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A CYBERNETIC PERSPECTIVE ON THE TEMPORAL ORGANIZATION AND CONTROL OF SYSTEMS



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TIME AS ARCHITECTURE, NOT A PARAMETER.
A Cybernetic Perspective on the Temporal Organization and Control of Systems

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Abstract
Time is commonly represented in technological and cybernetic systems through measurable parameters such as duration, response speed, signal delay, feedback frequency, and prediction horizon. Although these parameters are essential for describing system performance, they do not fully explain how temporal relations are organized within processes of control. This article proposes a cybernetic perspective that approaches time not merely as a parameter within which control takes place, but as an operational architecture through which systems connect past experience, present states, anticipated futures, and feedback-driven changes.

The study employs a conceptual-analytical approach, reconstructing the functional relationships between feedback, system modeling, prediction, adaptation, and higher-order control. On this basis, it develops a conceptual model of temporal architecture and examines the conditions under which its elements may become objects of adaptation and deliberate reorganization. Particular attention is given to the distinction between correcting individual actions and modifying the temporal organization of the control process itself.

The analysis suggests that temporal organization ought to be comprehended as a functional dimension of cybernetic control rather than merely a collection of external constraints or performance indicators. The article further proposes that the capacity to evaluate and reorganize temporal relations may represent an important mechanism of higher-order control. This

framework provides a conceptual basis for examining how adaptive systems can modify the temporal organization of their operations and, consequently, influence the trajectories of the processes they control. The proposed model is theoretical and requires further investigation in specific technical and applied contexts.

Keywords

Cybernetics; temporal architecture; feedback control; adaptive systems; temporal organization; predictive control; higher-order control.

Introduction



1.1. The Problem of Time in Cybernetic Systems

Time occupies a fundamental position in the operation of cybernetic systems. Every process of control unfolds through temporal relations: a system observes changes in its environment, processes incoming information, compares the current state with an intended or anticipated state, generates a response, and evaluates the consequences of its action. These operations are not instantaneous or independent of one another. They require time, occur in a particular sequence, and are connected through intervals during which information is transmitted, decisions are formed, and corrective actions take effect. Consequently, the temporal characteristics of a system have direct implications for the effectiveness and stability of its control processes.

In classical cybernetics, the relationship between time, information, and control was already recognized as an essential theoretical problem. Wiener (1948) examined the role of time in communication and control, drawing attention to the temporal conditions under which

information can be transmitted, interpreted, and used to regulate the behavior of a system. Feedback, in particular, presupposes a temporal relationship between an action and information about its consequences. A corrective response can only be generated after a change has occurred, been observed, and communicated to the controlling mechanism. The effectiveness of regulation therefore depends not only on the availability of information but also on when that information becomes available and how rapidly the system can act upon it.

In contemporary technical and organizational contexts, these temporal characteristics are commonly described through measurable parameters such as duration, response speed, signal delay, feedback frequency, observation intervals, and prediction horizon. Such parameters make it possible to assess the performance of a system, identify temporal constraints, and determine whether its responses are sufficiently rapid in relation to changes in the environment. Research on temporal organization has also demonstrated that the sequencing, pacing, and synchronization of activities influence how processes are coordinated and how effectively different operations are integrated (Ancona et al., 2001; Orlikowski & Yates, 2002). Time is thus present in cybernetic and organizational analysis not as an incidental background condition, but as a significant dimension of system functioning.

However, the description of temporal characteristics does not necessarily explain the organization of temporal relations within a controlled process. Knowing the duration of an operation, the frequency of feedback, or the average response time provides information about individual temporal properties, but it does not by itself reveal how observation, prediction, action, and correction are arranged in relation to one another. Two systems may demonstrate comparable response speeds while operating through substantially different temporal structures. One may rely on frequent observation and incremental correction, while another may use longer observation intervals, extended prediction horizons, and less frequent but more comprehensive interventions. *Their temporal parameters may overlap, yet the organization of their control processes may differ considerably.*

This distinction raises a question that extends beyond the measurement of time within a system. If control depends on the relations connecting observation, interpretation, prediction, action, and feedback, then the temporal organization of these relations becomes part of the mechanism through which control is exercised. The issue is no longer limited to how much time a process requires or how quickly a system responds. It also concerns how the system arranges the temporal conditions of its own operation, how it connects information from different temporal positions, and how these arrangements influence the trajectory of the controlled process.

The problem addressed in this article emerges at precisely this point. The established analysis of temporal parameters remains indispensable, but it may be insufficient when the objective is to understand how a system's temporal organization contributes to its capacity for control and adaptation. A broader conceptual perspective is therefore required, one that considers not only the measurable characteristics of time but also the functional architecture of temporal relations through which cybernetic processes are organized.

1.2. Beyond Temporal Parameters

The distinction between time as a parameter and time as an architecture does not imply that measurable temporal characteristics should be abandoned or regarded as theoretically secondary. Duration, delay, frequency, pace, and prediction horizon remain essential for describing the behavior of control systems. The distinction concerns the level of analysis at which these characteristics are considered. A parameter describes a particular temporal property

of an operation or process, whereas an architectural perspective examines how temporal properties and relations are organized into a functioning system of control.

A control process is not simply a sequence of actions that happen to occur over time. Its operations are connected through dependencies: observations provide information for decisions, decisions determine the timing and direction of actions, and feedback makes it possible to compare the consequences of those actions with the system's expectations. These dependencies create an organized temporal structure. The order in which operations occur, the intervals separating them, the pace at which they are repeated, and the relationship between current information and anticipated outcomes all contribute to the conditions under which control becomes possible.

Research on organizational temporality provides a useful conceptual point of comparison. Ancona et al. (2001) demonstrate the importance of examining time through multiple dimensions, including pace, cycles, and sequences, rather than reducing it to a single measurable variable. Orlikowski and Yates (2002), in turn, show how temporal structures are produced and reproduced through organized practices. These approaches are concerned primarily with organizational processes rather than technical control systems, and their findings should not be transferred uncritically to engineering contexts. Nevertheless, they help clarify a broader analytical distinction: temporal organization involves relations among activities, not merely the amount of time allocated to each activity.

Applied to cybernetic systems, this distinction directs attention toward the functional connections among the system's operations. The temporal organization of observation and response, for example, determines how frequently the system receives information about its current state and how much time elapses before that information produces a corrective action. The relationship between prediction and feedback determines whether anticipated developments can be compared with observed outcomes within a useful interval. Similarly, the sequencing of operations influences whether a system can respond through continuous adjustment, periodic correction, or a more substantial revision of its control strategy.

