Globalization, Quality and Systems Thinking: Integrating Global Quality Management and a Systems View

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Abstract: A global approach towards quality management highlights the need for constructing a new body of knowledge that views the field of global quality from a systems perspective. Based on the results of field experiments, and in light of the need to develop new global quality management terminology, the current article presents several key concepts in this field, with emphasis on a systems-oriented rationale and perspective. As such, the article is an important stage in building this body of knowledge, and towards the conceptualization of key variables used in global quality management, from a systems approach that interacts with the fields of international management and strategic management.

Keywords: globalization; systems thinking; global quality management; global quality system

1. Introduction

Globalization processes, through which organizations expand their activity beyond local systems into other geographical areas, alter the structures of operational environments. These processes give rise to border-crossing, multinational processes and products, creating complex international operational systems, characterized by multiple operational units located at scattered sites (numerous manufacturing plants, development departments, subsidiaries); the production of varied products; processes that occur at several sites; and diverse dependency relations (degrees of relatedness) among operational units. Different operational units may collaborate when working with shared or different customers, and supplier-customer relationships may be contained within the organization itself (i.e., suppliers and customers may be part of the same multinational enterprise).

Globalization provides organizations with many opportunities; however, it also presents management systems with complex challenges [1]. Beyond the classical issues associated with local operations, multinational organizations must also cope with challenges presented by the decentralization of manufacturing, procurement, marketing, administration, and other market-level activities. The global setting creates particular difficulties for quality assurance and control managers at different levels [1]. These challenges are largely a result of the high degree of complexity inherent in multinational systems. To address these challenges, managers of multinational organizations must adopt a broad, strategic perspective.

Even in organizations that function solely at the local level, operations are often characterized by significant complexity. A local organization must manage its inputs and outputs; identify, acquire and manage resources (capital, raw materials, technology, human resources, knowledge); coordinate operational activities and processes; and identify changes in the competitive environment and respond to them, even in situations of uncertainty.

Multinational organizations face all these challenges, further complicated by the fact that their operations encompass multiple, complex local environments, not only in the regions where the organization currently operates, but also those where it aspires to expand. As a rule, the operational environment in which a multinational organization functions is much more complex, dynamic and challenging than that of a local organization. The global environment is

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also characterized by greater managerial uncertainty, which presents managers on all levels with substantial challenges.

Therefore, managing multinational organizations requires a more sophisticated and complex skill set than managing local ones. Managers of global organizations must be flexible and adopt a broad, strategic view of organizational and business functions, and also be able to respond adequately and rapidly to constant, and sometimes simultaneous, changes occurring both within the organization and in the external environment. To cope with these challenges, a multinational organization, its business operations, and particularly its global quality management system must develop managerial mechanisms that enable it to function within its current and potential environment as a holistic entity, whose separate components are united by a single set of characteristics, values and management principles.

This article strives to create a new systems approach that can be integrated into quality management processes at the global level, and contribute to a better understanding of their complexities and diverse dimensions. This approach is based on General System Theory [2] that posits a basic similarity between systems in various disciplines, which facilitates the implementation of this theory for managing varied functional systems in companies and organizations that operate on both local and international levels, including global quality systems. GST incorporates a system of rules and arguments based on a comparison of different disciplines. The current article presents these principles, and uses them to construct new key concepts relevant for global quality management. These concepts will serve as a foundation for developing an updated body of knowledge that integrates two disciplines: quality management and systems thinking, in order to achieve the multidimensional perspective required for coping with management challenges in a global world.

2. Literature Review

2.2 The Concept of Systems Thinking in the Global World: Theoretical Background

Systems thinking is a concept that expresses consideration of an issue as a whole, emphasizing the interrelationships among components, rather than examining individual components. Systems thinking is founded on a holistic perspective; it does not try to break systems down into components in order to understand them. Rather, it focuses on how the components act together in networks of interaction. The whole emerges from the interactions among the components; once it has emerged, it is the whole that gives meaning to the parts. Therefore, the only way to fully understand a system is to understand its components as they relate to the whole. In short, "the whole is greater than the sum of its parts."

Many authors refer to the necessity of seeing the "big picture" when engaging in a process of problem-solving. Yet, breaking a problem down into its individual elements, and finding separate solutions for each element rarely provides an effective, conclusive solution. Indeed, the opposite is true: tackling a problem in its entirety often provides a much more effective solution.

