

How Cybernetic Can Enhance Organizational Intelligence?

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ABSTRACT:

In the modern era, cybernetic has shown an important place in the progressiveness of numerous internationally recognized firms as an appropriate hypothetical management framework to overcome the traditional organizational structural dilemma. This chapter will critically analyze the previous literature relevant to the aspects of organizational intelligence and cybernetics because it is vital for the researcher to understand the influencing features of cybernetics in enhancing organizational intelligence. These factors are explored from previous scientific literature using journals, publications, and books to develop the basis of the current research study. Therefore, the purpose of this chapter is attempting to carry out a review of relevant literature on how cybernetics can enhance organizational intelligence.

Thus, three sequential themes are introduced and discussed in this chapter. The first theme focuses on an overview of organizational intelligence, the second theme focuses on cybernetics, and the third theme focuses on the theoretical models for implementation of cybernetics to enhance organizational intelligence.

Keywords: *Cybernetic, Organization, Intelligence*

Need for study

The current study is deliberated to overcome the challenges faced by Organizations due to rapid changes and growth as well as constant pressure of success and competition. Organizations are facing numerous encounters due to complexity in internal and external environment. Internally, all types of organizations are facing challenges such as the absence of clear vision, uncertainty, difficulties in forming cohesive and unified teams, lack of core competencies or behaviors, poor communications, feedback system, and lack of awareness. Externally, high fluctuating hustles, turbulence in socio-economic arenas, complexity, and uncertainty in the market place are the main challenges for all types of organizations. To overcome these challenges, the firms need appropriate management approaches to enhance

the intellectual capacity, accelerate their speed and orient actors at all levels for coping with internal and external complexity. The author emphasizes on organizational learning and knowledge creation to cope with these mutable, effectively as adopted from Schwaninger, (2001). Furthermore, the intellectual frameworks are quite useful for coping with complex organizational challenges and variations (Pérez, 2010). Cybernetics has simple principles but highly effective for the organizational implementation to enhance the growth of organization. Therefore, this study is intended to incorporate both ideas the cybernetics (for information and control) to enhance the organizational intelligence (intellectual capacity) for overcoming the organizational challenges.

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Cybernetic

Cybernetics was initially coined as an idea about information and control by an American mathematician Norbert Wiener in 1948, which became a science of communication and autonomous control of humans and machines. It is the root of modern cognitive science that divides the intelligence into two main parts natural (human) and artificial (Man-made/machine) intelligence. Cybernetics is an interdisciplinary science that is defined as “*the science of communication and control in humans, machines, organizations, and societies across the reductive hierarchy of neural, cognitive, functional, and logical levels*” (Wang, et al., 2009). In Cybernetics, analog is drawn among computers, electronic systems, and the human brain and/or nervous system. The conceptual framework of cybernetics is applied to the study of humans and machines in the field of biology, sociology, management, psychology, and linguistics, whereas it became a practical approach to enhance the organizational growth. Now, Cybernetics is considered as the “*science of effective organization*” in social and management disciplines that describes the principles of behavior in terms of learning, progress, and adaptation within the complex and dynamic organizational system (Oliver & Montgomery, 2001).

Types of Cybernetics

The cybernetic systems can be divided into discrete and continuous based on the functionality and state of the system for any organization. Previously, the organizations work in discrete manners in which system work in an isolated environment; focus on a specific function, and for a particular time to handle a sole challenge, it is known as discrete or Management cybernetics. Recently, businesses use integrated systems in which they work under continuous process after expanding management cybernetics repository, it is known as a continuous system or Organizational Cybernetics.

Adam and fellows, the pioneers implemented both discrete and continuous principles of cybernetics in the context of organizational cyber security. They well-defined cybernetics abstractly as “*developed framework that follow the law of requisite variety and use the elementary mathematical ideas for discussing*

feedbacks, stability, equilibrium, disturbance, regulations, information, entropy, noise, communication, constraints, and amplification, all of these terms can be used in different disciplines of science” (Adams, et al., 2013). On the other hand, Cybernetics can be used as an analytical tool for diverse and complex organizational systems at two levels, first-order cybernetics (observed systems & their interrelationship) and second-order cybernetics (observer interaction with the system being observed). In social systems, second-order cybernetics is mostly considered due to the entrance of observers within the system to control it as an essential variable due to the distinct perception of the environment (Oliver & Montgomery, 2001). In the current study, we will consider organizational cybernetics to enhance the intelligence of the dynamic organizational system due to its integrative system methodology and ability to deal with complexity, effectively.