From this perspective, *temporal architecture can be introduced as a way of examining the organized relations through which a system connects its accumulated experience, present observations, anticipated future states, and feedback-driven corrections.* This formulation does not suggest that a system necessarily possesses an explicit representation of its entire temporal architecture. Rather, it identifies a functional structure that can be reconstructed analytically from the relationships among its operations. The architecture may be implicit in the system's mechanisms, yet it remains consequential for the way the system processes information and regulates its behavior.

The conceptual shift is therefore from examining temporal characteristics separately to investigating their functional interdependence. A change in feedback frequency, for instance, cannot always be understood simply as an increase or decrease in response speed. Depending on the system and its environment, it may alter the relationship between observation and correction, affect the relevance of available information, or change the balance between immediate response and longer-term prediction. *The same parameter may consequently have different effects depending on the architecture in which it operates.*

Time as architecture, in this sense, is not an alternative physical theory of time, nor does it imply that cybernetic systems can manipulate time itself. It refers to the organization of temporal relations within processes of control. The analytical task is to understand how these relations are structured, how they contribute to system functioning, and under what conditions their organization may itself become subject to adaptation.

1.3. Time, Rationality, and Environmental Constraints

The temporal organization of control becomes particularly significant when a system operates under conditions of uncertainty, incomplete information, and limited opportunities for observation or intervention. In such environments, the effectiveness of a decision depends not only on the accuracy of available information but also on the time required to obtain, interpret, and act upon it. A system that delays its response in pursuit of more complete information may lose the opportunity to influence a changing situation, while a system that responds immediately may act on insufficient or unreliable evidence. The problem is therefore not simply one of maximizing response speed, but of establishing an appropriate relationship between the time available, the information required, and the conditions under which a decision must be made.

The research of Gigerenzer (2002) offers an important perspective on this problem through the concept of ecological rationality. Rather than evaluating decision-making exclusively against an abstract standard of complete information and optimal calculation, this approach examines how strategies perform in relation to the structure of the environment in which decisions are made. A decision strategy may be effective not because it processes every available piece of information, but because it identifies which information is relevant and uses it in a manner appropriate to the conditions of the task. The relationship between cognitive resources and environmental structure is therefore central to understanding adaptive decision-making.

The work of Gigerenzer and Todd (2012) develops this position by examining how heuristics can support effective decisions under conditions of uncertainty. Heuristics are not necessarily inferior substitutes for comprehensive calculation; under particular environmental conditions, relatively simple strategies may produce effective results while requiring fewer informational and computational resources. Neth and Gigerenzer (2015) similarly emphasize the role of adaptive strategies in uncertain environments, where the suitability of a decision procedure depends on the characteristics of the situation rather than on a universal preference for greater complexity.

For the present study, the relevance of this research lies in its treatment of constraints and adaptation. It demonstrates that the effectiveness of a decision process cannot be assessed independently of the conditions under which that process unfolds. Time available for decision-making, the rate at which relevant information changes, and the costs of delayed or premature action all influence the suitability of a particular strategy. These considerations provide an interdisciplinary basis for examining temporal organization as a functional condition of adaptive behavior.

At the same time, the scope of this connection must be defined carefully. The research on ecological rationality primarily concerns human decision-making and the relationship between cognitive strategies and environmental structures. It does not, by itself, establish that technical systems autonomously reorganize their temporal architecture. In this article, it serves as a conceptual bridge for understanding why the organization of decisions in time matters under conditions of uncertainty. The analysis of technical adaptation and control requires additional grounding in cybernetic and engineering research, particularly in the theories of adaptive control and predictive regulation (Åström & Wittenmark, 1995; Mayne et al., 2000).

Taken together, these perspectives suggest that temporal organization should be examined in relation to the demands imposed by the environment and the functional capacities of the system. The relevant question is not whether a system should always respond faster, observe more frequently, or extend its prediction horizon. It is whether the temporal regime through which it operates is appropriate to the processes it must regulate. This leads to a further theoretical possibility: ***if the temporal organization of a system affects the effectiveness of its control, then the organization itself may become a potential object of adaptation***.

1.4. Research Problem, Aim, and Hypothesis

The preceding considerations identify a conceptual problem at the intersection of cybernetics, adaptive control, and research on temporal organization. Cybernetic and engineering approaches provide established methods for analyzing feedback, system modeling, prediction, adaptation, and the effects of temporal delays. Research on organizational temporality and ecological rationality, meanwhile, demonstrates that the sequencing, pacing, and timing of activities are consequential for coordination and decision-making. However, these perspectives do not automatically constitute a unified account of how the temporal organization of a cybernetic system may itself become an object of control.

The central research problem addressed in this article is therefore the need for a conceptual framework that explains temporal organization not merely as a set of parameters influencing system performance, but as a functional architecture connecting the principal operations of cybernetic control. This problem gives rise to the following research question:

How can time be understood and operationally organized as an architecture of cybernetic control, and how can systems modify this architecture to influence their own processes and trajectories?

The aim of the study is to develop a conceptual model of the temporal architecture of cybernetic control and identify mechanisms through which a system may modify its own temporal organization, thereby influencing the course of controlled processes.

The study advances the following hypothesis: if the temporal organization of a system determines the sequence, pace, and interconnection of observation, prediction, action, and correction, then modifying this organization may affect not only the speed of achieving a result but also the trajectory of system functioning. Furthermore, a system capable of evaluating the effectiveness of its own control regime may move from correcting individual actions to reorganizing the temporal architecture of control.

To address the research problem and examine this hypothesis at the conceptual level, the article pursues four interrelated tasks. First, it establishes the distinction between time understood as a measurable parameter and time understood as an architecture of functional relations. Second, it reconstructs the principal temporal connections among accumulated experience, present-state observation, anticipated future states, and feedback. Third, it examines how temporal characteristics of control, including feedback frequency, response pace, observation intervals, operational sequence, and prediction horizon, may become objects of adaptation. Fourth, it considers the possibility of higher-order control in which a system evaluates not only the outcomes of individual actions but also the effectiveness of the temporal organization through which those actions are generated and corrected.

The article employs a conceptual-analytical approach and does not present an empirical experiment or claim experimental validation of the proposed model. Its contribution consists in ***bringing established cybernetic and engineering mechanisms into a common conceptual framework centered on temporal architecture***. The analysis distinguishes between the modification of individual temporal parameters and the more substantial reorganization of the relations connecting the operations of control. In doing so, it seeks to clarify the conditions under which temporal organization may be considered a potential object of adaptation and higher-order control.

The argument proceeds from the reconsideration of time as a parameter toward the reconstruction of temporal relations within cybernetic processes. It then examines the possibility of treating these relations as objects of adaptation before considering the implications

of reorganizing the temporal architecture of control itself. The central movement of the article is thus from controlling processes in time to examining how a system may control the temporal architecture of its own processes.