According to Richmond [3], "Systems Thinking is the art and science of making reliable inferences about behavior by developing an increasingly deep understanding of the underlying structure." In a later article, Richmond [4] clarifies this concept by introducing the phrase "forest thinking," which he explains means looking at the issue "from 10,000 meters rather than focusing on local trees" and "considering how the system influences systems on the other side of the line and how these latter systems influence the former system."

Richmond [3] emphasized the importance of advancing systems thinking in organizations. Efforts to implement systems thinking need to be focused. Supporters of systems thinking are usually people who can view an issue from several perspectives [5-10], while non-systems thinkers tend to have a single viewpoint. Moreover, non-systems thinkers generally exhibit the 'biased jumper' level of critical thinking [11].

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Senge [12], one of the pioneers of systems thinking in business organizations, described systems thinking as:

- A discipline for perceiving wholes (entire systems),
- A framework for perceiving interrelationships, for seeing patterns of change rather than static 'snapshots',
- A set of general principles, distilled over the course of the twentieth century, spanning fields as diverse as the physical and social sciences, engineering and management,
- A specific set of tools and techniques.

According to Senge [12], a good systems thinker, particularly in an organizational setting, is someone who can see four levels operating simultaneously: events, behavior patterns, systems, and mental models. Systems thinking brings together the disciplines of personal mastery, mental models, shared vision and team learning. Many researchers agree that systems thinking is a very powerful tool for maximizing performance improvement in organizations. Numerous firms regularly use this approach to improve the quality of their decision-making and planning. Still, the use of systems thinking is insufficiently developed in most organizations. A major reason for this is the limited number of tools available for enhancing systems thinking training and measurement.

2.3 Recent findings of systems thinking research in global organizations

Most of the recent research on systems thinking in global organizations discusses definitions, skills, dimensions and perspectives related to this approach. These studies present a multidimensional view on theory and practice, as well as research and applications in a wide variety of fields. We present a sampling of the recent literature below.

Reynolds [13,14] with the theoretical aspects of systems thinking, and presents systems thinking in practice as a 'praxis', or theory-informed practice, demonstrating how its principles might be expressed in a particular systemic inquiry. Sillitto [15] examines the question of whether systems exist in the real world, claiming that it is often meaningful and useful to consider the notion that systems do exist in the real world, and that there are objective criteria for identifying them. Koral Kordova [16] suggests a model for describing factors relevant to systems thinking, presenting them graphically as equations for relationships between open and closed variables, and assigning given numerical values to those relationships.

Other scholars focus on system dynamics, a methodology created decades ago by Forrester [17]. On this basis, Papageorgiou and Hadjis [18] offered an integrated approach for evaluating business strategies prior to implementation. For this purpose, they suggest an archetypical system dynamics model, in which the web of interdependencies between organizational processes and market characteristics can be managed effectively.

Since systems thinking is not a discipline, but rather an interdisciplinary conceptual framework used in a wide range of fields, varied studies present how it might be applied to different domains in the global world, including systems engineering, project management, healthcare, psychology and education (19-26]. These studies enable us to better understand why it is so important to integrate a systems perspective into the working environment of global organizations. Beyond the conceptual foundations of systems thinking, they outline its terminology and tools, as well as the proper ways to use them. Improved understanding of new terminology and tools will facilitate defining problems, and designing solutions in an environment increasingly characterized by the chaos and complexity often associated with global organizations.

2.4 The need for a systems approach in Global Quality Management

Businesses in the twenty-first century operate in an increasingly complex global environment. The defining characteristics of global reality highlight the need to change how

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quality management is perceived and implemented, given the growing complexity and the large number of mutual relationships linking production, products, services and network processes [27].

Bashan and Armon [28] discuss the challenges facing the quality systems of parent companies, and subsidiaries as a result of mergers ,acquisitions and a variety of strategic partnerships, which characterize the processes expansion in the global world. These expansion create a multi-reciprocal network structure and raise questions about how to manage the multi-interface aggregation process structure.

Improving performance through better processes should be the focus of quality professionals. Above writings signify competitive advantage as the ability to stay ahead of the present or potential competition. It also provides the understanding that resources held by a firm and the business strategy will have a profound impact on the generation of competitive advantage [29].