Attributes of Organizational Cybernetics

The researcher complies with the attributes of organizational cybernetics as developed by Perez, (2010) i.e. viability, variety, Ashby’s law of requisite variety, Conant-Ashby theorem, Viable system model, Recursive, and organizational pathologies. In the context of Organizational Cybernetics, *Viability* is referred to the capacity of the system to maintain its existence in spite of changing the external environment, whereas, it must have self-regulation, learning, adaptation and evolution techniques to maintain the sustainability of the organization. *Variety* is referred to as the level of complexity of any system, organization, or company. The third element is identified as *Ashby’s law of requisite variety* that states, “Only variety can destroy/absorb variety”. Assert of *Conant-Ashby theorem* is “every good regulator of a system must be a model of a system” which states that quality of decisions is highly dependent on the quality of the used model to deal with a specific organizational concern. *Viable System Model (VSM)* provides the essential systems and their relationship for the viability of any organization. *Recursive* is a characteristic of VSM to implement all systems to determine the viability of the organization. *Organizational pathologies* can be structural, functional or informational that can be produced in case of

improper implementation of models. If any of this pathology appears in the organization, the organization cannot work accurately, or can disappear or even can lose its values as an independent entity.

Therefore, these attributes of cybernetics are vital to apply in the organizations for diagnosing and designing an appropriate organizational management system for the viability of any organization under the complex arena.

Implementation in Organizations

Organizational cybernetics have great potential and emergent properties due to its trans-disciplinary approach for exploring the strategic systems, structural reforms, constraints (internal/external) and possibilities to make any organization a viable system by maximizing its potential to adopt changes and ability to survive under unexpected conditions. The cybernetic system is a systematic approach to identify and develop powerful implementation for all sorts of organizations to succeed. An integrated form of management and behavior is essential part of integrating cybernetic for efficient decisions, purpose decisions, or value decisions (Ericson, 2014). Numerous studies implemented organizational cybernetic framework to handle the complexity in their organizational environment. For instance, Rios used in public and private organizations, Oliver & Montgomery used to implement Trust in complex organizations, Dodis and fellows used in solid waste management, Azadeh and fellows used to enhance the purchasing process, and Jung used in construction industry.

We can assume from the above-mentioned research studies that organizational cybernetics is an essential tool for enhancing the growth of organizations at system levels, organizational levels and industrial levels due to effective method of communication and control in complex organizational systems. Since, Organizations are complex entities, have a variety of elements and functionality, which require efficient handling, therefore, cybernetic bring various interactive systems into balance. It is beneficial for the organizations in different ways such as to handle the challenges of ubiquitous complexity, implementation of autonomy, and recursion for sustainability. The regulatory control of autonomy status or self-governance is vital to

cope with a continuously changing environment and complexity. Previously, most scholars' emphasis to develop theories, models, and their implications for the progression of the organizations using cybernetics in social sciences and management disciplines. There is limited literature related to the empirical evidence for the impact of cybernetics in enhancing organizational intelligence.

Organizational Intelligence and Its Attributes

Organizational intelligence is an intellectual capacity of any organization, which embraces organizational learning and knowledge management. It is deliberated as adopting change with the continuously changing environment, influencing and shaping the internal environment, reconfigure its internal environment under ambiguity from the external environment. Organizational intelligence can be used to focus on time management, lean management, quality management, and enhancing the capabilities of firms (Schwaninger, 2003). Therefore, organizational intelligence will be associated with processes such as adaptation, learning, development, and transformation.

Organizational intelligence is an integral, fractal, and non-linear system of contextual management for the complex organizational environment. The outlook of the researcher is to adopt any of the approaches as developed by Lefter, et al., (2008) including the behaviorist approach, the cognitivist approach, and/or an adaptive approach for intricate management process, which suits better for the organizational interest. The organizations can use *behaviorist approach* to yield suitable organizational motives of behavioral algorithms such as hybrid systems including human and cybernetic by the management. It is known as single-loop learning in which any single algorithm is used to obtain the tenacity related to previously embracing one due to some environmental stimulation. On the other hand, the *cognitivist approach* uses cybernetic modeling of organizations, which equalize the intelligence with the information-processing organizational structures without any contextual positioning. The *adaptive approach* is the third tactic, which can be used as a non-linear model for two stages of survival and performance of the organization. However, it works similarly to the behavioral approach under the simulated

environment but it is a passive approach (Lefter, et al., 2008). According to the observation of researcher, seven factors by Prejmerean & Vasilache, (2007) are appropriate to assess the organizational intelligence and its coefficients for the adoptive approach. These include *strategic vision, heart and soul, alignment, shared fate, change orientation, alignment, knowledge deployment, and performance pressure* (Prejmerean & Vasilache, 2007).