Methods

2.1. Conceptual-Analytical Approach

This study adopts a conceptual-analytical approach to examine the temporal organization of cybernetic control and to develop a framework for understanding time as an operational architecture rather than merely a set of measurable parameters. The research is theoretical in nature. It does not seek to test a predefined technical implementation or evaluate the performance of a particular control system through empirical measurements. Instead, it examines established cybernetic principles and reconstructs their functional relationships in order to identify the role played by temporal organization in the operation and adaptation of controlled systems.

The analytical foundation of the study is classical cybernetics, understood as the investigation of control, communication, feedback, and regulation in systems. Wiener (1948) provides the fundamental perspective for examining the relationship between information and control, particularly the role of feedback in connecting system actions with information about their consequences. This perspective makes it possible to approach temporal relations not as external conditions added to an otherwise complete control mechanism, but as part of the processes through which regulation is performed. The system's ability to observe changes, transmit information, generate responses, and evaluate their effects necessarily involves an organized sequence of operations.

The analysis is further informed by Ashby's (1952) account of adaptive behavior and system regulation. His work provides a basis for distinguishing between the correction of particular system responses and the broader adjustment of the conditions under which regulation takes place. This distinction is important for the present study because the proposed concept of temporal architecture concerns not only the timing of individual operations but also the organization of the relations that connect them. The question is whether adaptation can be considered at the level of the control regime itself, rather than exclusively at the level of the system's immediate responses.

The conceptual-analytical procedure consists of three interconnected operations. First, the study identifies the established cybernetic mechanisms relevant to temporal organization, including feedback, modeling, prediction, adaptation, and regulation under conditions of delay. Second, it examines the functional relationships among these mechanisms, focusing on the temporal dependencies that connect observation, interpretation, action, and correction. Third, it synthesizes these relationships into a conceptual framework that makes temporal organization analytically distinguishable from individual temporal parameters.

This approach requires a careful distinction between established theoretical positions and the conceptual synthesis proposed in the article. Feedback, adaptive regulation, system modeling, and the effects of delay are not introduced as new discoveries. They constitute the theoretical material from which the present framework is constructed. The contribution of the study lies in examining these mechanisms through a common analytical perspective: the temporal architecture of control. Accordingly, the article does not claim that previous cybernetic research

overlooked time, nor does it suggest that all temporal relations can be reduced to a single organizing principle. Its objective is to clarify how already established mechanisms may be understood in relation to the temporal structure of the processes they regulate.

The study also draws selectively on engineering research concerning adaptive and predictive control. Åström and Wittenmark (1995) provide a theoretical basis for examining how control mechanisms may adjust their parameters in response to changing system conditions. Mayne et al. (2000) contribute to the analysis of predictive control through the relationship between current observations, future predictions, and successive control decisions. These works are used to examine the functional organization of control processes, rather than to claim that the proposed conceptual model has already been implemented or validated in a particular engineering system.

The scope of the method is therefore conceptual reconstruction and theoretical synthesis. Its outcome is not a numerical model, an algorithm, or an experimentally verified control procedure, but a structured account of temporal relations that can support further investigation in specific technical and applied contexts.

2.2. Functional Reconstruction of Temporal Relations

The second methodological operation consists of reconstructing the functional relations through which temporal organization emerges in cybernetic control. Rather than treating time as a single variable, this procedure examines the connections among the different temporal positions and operations involved in regulation. The reconstruction is based on the premise that a controlled process acquires its temporal structure through the relationships linking information about previous states, observation of the current state, anticipation of possible future states, and feedback concerning the consequences of action.

The first element of this reconstruction is **accumulated experience.** A system's current operation may depend on information retained from previous observations, earlier responses, and the consequences of prior actions. In cybernetic terms, this accumulated information contributes to the model through which the system interprets its present condition and determines an appropriate response. Wiener (1948) establishes the significance of information and communication for control, while Conant and Ashby (1970) demonstrate the importance of a model of the regulated system for effective regulation. Together, these perspectives make it possible to examine the relationship between previous information and present control decisions without treating the past as merely a chronological background.

The second element is **the observation and assessment of the present state.** A system must obtain information about the process it regulates in order to determine whether its current behavior corresponds to the conditions or objectives of control. Observation is therefore not an isolated event; it is part of an operational relationship between the state of the system and the information available to its controlling mechanism. The timing of observation is particularly important because information about a system's condition may become less useful as the system or its environment changes. The interval between observations, the availability of feedback, and the time required to process incoming information all influence the conditions under which the present state can be assessed.

The third element is **the anticipated future**. Control frequently involves more than responding to an already observed deviation. It may require the system to estimate possible future states and select actions in relation to those estimates. Predictive control provides an established technical example of this relationship. Mayne et al. (2000) describe a control framework in which future

system behavior is predicted over a finite horizon, while control decisions are successively reconsidered as new observations become available. The significance of this mechanism for the present study lies in the functional connection it establishes between the current state, an anticipated future, and the sequence of subsequent control actions. The future is not treated as a predetermined outcome but as a model-based domain of anticipation that informs present decisions.

The fourth element is **feedback and verification.** Through feedback, the system obtains information about the consequences of its actions and can compare observed results with the expected or desired state. This relationship closes one operational cycle while providing information for the next. Wiener (1948) establishes feedback as a central mechanism of cybernetic regulation, and Conant and Ashby (1970) clarify the relationship between the regulator's model and the system being regulated. From the perspective of temporal reconstruction, feedback connects the consequences of previous actions with current assessment and subsequent decisions. It therefore provides the mechanism through which the temporal organization of control can be continuously maintained or modified.

These four elements should not be interpreted as independent chronological stages that always occur in a strictly linear order. In practical control processes, observation, prediction, action, and feedback may overlap, recur at different frequencies, or operate through multiple interconnected loops. Accumulated experience may be updated continuously, predictions may be revised as new information becomes available, and feedback may influence both immediate responses and subsequent modeling. The purpose of the reconstruction is not to impose a universal sequence on all cybernetic systems, but to identify the principal functional relations through which their temporal organization can be analyzed.

The reconstruction also makes it possible to distinguish between two levels of temporal regulation. At the first level, a system operates within an established temporal regime: it observes, predicts, acts, and corrects according to a particular arrangement of intervals, sequences, and response rates. At the second level, the effectiveness of this arrangement may itself become a subject of evaluation. Ashby's (1952) work on adaptive regulation provides a theoretical basis for considering how a system may adjust the conditions governing its behavior, while Åström and Wittenmark (1995) offer engineering examples of adaptive mechanisms that modify control parameters in response to changing conditions. These approaches do not establish that every system can reorganize its entire temporal architecture. They do, however, support the methodological distinction between adjustment within a control regime and adaptation of the conditions under which that regime operates.