The global economy and its characteristics have had a profound impact on the development of the concept of quality worldwide. This development is further driven by changes in the economy, the labor force, and technology. These changes have created a need to adopt a new approach towards defining quality. While quality was previously defined by determining the percentage of defective products on the production line, newer definitions are significantly broader.

We need to develop a strategic and practical approach to sustaining business excellence to support executives and their organizations that face uncertainty and instability in their particular market environments [30].

Reviewing the literature on Global Quality Management (GQM) indicates a need for a solid GQM philosophy, with an emphasis on the need for intra-organizational coordination and process management. Despite the increasing use of the term GQM, there is still no single agreed-upon definition, nor is there a universally agreed-upon GQM concept.

According to Barabási and Frangos [31], "network organizations" are formed as a result of the company's expansion processes. This creates synergy between organizations, or within a meta-organization, moving from a tree structure to a multi-dimensional network structure. The great complexity that characterizes the competitive global environment generates the need to adopt a systems perspective for analyzing how a multinational company develops, and its effect on global quality functioning and performance. The systems analysis approach is based on open and complex systems theories [1, 32] and contingency theory [33], which are used to analyses management patterns of multinational companies and their functional systems, including their quality systems.

Integrating knowledge from the disciplines of international and strategic management affords a systemic perspective, and an understanding of the dynamic expansion of global organizations. Expansion affects the spread of multi-site quality systems, and the ways in which they perform on the local and global levels. Thus, systems analysis can serve as the key for the future planning of the quality system's functional global integration. It is important to emphasize that integrating varied systems must be part of the organization's strategic plan. The guiding principles of any strategic management process must include an understanding of necessary changes in the organization, the implementation and management of these changes, and the roadmap for sustaining improvements that lead to better performance [34]. Quality systems must be an integral part of these processes, adapted to the appropriate level of international expansion, so as to create added value to the company.

While the classic issues of local operations are still relevant, globalization introduces new issues linked to the dispersion of production, purchasing, marketing, management, etc. around the globe, which directly affect quality management. The new operational environment prompts a new set of challenges for quality managers at various levels [35]. According to Satish, Mehra, and Surendra [36], although globalization provides numerous opportunities, it also

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creates serious management challenges. Issues related to quality management are given added weight because of the need to function at a very high level of complexity, which demands intricate administrative and managerial strategies.

Bashan and Notea [37] present a hierarchical model for the global maturity of a multinational organization, and a derivative model for assessing the maturity level of quality management systems (QMS). They also analyzed QMS operations in multinational companies, and developed a framework for classifying their features based on the global operational and marketing structures that arise from the expansion processes. The most complex and challenging constellation is formed as a result of M&A activities that create a network structure with multiple interrelations. Their findings suggest multiple conflicts and a lack of clarity regarding the integrative management of the various quality systems within a group. This highlights the need for planning relevant integration mechanisms for quality functions, with mechanisms meant to ensure that the various quality systems within the multinational company are mutually inter-connected and function as part of a single organizational entity, thereby reducing failures and ensuring quality across global processes.

3. Methodology

3.1 Research Design

The research paradigm combines quantitative and qualitative methods. In the first, exploratory stage, we conducted in-depth, structured interviews with experts in systems thinking, engineers and project managers who work in global organizations in a business environment characterized by complex and dynamic challenges [**38**]. The interviewees were about asked applying a systems perspective to managing projects and organizations, and we also collected information about projects, such as the role of the project manager, measures of project success, as well as the relationship between project leaders' systems thinking and the success of the project.

The main stage of the study used both qualitative and quantitative methods, as shown in Figure 1. The quantitative study was based on the tools of systems thinking, primarily on a questionnaire previously developed to examine the systems thinking competency of managers and engineers who lead global organizations. The original questionnaire was validated by experts, and revised in light of the their comments [23, 38]. The qualitative study used Grounded Theory as its theoretical and methodological framework [40, 41], particularly the methods and processes recommended by Strauss and Corbin [41] for analyzing data and constructing theory in qualitative research.

