delivery process was guided by rules and procedures for customer-ordered production, which in turn had developed based on different actors, such as iterative coordination. Second, the rhythms of sales challenges rely on coordination across different logics and the common rhythm of customer-ordered production. Each actor coordinated cost and volume objectives, but not in concert.

6.3.2. Adaptation and adaptability

An important insight is that the highly integrated supply chain is a loosely coupled system that simultaneously exhibits coupling and decoupling.[3,22,38] Typically, we can define three independent actors taking in their own worlds and action logics, engaged in a supply chain; this implies a loosely coupled system.[34] Loosely coupled system thinking is applied in supply chain literature;[3,22] we may offer insights into the simultaneous coupling and decoupling of supply chain elements. Rhythmanalysis engages in dynamics of integration that are temporal processes and temporal structures.

6.4. Temporal supply chain integration

Despite order-to-delivery procedures that stabilize the system and despite distinct couplings among actors, decoupling is a fact of actors' understanding of their autonomy and priorities. The loosely coupled supply chain comprises responsive elements that have some separateness and identity.[35] As actors juxtapose adaptation and adaptability,[3,22] there are ambiguities regarding how to combine logics and tensions of independence and coordination. The temporal processes of adaptation here and now relate to adaptability in future situations. The actors' rhythms relate to the supply chain and to others in their network; they adapt to current needs and maintain some flexibility for future development. The temporal structures of independence and coordination might be examined in relation to the trade-off between adaptation and adaptability to learn about the degree of integration (Table 4).

In the supply chain, there is an adaptation in which many identities are seen as a group with a common good but with differences in the timing of the actor. (i) Godsell *et al.*[18] argued that a disintegrated supply chain is natural and that, in practice, there is little evidence of alignment of demand and fulfillment in the supply chain. Even though we agree that the actors' worlds and logics of action differ, there is undoubtedly significant adaptation, both operational and strategic. However, alignment occurs across a variety of polyrhythmic situations, including eurhythmy and arrhythmia. The everyday lives of the

Table 4. Temporal supply chain integration

Temporal processes and structures	Adaptation (partial coupling)	Adaptability (partial decoupling)
Independence: Spaced time of actors' worlds	Take in others' logics in one's own world	Demands from other parts of the network
Coordinating: Energy for common temporal structures	Bridging logics	Balance and develop in concert

different actors are only temporarily aligned because the network actors have different and changing situations. They are involved in social integration and sensitive to rhythm and system integration, which stabilize supply chain structures, such as order-to-delivery procedures.[5]

Contradictions in interdependent social systems are natural because new, unforeseen actions are introduced into repetitive processes. (ii) Partial decoupling is due to new situations that individual actors encounter. The discussed empirical material illustrates two influential forms of polyrhythmic repetition and three instantiations of these (industrial, marketing, and transportation). Each social system has different repetitions that, in a moment, strengthen or weaken each other. For example, the industrial rhythm had linear repetition, the marketing rhythm and the transporters' rhythm had cyclical repetition. Marketing and transportation might both have cyclical rhythms, but there are differences between these that relate to their composition. The demands from other parts of the network and the actors' degree of independence promote adaptability.

In line with Borgström,[5] we argued that supply chain integration should be seen as continuous coordination rather than as an entity. Both eurhythmia and arrhythmia can result from an integrated supply chain. Adaptation is about bridging different logics. Rhythmanalysis describes overlapping and interacting worlds of place/time/energy that open up for a more informed way of discussing integration. Adaptation in temporal structures is a practical accomplishment of understanding and bridging logics. (iii) The supply chain polyrhythmia is inevitable; however, episodes of eurhythmia and arrhythmia are accomplishments.

Adaptability of the supply chain is in concert with others. Individual rhythms are meaningful because they develop both within and beyond the chain. (iv) They inform of the partial decoupling that is necessary: aligning structures, interacting in decoupling, in short, infusing energy for an ongoing balancing eurhythmic action, which bridges rhythms in the polyrhythmic scenario. Temporal structures form and are formed by action,[37] which implies, for example, the possibility of moving from one polyrhythmic structure to another. The rhythms of the business actor and the industrial actor are well described in the literature. However, the transporter's role in supply chain integration processes is seldom clear,[12] but it might offer a potential to balance business networks.[3,22]

7. Conclusion

Integration is seen as a panacea in supply chain management literature, but is questioned conceptually. The system of integrated organizations that integrate for the benefit of efficiency and effectiveness is difficult to identify as a thing in practice. Supply chains are dynamic entities, and our findings contribute to understanding how integration works as a eurhythmic as well as an arrhythmic process. Supply chain actors always have a rhythm, and integration creates a harmony of these. Disharmony in integrated supply chains can arise from differences in spatial, temporal, and energetic conditions. Integration is in this way dialectical; it is made and remade. Our case illustrates differences in strategic priorities and energy. Actors are not only a part of a supply chain but also interact in worlds of their own that might have largely different logics of action and impose a difference in action. The integrated order-to-delivery process became problematic as it was enacted with such a concurrent logic of action.

The rhythmanalytical approach is a contribution to understanding the everydayness of supply chain integration, with social aspects considered alongside prevailing technical and economic ones. Integration, whether spatial or temporal, is worth very little without coordination, which Lefebvre[28] considered as energy and action. The potential for coordination differs among these actors because of their rhythms. Rhythm offers an understanding of differences, but coordination implies knowledge not only of the other actors' worlds but also about their coordination in their worlds. Therefore, the order that can be coordinated for the sake of customer-ordered production is temporal. Rhythms and coordination are important for integrative ambitions.

In the case of a customer-ordered production strategy, we investigated three simultaneous rhythms during a controversial period and their differences, together with a discussion of temporal processes and structures. The polyrhythmic supply chain included distinct actors, each

with different rhythms that indicated everydayness. The combination of different actors' rhythms in a supply chain shifts over time and might be eurhythmic or arrhythmic. Temporal order in terms of supply chain integration is seen as a trade-off between adaptation and adaptability on the one hand, and independence and coordination on the other. Independent structures are designed to bridge the logic of action with demands from other parts of the network. Coordination is to balance and develop in concert.

The Verduyn[35] framework is an inspiration for exploring the temporal process by which events unfold in a development. The production and sale of a new car take place in different social landscapes, and tensions between them are logical, given their differences in actors and structures. Transportation, both spatially and temporally, connects these landscapes and has an identity of its own.

This paper contributes to the supply chain integration literature, particularly by advancing conceptual development that responds to criticisms of integration in practice and of supply chain integration as unnatural. In addition, we contribute methodologically to interpretative supply chain management research, both in terms of numbers (the small minority of such publications) and in the social approach that informs our analysis.

The current study has limitations and potential for further research. This study provides an in-depth perspective on integration dynamics but is based on the logic of action of bundled supply chain actors. A supply chain has many more actors that might offer a more fine-grained analysis. Moreover, a supply chain consists of many more instances of integration than those related to customer-ordered production strategy and the order-to-delivery process. We recognize the potential to better understand the complexities and dynamics of integration in such additional studies. There is potential to further use social approaches in supply chain management research, especially in supply chain integration research, which needs additional interpretive studies to explore its conceptualization.

Acknowledgments

None.

Funding

The publication of this study was supported by the Swedish retail institution, Swedish Retail and Wholesale Council (HUR).

Conflict of interest

The authors declare they have no competing interests.

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Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data

Not applicable.

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