Functional reconstruction thus provides the intermediate analytical step between established cybernetic mechanisms and the conceptual model developed in this study. It identifies the temporal relations that must be considered together if time is to be examined as an architecture of control rather than as a collection of separate performance indicators.

2.3. Conceptual Model Construction

The third methodological operation consists of constructing a conceptual model of temporal architecture by synthesizing the functional relations identified in the preceding analysis. The model is intended to provide an analytical representation of how a cybernetic system connects accumulated experience, present-state observation, anticipation, and feedback, and how these relations may become subject to adaptation. It is not proposed as a universal technical configuration or as a mathematical description applicable without modification to every class of

system. Its purpose is to establish a coherent conceptual structure for examining the temporal organization of control.

Model construction proceeds from the identification of functional components and the relations connecting them. The first component concerns the relationship between accumulated experience and the system's capacity to interpret its present condition. The second concerns the observation and assessment of the current state. The third concerns the use of models and predictions to anticipate possible future developments. The fourth concerns feedback, through which the consequences of action are evaluated and information is returned to the control process. These components form an interconnected architecture rather than a simple linear chain, because the output of one operation may influence several others and may alter the conditions under which subsequent operations occur.

The model draws on the cybernetic relationship between regulation and system representation established by Conant and Ashby (1970). Their formulation emphasizes that effective regulation depends on the regulator possessing a model of the system being regulated. For the purposes of this study, this relationship is relevant because the temporal organization of control cannot be examined independently of the information and representations through which the system interprets its own state. The model also incorporates the adaptive perspective developed by Ashby (1952), according to which the conditions of regulation may require adjustment when the existing mode of operation is insufficient to maintain effective behavior.

A further element of the construction is the relationship between prediction and successive control decisions. The work of Mayne et al. (2000) demonstrates how predictive control can connect a model of future system behavior with repeated decisions based on updated observations. Åström and Wittenmark (1995) provide a complementary engineering perspective on the adjustment of control mechanisms under changing conditions. These approaches inform the model's treatment of prediction and adaptation, while the recent analysis of delay-based control by Fridman and Selivanov (2025) helps establish why temporal delays should not automatically be regarded as passive disturbances. *Depending on the system and control design, delays may become factors that must be explicitly incorporated into the regulation process.*

On this basis, the conceptual model is constructed around two related levels of organization. The first is the temporal architecture of the controlled process itself. It concerns the arrangement of observation, prediction, action, and feedback, including their sequence, pace, intervals, and interdependencies. The second is the possible adaptation of this architecture. At this level, the system's operation is examined not only in terms of whether individual actions produce the expected outcomes, but also in terms of whether the temporal regime governing those actions remains appropriate to the conditions of the process.

This distinction is central to the model. A system may correct an individual action while retaining the same temporal organization of control. For example, it may change the magnitude of a response without changing the frequency of observation, the interval between feedback cycles, or the prediction horizon. Such an adjustment takes place within the existing architecture. By contrast, a more substantial adaptation may involve changing the relationships among these operations: modifying the observation interval, altering the sequence of decisions, adjusting the frequency of feedback, or reconsidering the horizon over which future states are anticipated. In this case, the system does not merely change what it does within a given temporal regime; it modifies aspects of the regime through which its actions are organized.

The construction of the model therefore requires a distinction between parameter adjustment and architectural reorganization. The two may be connected, and a change in one parameter may contribute to a broader structural modification. Nevertheless, they are not conceptually

identical. Parameter adjustment concerns the value or setting of a particular temporal characteristic, whereas architectural reorganization concerns the functional relations among the operations of control. The distinction makes it possible to formulate the central proposition of the article without assuming that every adjustment of timing constitutes a higher-order change.

The model is evaluated conceptually against three criteria. First, it must remain consistent with established cybernetic principles of feedback, regulation, and system modeling. Second, it must distinguish temporal characteristics from the functional relations through which those characteristics acquire significance. Third, it must provide a basis for examining the transition from the correction of individual actions to the possible reorganization of the temporal regime of control. These criteria define the internal coherence and analytical scope of the proposed framework; they do not constitute empirical validation.

The resulting conceptual model provides the methodological foundation for the Results section. It establishes the elements and relations through which temporal architecture can be defined, examined as an object of adaptation, and considered in connection with higher-order control. The subsequent analysis develops these propositions and clarifies the extent to which the temporal organization of a system may become part of the system's own regulatory activity.

Results

3.1. Defining Temporal Architecture

The conceptual analysis makes it possible to distinguish between two ways of describing the temporal dimension of cybernetic control. In the first, time is represented through measurable characteristics of system operation: duration, delay, response rate, observation frequency, and prediction horizon. In the second, attention shifts to the organization of relations among operations that take place at different temporal positions. The distinction is not between quantitative and qualitative descriptions as mutually exclusive approaches. Rather, it concerns whether temporal characteristics are examined independently or understood through the functional structure in which they operate.

For the purposes of this study, temporal architecture is defined as the functional organization of temporal relations through which a cybernetic system connects accumulated experience, present-state observation, anticipated future states, and feedback-driven correction in the regulation of its processes. This definition identifies temporal architecture as an operational dimension of control. It concerns how the system relates information from different temporal positions, how it arranges the operations through which that information is used, and how these arrangements support the regulation of ongoing processes.

The definition brings together several mechanisms that have been examined separately in cybernetic and systems research. Wiener (1948) established the importance of feedback and communication for the regulation of system behavior. Conant and Ashby (1970) clarified the role of system models in effective regulation, while predictive control research demonstrates how representations of anticipated states can inform successive control decisions (Mayne et al., 2000). The present conceptual contribution is to examine these mechanisms as components of a broader temporal organization rather than as isolated functions.

An important consequence follows from this definition: **temporal architecture cannot be identified with a particular temporal parameter.** A system's feedback frequency, for example,

describes how often information about its behavior is returned to the control mechanism. It does not, by itself, explain how that information is interpreted, how it is related to accumulated experience, or how it influences subsequent predictions and actions. Similarly, a prediction horizon indicates the temporal range considered by a predictive mechanism, but does not fully describe the relationship between prediction, observation, and correction. Each parameter characterizes one aspect of operation; architecture concerns the organization of their functional interdependence.

Temporal architecture is therefore not simply the sum of temporal parameters. It is the structure of relations that gives those parameters their operational significance. A change in one parameter may leave the broader organization largely intact, while a change in the relationships among several operations may alter the way the system regulates its processes. This distinction allows the analysis to move beyond the assessment of isolated performance characteristics toward the examination of the temporal organization of control itself.

3.2. The Architecture of Temporal Relations

The proposed definition can be developed through four interconnected elements: accumulated experience, present-state observation, anticipated future states, and feedback. Together, they form the principal functional relations through which a cybernetic system maintains continuity between what has occurred, what is currently taking place, and what may occur as a consequence of its actions. Their significance lies not in their chronological separation, but in the dependencies that connect them within the control process.