i. *Strategic Vision*: is an assessment of previously implemented strategies in the organizations by focusing on strategic discussions, annual strategic reviews, environmental perusing, value propositions, statement of direction, and relationship among the statement & decisions.

ii. *Shared fate*: has elements of individual behaviors such as the sense of belonging, employees' perspective toward organization, partnership, beliefs, sharing of priorities, and management viewpoint towards employees, etc.

iii. *Change Orientation*: accounts approach towards changing environment to keep up demand, the adaptation of innovative approaches, creative ideas, openness, and learning from the mistakes.

iv. *Heart and Soul*: is the measurement of the commitment of employees and management in terms of their perceived work quality, prides, willingness to extra efforts to build organizational success and optimism.

v. *Alignment*: is the measure of implementation of mission, policies, and strategies. It is the facilitation of performance and information systems for value creation and appropriate organizational structure.

vi. *Knowledge Deployment*: is measured by the organizational structure of knowledge sharing among all stakeholders. Besides, it considers the manager's attitude towards employees' knowledge skills and the flow of Information systems' knowledge at all levels.

vii. *Performance Pressure*: is a measure of performance goals and expectations at all levels, a clear understanding of role and responsibilities, feedbacks on the performance at all levels, and replacement of poorly performing individuals or teams within the internal environment of the organization.

Therefore, the behaviorist and cognitivist

approaches are appropriate to use at manager level, whereas Adoptive approach is suitable for organizational level in my opinion. These attributes of organizational intelligence are largely influencing the growth of any organization by expanding the development indicators. A systematic adoptive approach using these attributes enable the organizations to cope with virulent economic, globalization, delocalization, and financial crisis around the world and thrive. As we know, proper management can enhance the performance of organizations. These intellectual organizations can shift demand into their strengths using intelligent operations such as influencing the external environment using marketing strategies, carrying out of R & D, human resource management, and technological advancement as internal resources. Likewise, it can improve the organizational culture by addressing the problematic attributes of the organization as previously stated by Lefter, et al., (2008).

Theoretical Models for Cybernetics and Organizational Intelligence

Modern organizational intelligence is based on both intelligence (natural and artificial) for operational management in the organization. It implies that the dynamics of cybernetics "information" and "control" are the vital components of organizational intelligence. Management cybernetics have developed numerous models for diagnosing and design organizational intelligence. Here are entailed three most significant cybernetic models for the current study to implement for organizational intelligence including the Viable System Model (Beer, 1985; Schwaninger, 2006), Team Syntegrity Model (Beer, 1994; Schwaninger, 2003), and Model of System Control (Gaëlweiler, 1990; Schwaninger, 2001). These three theoretical models share two main characteristics; firstly, comprehensive insights of organizational features and secondly, linked with integral cogent logic (Schwaninger, 2001). It is established that the quality of the decision made by organizational managers is largely dependent on the applied model; the current turbulent environment obliges the implementation of the right model for diagnosing and designing any type of firm's ability for viability (Rios, 2010).

Viable System Model (VSM)

The viable system model is originally proposed by Beer, (1985) through a blend of cybernetics and management to redesign the organizational structure after identifying the shortcomings. It is securitized by numerous researchers including Schwaninger, (2006), (Adams, et al., 2013) by applying cybernetics to the organizational environment. This model undertakes the main structural issues for the viability and progression of the organization using *diagnose* and *design* technique (Schwaninger, 2001).

It is a powerful tool to analyze and design a complex organizational environment, which is based on five theoretical managerial systems and their interrelationship to provide the organization an exceptional structural strength. Concretely, a viable organization should set forth and implement five systems that are *System 1) management of basic subsystem*, *System 2) coordination among all subsystems*, *System 3) operative management using auditing & monitoring*, *System 4) long-term management and relationship with overall environment*, and *System 5) normative management system*. This model provides a comprehensive approach to handle any situation from diagnosis, management, coordination among all stakeholders, auditing and normative management.