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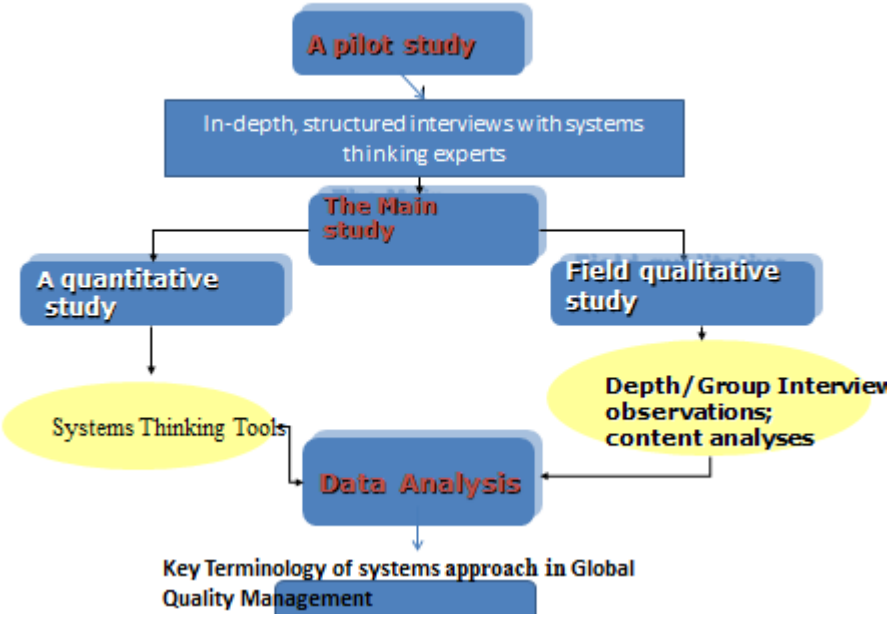

Figure 1. The research design

Grounded theory is a qualitative approach for generating theories by exposing patterns that emerge from data. It is a complex iterative process that begins with asking generative questions that help guide the research. As data is gathered, core concepts are identified and linkages developed between core theoretical concepts and the data. This is followed by content analysis, verification and summary. In this study, field data were gathered in the form of observations, longitudinal studies, content analyses, and in-depth interviews with organizational transmitters of knowledge: CEOs, quality managers, and global operational managers. The field study included eighteen multinational companies.

Representative global profiles were identified by analyzing the field data. The grounded theory framework was used to develop a preliminary theory and identify relevant key variables. In order to highlight the dynamic changes to which the global quality system is exposed, the analysis considered factors from additional disciplines, including international management and global strategies, mergers and acquisitions, and strategic partnerships. The analytic process is further supported by the principles of open and complex systems theories [42, 43], which focus on a systems view of mutual relations and interface relations between organizations and the environment in which they operate, and between organizations and their functional subsystems [44-46].

In this study, we support the insights arising from the literature regarding the development process of multinational companies, and present the features of the management and operations systems that emerge as a consequence of this process. Therefore, it was necessary to map and analyses the global profiles of the participating companies, link the existing structure of their operational and marketing systems to a series of strategic steps that characterized their expansion process in recent years.

4. Findings

As described in the Methodology section, this article presents results from a study using quantitative tools about systems thinking, and qualitative tools applied in a field study of 18 multinational companies. The study supports the adoption of a systems approach for analyzing the complex processes with which global quality systems must cope.

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A global quality system is one of the many functional systems that operate within a multinational or global company. A multinational/global company may be defined as either (1) a group of companies controlled by one main managerial body, whose operations are spread out over several countries; or (2) a company that deals with manufacturing or service provision through its various branches (subsidiaries) in several countries. It controls the policies of these companies and must manage them from a global perspective.

The results of a new study show that there are several components that influence the functioning of global quality systems, and – in their current form – pose as yet unanswered challenges. These include:

- Mergers and acquisitions
- Strategic partnerships
- Vertical integration – procurement, suppliers, customers or distributors
- Horizontal integration – acquiring companies that produce competing products or complementary products (buying out the competition)

Because the global expansion of multinational companies is dynamic, their operational and marketing systems also expand in a dynamic manner. As a result, new quality systems of organizations and operations are integrated or acquired through the abovementioned expansion process, and added to the global quality system. From the very definition of a multinational company, it is clear each of the management systems is required to function on both the integrative and local levels.

Findings of the current field study indicate the existence of different levels of complexity in the set-up of the operational and marketing systems, which require suitable responses from the quality system. A quality system must simultaneously support the multiple operational and marketing systems that are acquired or dynamically integrated into a multinational company, while maintaining interrelationships on a global level. However, our findings show only low levels of involvement by the quality system in the steps towards the organization's global expansion, as well as limited global orientation by management. The concept of quality management in global organizations remains poorly defined. The procedural approach still focuses on the single/individual organization's 'closed system', rather than being characterized by a broad, systems perspective as required by its multiple dimensions and processes.