The first element is **the relation to the past**: accumulated experience and system memory. Previous states, recorded observations, and the consequences of earlier actions provide information that can influence current regulation. This information may be retained in explicit models, stored data, learned parameters, or other mechanisms appropriate to the system. Its functional role is to make the current control decision dependent on more than the immediate state of the process. The past, in this architecture, is not simply a completed sequence of events; it is information from previous operations that remains available to influence subsequent behavior. The importance of system representation for effective regulation is consistent with the model-based perspective developed by Conant and Ashby (1970).

The second element is **the relation to the present**: observation and assessment of the current state. The system must establish what is happening within the process it regulates and determine how the available information relates to its operational objectives. This assessment provides the immediate reference point for subsequent decisions. However, the present is not an entirely independent temporal domain. Its interpretation depends on the information retained from previous operations and on the expectations against which the observed state is evaluated. The current state becomes meaningful for control through its relationship with both accumulated experience and anticipated developments.

The third element is **the relation to the future**: modeling and prediction. A control system may use available information to estimate possible future states and evaluate the consequences of alternative actions. Prediction extends the temporal reach of control beyond immediate reaction, allowing decisions to be formed in relation to anticipated developments. In model predictive control, for example, future behavior is estimated over a defined horizon, and control actions are reconsidered as new observations become available (Mayne et al., 2000). T**he future therefore enters the architecture not as a known or predetermined outcome, but as a modeled domain that informs present action.**

The fourth element is **feedback: verification and correction.** Feedback connects the consequences of an action with the information used in subsequent regulation. By comparing observed outcomes with expected or desired states, the system obtains a basis for determining whether its current mode of operation remains adequate. This relation is central to the cybernetic understanding of regulation developed by Wiener (1948). In the architecture proposed here, feedback performs an additional analytical function: it connects the system's experience of the consequences of action with the possible revision of its current assessment, model, or subsequent decisions.

These four elements form a functional configuration that can be represented as follows:

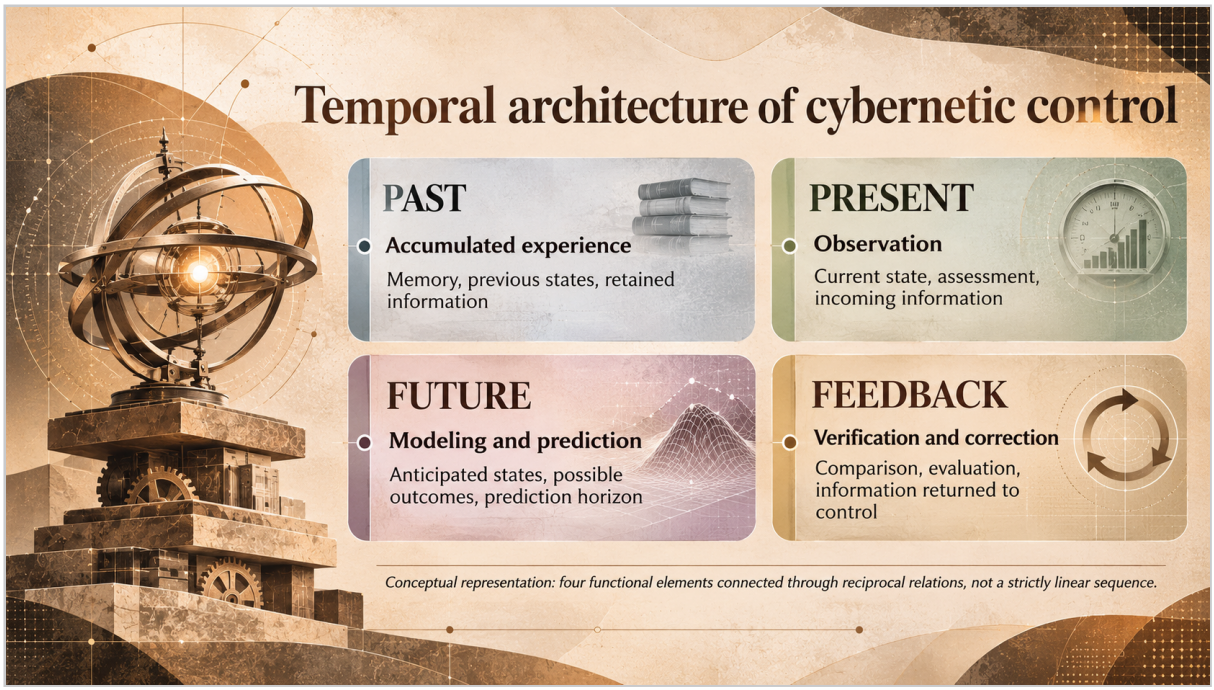


Figure 1. Conceptual representation: four functional elements connected through reciprocal relations, not a strictly linear sequence.

The configuration should not be interpreted as a fixed four-stage algorithm. Its elements may operate simultaneously, at different frequencies, and through multiple feedback loops. The model identifies functional positions within the temporal organization of control rather than prescribing an identical operational sequence for every system. Its purpose is to make visible the relations that are otherwise easily obscured when temporal characteristics are examined separately.

The resulting architecture establishes a continuous relationship between retained information, current assessment, anticipation, and the evaluation of consequences. Each element contributes to the functioning of the others: experience informs interpretation, observation updates the basis for prediction, prediction influences action, and feedback provides information for subsequent assessment and modeling. The temporal architecture is therefore defined by the organization of these dependencies, not by the mere presence of four separate components.

3.3. Temporal Organization as an Object of Adaptation

Once temporal architecture is understood as a functional organization of relations, a further possibility becomes analytically visible: the temporal characteristics of a control process may themselves become objects of adaptation. This proposition extends the analysis from the effects of time on system performance to the possibility of modifying the temporal conditions through which control is exercised.

Several characteristics are particularly relevant to this transition. They include the frequency of feedback, the intervals between observations, the pace of response, the sequence of operations, and the prediction horizon. Each describes a different aspect of temporal organization, and each may influence the relationship between the system and the process it regulates. Their significance, however, depends on the specific conditions under which control takes place.

Feedback frequency determines how often information about the consequences of action becomes available to the control mechanism. More frequent feedback may allow deviations to be detected earlier, but it may also increase the informational and computational demands placed on a system. Less frequent feedback may be appropriate where changes are relatively slow or where observations are costly, although excessive intervals may reduce the system's capacity to respond to developing deviations. The relevant consideration is therefore not frequency in isolation, but its suitability for the dynamics of the regulated process.