Previously, Schwaninger, (2006) applied this model on various real-time organizations and found a positive impact of using VSM on the transformation of business, corporate ethos, strategic development, enhancing cohesion, and redesign of a meta-system. This model emphasizes three main elements and their interrelationship operation, environment, and management that influence the organization at each level. It is established that any deficiency in any of the above-mentioned five systems can threaten the viability of the organization. On the other hand, comprehensive implementation of VSM can assist the manager in the powerful diagnostic insights to find innovative approaches to organizational design. Thus, this theoretical model is an efficient tool for managers to manage the organizational environment using all aspects of organizational intelligence and cybernetics (communication & control).

Team Syntegrity Model (TSM)

The Team Syntegrity model (TSM) is initially developed by Stafford Beer in 1994, afterward numerous changes have been implemented to enhance the usefulness in the context of organizational cybernetics. It offers a structural framework to develop interactive behavior among all stakeholders in an organization to nurture the synergy, knowledge creation, and consistency (Schwaninger, 2001). The holographic model has a future-oriented approach for a large group of people having the same motive that enables all members to contribute democratically by an organized communication process. It is built on the polyhedral preposition of Fuller, where syntegrity is developed from synergy (corporation among concerned individuals), and integrity (structural strength by tension) to tackle the shared issue. This model is suitable for forming a team-oriented structure and organizational cognition process. The process of Team Syntegrity model consists of five phases; *Opening with joint creation of an issue*, *Generation of consolidated statements as perceived by each Infoset on Importance of the agenda*, *group assignment after discussion and combined final consolidated statements*, *outcome resolve among all sub-teams*, and *finalization of all group results*. It is a process in which multiple Infoset (individual shareholders, having similar goals) are interlinked for handling a sole issue with proper involvement to develop syntegrity. It is an integration process in which multiple topics and prospective towards shared knowledge are discussed. Moreover, this activity has the potential to generate new ideas relevant to the integrated discussion. The TSM is previously applied for the self-organization process, the planning process of technical institutes, organizational change, and strategic management to develop local and electronic syntegrity of Infoset from around the world (Schwaninger, 2003). Therefore, this model provides the innovative and revolutionary root of cybernetic management for the complexity of the organizational turbulence environment.

Model of System Control (MSC)

Cybernetics assist the organizations to cope with the management complexity and the Model of System Control (MSC) provides a

comprehensive framework for control of variables/activities to enhance organizational capability (Schwaninger, 2001). The MSC specifies, regulates, steers, and interrelates the control variables to deal with the complexity of the organizational environment in order to achieve the organizational goals (intrinsic and extrinsic) and implement dynamic equilibrium. Traditionally the control models were used exclusively for the profit gain but under evolutionary complexity, those are no longer beneficial for the sustainability of the organization. Organizational intelligence or fitness required a comprehensive model of systematic control.

Rendering to Gaelweiler, (1990), a model of systemic control is perceived as a sole control system that governs by means of control variables at each logical level such as operative, strategic and normative that are interrelated to each other. This model presents different criteria at each level such as efficiency (quality, productivity, and profitability) at the operative level, effectiveness (competitive and cooperative sense) at the strategic level, and legitimacy (ability to fulfill the claims of all related stakeholders) at the normative level.

The systematic control at *Operative level* is needed to add value for all primary stakeholders (customers, personal, and owners) of the organization in terms of profit, value, and liquidity. The prerequisite attainment of specific control variables is vital for achieving customer benefits, social benefits, ecological benefits, company value, cash flow, and shareholders' profit related to operational management.

The systematic control at the *strategic level* is essential for predetermined value potential, which is all business-specific demands (in terms of resources, capabilities, core competencies). The behavior of essential variables can be predicted and controlled/influence, although value and value potential needs to be separately controlled. The value potentials are managed using dynamics of customer problems, their solutions, technological substitution, and value chain. These properties can comprise sustainable efforts for innovation or redesign a business system that has the ability to recreate the industry shape, create new opportunities, or introduce a new mode of handling business. According to the MSC, in fact, profit is not the strategic goal or variable but the

appearance or absence of profit is the consequence of good or bad strategies.