Based on the study findings, Figure 2 presents a first attempt to portray the complexity levels of global organizations. The left-to-right movement shown in the figure displays several levels of complexity that may or may not develop in a global organization, depending on the strategic steps taken.

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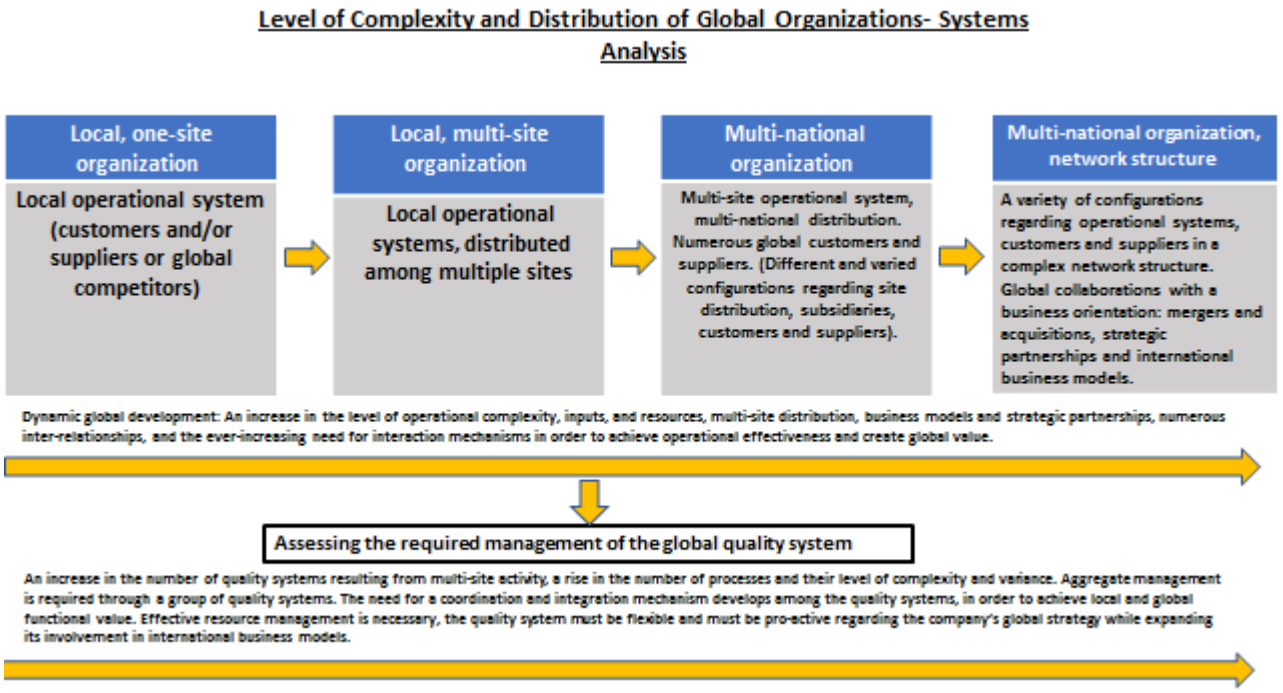

Figure 2. Global organizations' complexity levels

The starting point (on the left) is a single-site, local organization that has a relatively low level of global complexity, stemming from its operations with global customers and suppliers. Moving further right in the figure, the level of global complexity rises, and the number and complexity of the processes change and, for the most part, grow. Mutual relationships between operational units, subsidiary companies and strategic partners are added to the company, on the global level. Multinational firms with a network structure present the most complex and challenging structure on the managerial level (on the far right of the figure).

The functional managerial systems in the organization, including the global quality system, which is the focus of the current study, face complex managerial challenges, following from the increase in the company's general level of complexity and its multiple infrastructures and interrelationships.

Figure 2 describes the analytical components discussed below. It shows the need for assessing the best way to manage a global quality system (presented in the bottom part of the figure), as a result of the organization's diverse global complexity levels. This assessment undoubtedly requires the integration of basic concepts from the field of systems thinking, and the development of suitable terminology, which is described in the Discussion section.