Observation intervals similarly determine how often the system obtains information about its current condition. Their adjustment may influence the relationship between available information and the rate of environmental change. A system operating in a relatively stable environment may not require the same observation regime as one exposed to rapid or unpredictable changes. This does not establish a universal rule for increasing or decreasing observation frequency. Rather, it identifies the interval itself as a characteristic whose adequacy can be assessed in relation to the conditions of operation.

The pace of response concerns the interval between the recognition of a condition requiring intervention and the implementation of an action. It is related to feedback frequency and observation intervals, but is not identical to either. A system may receive information frequently while responding according to a more deliberate decision procedure. Conversely, a system may be designed to respond rapidly once a particular condition has been detected. The relationship between response pace and the other temporal characteristics therefore contributes to the overall organization of control.

The sequence of operations introduces another dimension. In some processes, the order in which information is collected, evaluated, and acted upon is predetermined. In others, the sequence may be adjusted according to changing conditions or the availability of information. Altering the sequence can change the dependencies among operations without necessarily changing their individual duration. This is important because a system's effectiveness may depend not only on how quickly its operations are performed, but also on whether they occur in an appropriate order.

Finally, the prediction horizon determines the temporal range over which future system behavior is considered. A longer horizon may allow the system to account for more distant consequences, while a shorter horizon may be more appropriate when reliable anticipation is limited or when the process changes rapidly. Predictive control demonstrates that the horizon is an operational characteristic that can be incorporated into the design and execution of regulation (Mayne et al., 2000). Its relationship with observation and feedback is particularly

significant because predictions must remain connected to updated information about the actual process.

Engineering research on adaptive control provides a basis for understanding how control parameters may be adjusted in response to changing system conditions (Åström & Wittenmark, 1995). Research on delay-based control further demonstrates that delays can be incorporated into the design and analysis of control mechanisms rather than treated exclusively as unavoidable disturbances (Fridman & Selivanov, 2025). These approaches support the technical plausibility of examining temporal characteristics as elements of system regulation. They do not, however, establish that modifying an individual parameter necessarily produces a reorganization of the entire temporal architecture.

The distinction is important when connecting engineering adaptation with the broader question of environmental constraints. Research on ecological rationality shows that the effectiveness of a decision strategy depends on the relationship between the strategy and the environment in which it operates (Gigerenzer, 2002; Gigerenzer & Todd, 2012). In the present context, this perspective supports the general proposition that temporal arrangements should be assessed in relation to environmental demands and available resources. It does not provide direct evidence for autonomous temporal adaptation in technical systems; that question must be examined through the relevant cybernetic and engineering mechanisms.

The conceptual result is that temporal organization can be treated as a potential object of adaptation at the level of identifiable operational characteristics. **A system may adjust the frequency of feedback, the intervals of observation, the pace of response, the sequence of operations, or the horizon of prediction.** Such adjustments may improve the suitability of its control regime under changing conditions. Nevertheless, the modification of a temporal characteristic should not automatically be equated with a change in the architecture itself. The latter requires examining whether the functional relations among the operations have also been reorganized.

3.4. Higher-Order Reorganization of Control

The distinction between adjusting a temporal characteristic and reorganizing temporal architecture leads to the final conceptual result of the study. A system may correct an individual action while retaining the established organization of its control process. It may change the magnitude of a response, revise a particular control parameter, or compensate for an observed deviation without reconsidering the temporal regime through which its operations are coordinated. Such corrections take place within an existing architecture.

Higher-order reorganization concerns a different level of regulation. It arises when the system's evaluation extends beyond the outcome of a particular action to the adequacy of the control arrangement that produced it. The object of evaluation is no longer only whether the system has reached an intended state, but whether the temporal organization of observation, prediction, response, and feedback remains appropriate to the conditions of the process.

This distinction can be expressed through **two levels of control:**

- **First-order adjustment:** the system modifies an action or an operational parameter while retaining the existing temporal organization of control.
- **Higher-order reorganization:** the system modifies aspects of the temporal organization itself, reconsidering the relations among operations through which control is exercised.

The distinction is conceptual rather than a claim that every adaptive system necessarily possesses a separate mechanism for evaluating its own temporal architecture. It identifies a possible extension of adaptive regulation that must be demonstrated in the design and operation of particular systems.

Ashby's (1952) work on adaptive regulation provides an important theoretical foundation for considering changes in the conditions governing system behavior. His account of ultrastability draws attention to the possibility that adaptation may involve adjustments beyond immediate responses to disturbances. Conant and Ashby (1970), meanwhile, establish the significance of the regulator's model for effective control. Together, these perspectives make it possible to formulate the higher-order question: whether the system's representation of its own functioning can include not only the state of the regulated process but also the adequacy of the regulatory arrangement itself.

Applied to temporal architecture, this possibility requires a system to obtain and interpret information about the performance of its control regime. For example, repeated discrepancies between predicted and observed outcomes may indicate not merely that a particular action was insufficient, but that the existing prediction horizon, observation interval, or feedback frequency is no longer appropriate. Similarly, persistent delays between the detection of a deviation and the implementation of a corrective response may indicate a structural limitation in the organization of operations. In such cases, repeating the same type of correction may not resolve the underlying problem because the difficulty lies partly in the temporal arrangement through which corrections are generated.

A higher-order response would therefore involve reconsidering the organization of control. The system might alter the relationship between observation and action, modify the frequency with which feedback is processed, revise the temporal horizon used for prediction, or change the sequence through which information is evaluated and decisions are implemented. These examples identify possible forms of reorganization; they should not be understood as a universal set of operations or as evidence that every system can perform them autonomously. Their realization depends on the system's architecture, available information, control mechanisms, and capacity to modify its own operating regime.

The distinction also clarifies the relationship between parameter adjustment and architectural change. A modification of feedback frequency, for instance, may remain a local adjustment if all other functional relations are preserved. However, if that modification is accompanied by changes in the relationship between observation, prediction, and correction, it may form part of a broader reorganization. The decisive criterion is not the number of parameters changed, but whether the functional organization of temporal relations has been altered.

The conceptual model therefore identifies *a possible transition from the regulation of processes to the regulation of the temporal conditions through which those processes are controlled.* This is the central meaning of higher-order control in the present study. The system does not merely act within a temporal architecture; under appropriate conditions, it may evaluate and modify aspects of that architecture in response to the changing demands of its environment and the limitations of its existing control regime.

The results of the conceptual analysis can thus be summarized in three connected propositions. First, temporal architecture is a functional organization of relations connecting accumulated experience, present-state observation, anticipated future states, and feedback-driven correction. Second, identifiable temporal characteristics of control may become objects of adaptation when their configuration affects the suitability of system operation. Third, the evaluation and

modification of the relations among these characteristics constitute a possible form of higher-order reorganization, distinguishable from the correction of individual actions.