The third level is *normative management*, which is an independent criterion to measure the viability (ability to maintain a distinct existence) and development (growing ability, viability beyond survival) of the organization. Viability is properly measured in VSM that is an excellent theoretical instrument to diagnose and develop the viability of the organization. However, the MSC provides a systematic approach to provide viability in terms of the development of the organization instead of only a survival point of view or self-sustaining. It provides a multifaceted theoretical framework for the progressive development in terms of social, political, cultural, ethical, aesthetic, and ecological prospects to match the claims of all types of stakeholders for extensive sustainability and progressive growth (Schwaninger, 2001).

Therefore, according to the system control model, an organization cannot survive and reap the fruits of success without possession of value potentials (strategic level), actualized conversion into value (operational level), and precondition of viability as ensured in normative management through the interrelationship of all logical levels.

Cybernetic in viability of the Organization

The integrated framework is necessity of systematic management of organizational cybernetics to incorporate the notion of all three models subsume Viable System Model, Team Syntegrity Model, and Model of System Control, which should emphasize all aspects of the organization to provide a complete picture instead of some components. As, these models have limitations due to the complexity and widespread notion of the practical world. The multidimensional framework encompasses the essential parameters and perceptible interrelationship to enhance organizational intelligence. Moreover, the viable structure enables all the management individuals to pledge, activate the organizational development, and transform it effectively. This framework has five dimensions i.e. activities, structure, behavior, fundamental parameters of the organization, and time.

Activities dimension assemble all the intended operations or activities executed by the organization. These changes can include

reshaping the profile, thrust, revising the principles, goals, and rules that manage the behavior of the organization (internally and externally). Moreover, the development of core competencies, reconfiguring and renewing activities can be embedded to enhance organizational intelligence.

The *Structural dimension* underlines the stable mutual relationships among the elements/components of the organization using structural change. The spectrum of transformation can be structural change, redesign of processes or management systems, change in management resources, and shape infrastructure, even the composition of the team.

The *behavioral dimension* emphasizes the characteristics of the organization or its elements based on the pattern of desired or actual qualitative features of conduct. The potential transformation can be reframing (Insights, languages or new model), revitalizing (progress capabilities), empowerment (qualifying people), and energizing (building cohesion and Join action) under the behavioral and cultural domain.

The *fundamental parameters* of the organization are the powerful levers of change that can influence all three dimensions of the organization including activities, structure, and behavior. These subsumed identity, ethos, and vision are essential under the self-referential process and revised in case of necessity. Thus, intelligent organizations adhere to their viability to the goal of progression (self-development) in a broader way to contribute in the distinct identity. In the context of cybernetics, intelligent organizations are under the control of learning, control of development, and control of transformation.

The *time dimension* is largely inherent in all the four dimensions but in different momentum. For instance, strategic development can be quickly revised, behavioral and activities change will take more time, even structural transformation can take higher time and resources.

According to Schwaninger, (2001) organizational transformation can be leveraged using the principles of three models in an integrated and synchronized manner because these are interlinked by resilient and rational intangible associations. The three logical levels (operative, strategic and normative) can connect

naturally in the MSC and the VSM, whereas the dynamics of TSM are pairing both models (Schwaninger, 2001).

Case Studies

Here are numerous previous research studies of evidence to stage the benefits of using organizational cybernetics in organizational systems.

Rios, (2010) introduced a cybernetic framework that is based on Beer's viable system model (VSM) for public and private organizations' managers to handle the complexity in their organizational environment. It implemented cybernetics to diagnose and design the viability of the organization. The sequence of the process is structurally formalized as clarification of the organizational identity, defined purpose, boundaries, and diagnosis of all structural components to apply the concept of cybernetics for higher organizational performance and overcome the organizational difficulties (Rios, 2010). Thus, the practical implementation of cybernetics in the complex organizational environment found capable to handle the challenges of the public and private organizations.

Oliver & Montgomery, (2001) studied the conceptual framework and principles of cybernetics to understand the dynamics and sustaining techniques of trust within the social system of a complex organization (internal and external environment). It stated that trust is a system-related concept, which is continuously under sprouting state of trust building, trust stability, and trust dissolution in the organizations. The holistic approach of the cybernetic enabled the actors to measure the characteristics at the system level (inter-organizational) and organizational level (intra-organizational level) instead of the individual level. The findings of the study imply that the cybernetics is an appropriate framework for understanding the organizational trust due to dynamic multilevel characters that are constantly progressing (in terms of enhancing or eroding) at different stages through the process of perception of information, decoding, evaluating, and adjusting (Oliver & Montgomery, 2001). Therefore, this exploratory study ensures that the use of cybernetics using a holistic approach can benefit the organizations to manage the trust.