These propositions establish the conceptual basis for the discussion that follows. They do not imply that temporal architecture is already a standardized category within engineering practice, nor that the proposed model has been empirically validated. Rather, they provide a framework for examining an additional dimension of cybernetic control: not only how a system regulates processes over time, but also how it may reorganize the temporal relations through which regulation becomes possible.



Figure 2. Implications and limitations of the temporal architecture of cybernetic control

Discussion

4.1. Theoretical Implications

The conceptual model developed in this study invites a reconsideration of the role of time within cybernetic theory. Its principal implication is that temporal organization can be examined not only as a condition influencing the performance of a control system, but also as a functional dimension of the system's regulatory structure. This perspective does not require replacing established cybernetic concepts. Rather, it provides a way of examining their interdependence through the temporal relations that connect information, modeling, prediction, action, and feedback.

Classical cybernetics established that regulation depends on the circulation of information and the capacity to use feedback in modifying system behavior (Wiener, 1948). The proposed framework extends this analytical perspective by emphasizing that the effectiveness of such circulation depends partly on how the relevant operations are organized in time. Feedback is not simply information returned to a regulator; it is information that becomes available at a particular moment, after a particular sequence of events, and within a specific interval for possible intervention. Similarly, a system model is not merely a representation of the regulated

process. It participates in a temporal relationship between accumulated information, present assessment, and anticipated developments.

The relationship between regulation and modeling is particularly important in this context. Conant and Ashby (1970) formulated the principle that an effective regulator must embody a model of the system it regulates. Within the present framework, this principle can be considered in relation to the temporal organization through which the model informs control decisions. A regulator's model may be adequate in terms of its representation of the system, yet its operational effectiveness may also depend on when information is incorporated, how frequently predictions are revised, and whether the interval between assessment and intervention corresponds to the dynamics of the regulated process. The temporal dimension therefore does not replace the importance of modeling; it adds another level at which the adequacy of regulation can be examined.

Ashby's (1952) work on adaptive regulation provides a further theoretical connection. Adaptation is conventionally associated with a system's capacity to modify its behavior or regulatory conditions in response to disturbances and changing circumstances. The present study suggests that this perspective can be extended conceptually to the organization of temporal relations. If the arrangement of observation, prediction, response, and feedback contributes to the effectiveness of regulation, then the suitability of that arrangement may itself become relevant to adaptation. The system's capacity to maintain effective control may depend not only on changing its responses within an established regime, but also, under appropriate conditions, on reconsidering aspects of the regime itself.

This proposition introduces a *distinction between adaptation within a temporal architecture and adaptation of the temporal architecture*. The former concerns changes in individual actions or parameters while the underlying organization of control remains substantially unchanged. The latter concerns modifications to the functional relations connecting the operations of control. The distinction is theoretically useful because it makes possible a more precise discussion of adaptive regulation without assuming that every parameter adjustment constitutes a structural transformation.

The concept of higher-order reorganization should therefore be understood as a conceptual extension of established cybernetic reasoning, not as a claim that a new universal mechanism of control has been discovered. It identifies a level of analysis at which the organization of regulation itself becomes an object of evaluation. This provides a basis for examining whether a system can recognize limitations in its current temporal regime and modify the relations through which its regulatory operations are coordinated.

4.2. Temporal Adaptation and Decision-Making

The proposed framework also has implications for the relationship between temporal organization and decision-making under uncertainty. A central insight of research on ecological rationality is that the effectiveness of a decision strategy depends on the structure of the environment in which it is used. Gigerenzer (2002) argues against evaluating rationality exclusively through the assumption that more information and more extensive calculation necessarily produce better decisions. **The suitability of a strategy must instead be considered in relation to the available information, the constraints of the task, and the regularities of the environment.**

This perspective is relevant to temporal adaptation because the amount of time available for observation, evaluation, and intervention is itself part of the decision environment. A strategy

that requires extensive information processing may be appropriate in a relatively stable situation, but less suitable when relevant conditions change rapidly. Conversely, a rapid response may be effective when immediate intervention is necessary, but inadequate when the consequences of action require more extensive evaluation. The relationship between decision quality and temporal organization is therefore conditional rather than universal.

The work of Gigerenzer and Todd (2012) further demonstrates that relatively simple decision strategies may perform effectively when their structure is appropriate to the environment. Neth and Gigerenzer (2015) similarly emphasize the adaptive role of heuristics under conditions of uncertainty. These findings provide an important conceptual qualification to the interpretation of temporal efficiency: a more elaborate decision process is not necessarily a more effective one, just as a faster response is not necessarily a better response. The relevant issue is the relationship between the strategy, the time available, and the structure of the situation.

For the present study, this connection helps clarify why temporal architecture should not be evaluated according to a single criterion such as speed. Its effectiveness depends on the coordination of several temporal characteristics and their suitability for the conditions under which control takes place. Feedback frequency, observation intervals, response pace, and prediction horizon may need to be balanced differently in different environments. The objective of adaptation is therefore not to maximize each characteristic independently, but to establish an arrangement that supports effective regulation under the constraints of a particular process.

There is, however, an important boundary between the interdisciplinary contribution of ecological rationality and the technical claims made in this article. Research on heuristics primarily concerns human decision-making and the interaction between cognitive strategies and environmental structures. It does not establish that technical systems possess the same decision mechanisms or that they can autonomously reorganize their temporal architecture. Its contribution here is more specific: it supports the general analytical principle that the effectiveness of a strategy must be evaluated in relation to temporal and environmental constraints. The technical possibility of adjusting control parameters or modifying regulatory mechanisms must be grounded separately in cybernetic and engineering research.

This distinction allows the article to connect two research traditions without conflating their objects of study. Ecological rationality provides a perspective on adaptive choice under limited time and information, while adaptive control provides mechanisms through which technical systems may modify their regulatory behavior. The concept of temporal architecture offers a common analytical question across these domains: *how are the temporal conditions of observation, evaluation, prediction, and action organized in relation to the demands of the environment?*

4.3. Engineering Implications

The engineering implications of the proposed framework concern the way temporal characteristics are considered in the analysis and design of adaptive control systems. The study does not introduce a new control algorithm or prescribe a specific technical implementation. Its contribution is to suggest that the assessment of control performance may benefit from examining the relationships among temporal parameters rather than treating them exclusively as separate design variables.

Adaptive control provides an established basis for modifying system behavior and control parameters in response to changing conditions (Åström & Wittenmark, 1995). Within the proposed framework, such modifications can be examined at two analytical levels. At the first

level, an adaptive mechanism changes a particular parameter while retaining the general organization of the control process. At the second, the combined effects of parameter changes may require reconsidering the relationships among observation, prediction, and response. This distinction may be useful when evaluating whether an adjustment represents a local optimization or contributes to a broader modification of the control regime.