Another study by Adams, et al., (2013) explored the cybernetics principles for developing the cybersecurity for defensive propose, whereas suggest using for offensive purpose too. Nearly all organizations have a presence on the internet and cyber-attacks are increasing in number but no proper solution is implemented. It enables researchers to introduce comprehensive systems that can implement a moving target defense. This empirical study used the concept of cybernetics, the control theory, systems theory, information theory, and game theory for developing the foundational principles of cybersecurity (Adams, et al., 2013). Hence, it is revealed that cybernetics have potential applications in the field of cybersecurity for defensive and offensive applications to serve the organizations.

A comprehensive study was conducted by Schuh & Kramer in 2016 to implement the cybernetics as a theoretical instrument for controlling technological management activities. Technology-oriented organizations are under continuous turbulence environment due to complexity, relevance, and fast technological developments, thus, a well-structured, integrated, and lucid management process is necessary for ensuring the sustainability of complex organizations and allocation of resources efficiently in the competitive environment. The study implemented elements of cybernetics to link the technological management activities for controlling the intangible and interactive components of technology management activities (Schuh & Kramer, 2016). It supports that the implementation of cybernetics is an apt tool to control technological management activities in the organizational setup.

A comprehensive study was conducted by Morgan, (1982) that explored the main aspects of organizations in the context of cybernetic. It explored the impact of cybernetic on the organizational system in symbolic view as *thermostats, decision-makers, morphogenic systems, learning systems, and organizational ecology*. The study found that the cybernetic technique could facilitate the design of systems for self-regulation and control, which acts as the instrument of goal-seeking activity. Moreover, the organization can enhance the profit, production, or other organizational variables by implementing cybernetic techniques based on the

thermostat, black box, or decision-maker metaphors. The study also mentioned that the development of Cybernetic concept is started into two ways on the principle of information theory (Developed theories and technique for regulation in building the machines and social systems), other epistemological implications of the cybernetic perspective (understanding about the evolution of ecological system) (Morgan, 1982). Therefore, the thorough cybernetics approach can fulfill the demands of organizations in the modern complex environment.

Previously, most scholars' emphasis to develop theories, models, and their implications for the progression of the organizations using cybernetics in social sciences and management disciplines. There is scarcity in the literature related to the practical implication for the impact of cybernetics in enhancing organizational intelligence.

Critical Analysis

Organizational aptitudes including consciousness, fabrication of new-fangled information, sagacity, and vision are largely based on three aspects of organizational intelligence. Cognition is the key to organizational intelligence that involves activities such as observe, insight, reminisce, elucidate, and broad view. Self-organization is an activity of the mind to stimulate the operations according to the external environment, whereas self-reference is the apt process to cope with a difficult situation. On the other hand, Cybernetics is enormously contributing to the progression of organizations for three decades using these three aspects of organizational intelligence including organizational cognition, self-organization, and self-reference to improve organizational life as mentioned by Schwaninger, (2003).

In other words, we can say that cybernetics can be embodied into operative (delivering the value to all stakeholders), strategic (creation of potential), and normative management (the ethical basis for the identity of an organization) for systematic control to deal with the survival and development of the organization. The second important function of cybernetics is communication, which is a building block of any organization in the modern era. In this context, Team synteegrity is a powerful holographic model of cybernetics to develop a polyhedral structure

of communication within an organization to foster the organizational consciousness and cognition. Cybernetics is an outstanding system to connect all the concerning individuals using their organizational intelligence from all relevant actors of the global village.

CONCLUSION

This chapter routes to analyze the importance of cybernetics in the organizational environment and its implementation in the context of organizational intelligence. Although scholars are using cybernetics in social sciences and management disciplines but its implementation to enhance the organizational intelligence has not significantly been explored except in few previous case studies. The review of the literature indicates that further scientific knowledge is required regarding the use of cybernetics to enhance organizational intelligence. Therefore, this section concludes after the exploratory revision of previous works of literature related to organizational intelligence, cybernetics and their linking theoretical models for creating a base for the proposed research study.

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