Model predictive control provides a particularly relevant context for this discussion. Its use of a prediction horizon and successive reconsideration of control actions establishes an operational relationship between current observations and anticipated future states (Mayne et al., 2000). From the perspective of temporal architecture, the prediction horizon cannot be assessed entirely independently of the frequency of new observations, the timing of control decisions, and the dynamics of the regulated process. These characteristics jointly determine how the predictive mechanism participates in the overall organization of control. The conceptual framework therefore suggests examining their coordination as well as their individual values.

The treatment of delay offers another important engineering connection. Delays are frequently associated with communication constraints, measurement processes, computation, and the physical dynamics of controlled systems. Their effects depend on the architecture and conditions of the particular control problem. Fridman and Selivanov (2025) review approaches in which delays are explicitly incorporated into control design, including methods that use delay-related structures as part of the regulatory framework. This research demonstrates that temporal delay need not be understood exclusively as an external obstacle. Under particular technical conditions, it can become an element considered in the design and analysis of control.

The proposed concept of temporal architecture provides an additional way to interpret such approaches. Rather than examining delay only as an isolated quantity, it encourages consideration of how delay interacts with observation, prediction, feedback, and the timing of intervention. A delay may have different consequences depending on whether the system operates through continuous feedback, periodic observation, or predictive mechanisms. Its significance is therefore partly determined by the temporal organization in which it occurs.

Several practical questions follow from this perspective. When a control system experiences persistent deviations, is the problem attributable to the parameters of a particular response, or does it arise from the timing of observation and correction? When prediction becomes less reliable, should the system modify its predictive horizon, increase the frequency of observation, or reconsider the relationship between prediction and feedback? When communication or computational delays increase, can the existing control regime accommodate them, or must the coordination of operations be revised? These questions do not constitute a ready-made engineering procedure, but they indicate how the proposed framework may inform the analysis of complex control systems.

The principal engineering implication is therefore methodological: *the temporal organization of a control system deserves consideration as a coordinated structure rather than merely as a collection of independent timing settings.* This approach may help distinguish between local parameter adjustment and changes that affect the organization of the control process as a whole. Its practical value remains to be established through application to specific systems, where the relevant variables, constraints, and performance criteria can be defined and tested.

4.4. Scope and Limitations

The proposed model has a deliberately defined theoretical scope. It presents **temporal architecture as a conceptual framework for examining the organization of relations among**

accumulated experience, present-state observation, anticipated future states, and feedback-driven correction. It does not claim that these four elements constitute an exhaustive description of every cybernetic system, nor that they must be implemented as separate components in a technical architecture. Depending on the system under consideration, some functions may be distributed, combined, implicit, or realized through different mechanisms. The model is intended to support functional analysis, not to impose a universal technical configuration.

A second limitation concerns the distinction between temporal organization and physical time. The article examines the temporal structure of processes of control, including sequence, duration, pace, delay, observation intervals, and prediction horizons. It does not propose a theory of physical time, nor does it suggest that cybernetic systems can alter time as a physical dimension. *The concept of temporal architecture refers exclusively to the organization of operations and relations through which control is exercised.*

A third limitation concerns the interpretation of adaptation. The ability to modify a temporal parameter does not necessarily imply the ability to evaluate or reorganize the broader architecture of control. Such a capability depends on the system's design, the information available to its regulator, the mechanisms through which control conditions can be modified, and the criteria used to assess the effectiveness of regulation. The transition from local adjustment to higher-order reorganization is therefore a theoretical possibility whose realization must be investigated in particular system classes. It should not be assumed as an inherent property of adaptive systems.

The interdisciplinary character of the argument also requires qualification. Research on organizational temporality and ecological rationality provides useful perspectives on sequencing, pacing, coordination, and adaptation under environmental constraints (Ancona et al., 2001; Orlikowski & Yates, 2002; Gigerenzer, 2002; Neth & Gigerenzer, 2015). However, organizational processes, human decision-making, and technical control systems have different operational structures and cannot be treated as interchangeable. These sources support the broader conceptual analysis of temporal organization, while claims about technical mechanisms remain grounded in cybernetic and engineering literature.

Finally, the study is conceptual and does not provide empirical validation of the proposed model. It does not establish quantitative relationships between temporal parameters, demonstrate the effectiveness of architectural reorganization, or identify universal thresholds at which a control system should modify its temporal regime. These questions require further investigation through the analysis and testing of specific systems. Possible directions include examining how changes in feedback frequency and observation intervals affect regulatory performance, how prediction horizons interact with system dynamics, and under what conditions modifications to temporal parameters produce a broader reorganization of control.

Such investigations would need to define the relevant system boundaries, operational variables, performance criteria, and mechanisms of adaptation for each application. They would also need to distinguish measurable improvements in response or stability from evidence that the underlying temporal organization has changed. *This distinction is essential if the concept of higher-order control is to move from theoretical interpretation toward operational assessment.*

Within these boundaries, the proposed framework offers a conceptual contribution to the study of cybernetic systems. It brings established mechanisms into a common analytical structure and identifies temporal organization as a potential object of adaptation. Its value lies not in claiming to resolve every aspect of temporal control, but in making a particular question more precise: whether the effectiveness of a system depends only on how it regulates processes, or also on its

capacity to reconsider and modify the temporal relations through which that regulation is organized.

Conclusion

This study examined the temporal dimension of cybernetic control beyond its conventional representation through measurable parameters such as duration, response speed, delay, feedback frequency, and prediction horizon. While these characteristics remain essential for understanding system performance, the analysis has demonstrated that they do not fully explain how temporal relations are organized within processes of control.

The central result is the conceptualization of **temporal architecture** as the functional organization of relations connecting accumulated experience, present-state observation, anticipated future states, and feedback-driven correction. This perspective brings established cybernetic mechanisms into a common analytical framework and makes it possible to consider their temporal interdependence as a dimension of system regulation.

The study further distinguishes between adjustments made within an existing temporal regime and the possible reorganization of the regime itself. This distinction provides a conceptual basis for examining higher-order control, in which a system evaluates not only the outcomes of its actions but also the adequacy of the temporal organization through which those actions are generated and corrected. In this sense, adaptation may involve not only changing what a system does, but also reconsidering how its operations are organized in time.

The proposed model is theoretical and requires further investigation in specific technical and applied contexts. Future research should examine the conditions under which modifications to temporal parameters produce broader changes in control architecture and whether such changes can improve the effectiveness of adaptive and predictive systems.

The principal conclusion is that the capacity to control a process depends not only on what a system does, but also on how it organizes the temporal relations through which its actions become possible. **Time, therefore, is not merely a parameter of control. It is part of its architecture.**

Declarations

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