To conclude, the study findings highlight the need for a new global approach, as follows:

- Support of strategic, marketing and operational objectives as factors that provide quality, and added value,
- Adopt a systems approach for analyzing the activities and developmental stages of global quality functions, as a part of a complex multinational company,
- Integrate a strategic, marketing and operational rationale into the work methods and philosophy of the quality system, although these are not their focus in a traditional company,
- Expand the process approach, by which the system is open and has multiple infrastructures,
- Identify structures and configurations on a network basis, to enable cooperation among different quality systems in the network.

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The creation of terminology combining the content worlds of quality management and a systems approach is a basic condition for expanding research about global organizations and the role of their functioning systems. These concepts are derived from the managerial environment presented in Figure 2, and will be described in detail in the Discussion section.

5. Discussion

Fundamental concepts from the field of systems thinking may be beneficial for global quality systems, facilitating better understanding their organization, how they are managed, and the challenges they face. Based on the findings presented above, and in light of the need for new global quality management terminology, we present innovative key concepts for this field. These concepts can serve as a foundation upon which a novel global quality management theory might be developed, based on a systems approach, and which would facilitate constructing a body of knowledge that supports this theory.

These new concepts expand on concepts already found in the existing literature: system, quality system, and global quality system.

System: A group of parts that operate together to achieve common goals (with emphasis on the relationships between the system's components. Thus, a group of parts that are not connected is not considered to be a system).

QMS – Quality Management System: QMS is the functional system within an organization that is responsible for quality policies and targets, under routine quality assurance processes, using quality assurance regarding resources and products. (QMS is an integrated system combining safety, hygiene, environment, community, etc.)

GQMS – Global Quality Management System: Expands the definition of a **QMS** to a **group of quality systems** that are supposed to operate together, under **clear** quality assurance **policies**, in decentralized organization, comprised of subsidiaries and operational units that have complex interrelationships.

These systems are inter-dependent and influenced by each other. The relationships are, for the most part, extremely dynamic, but can also be permanent.

5.1 Characterizing the GQMS using General Systems Theory (GST)

In GST-based terminology, a GQMS is an open system that establishes interrelationships with the business environment, and allows for the exchange of information and resources with its environment. Closed systems are stable, static and balanced, and do not allow for the exchange of information and resources with the surrounding environment. Open systems are different, and the following characteristics qualify a GQMS as an open system:

1. A GMS consumes inputs from the business environment, which undergo conversion processes. At the end of the process, it exports outputs to the environment.
2. The processes that occur in the system are of a cyclical nature. The product exported to the environment provides the energy necessary to repeat the operations cycle.
3. *Feedback*: In a GQMS, there are permanent feedback processes. The system changes its behavior in accordance with the information it receives from the business environment.
4. *Differentiation*: A global quality system becomes more complex, interdisciplinary, and multi-disciplinary.
5. *Equifinality*: There are different ways to achieve the goals and desired results of a GQMS.
6. *Synergy*: The interrelationships between the quality system's different parts are very important; the whole is greater than the sum of the system's parts.
7. *Hierarchy*: A GQMS is comprised of sub-systems and is itself a sub-system of the organizational system, which is above it in the hierarchy. Every system within a GQMS may be defined in a hierarchical manner: sub-units (components) are included in larger units (the global quality system), and these units exist within even larger units (the business environment).

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8. *Structure*: In order to function correctly, relationships and interrelationships exist among the different parts of the quality system. Proper functioning of the GQMS also depends on mutual appropriate relationships among its parts and components, and between it and the other systems operating within its environment. It is important to understand the functionality of the global quality system's different components, and their contribution to the system's general functioning. The addition or removal of a single component changes the entire GQMS.
9. *Borders*: It is necessary to create boundaries between the GQMS and units that are external to it. The business environment is outside of the quality system, and the system's influence must be taken into account.

Based on the principles of Bertalanffy's theory [2] concerning the *similarity of all systems*, all organizational systems have a similar behavioral pathway. A global quality network is an open system with borders that can be opened and closed. By opening the borders, the system can exchange energy and information with the business environment (other systems) in order to develop and change.

Models derived from GST can simplify analysis of complex problems in a GQMS. GST can provide microscopic and holistic perspectives on the system's decision-making process by relating to a large number of aspects. Systems thinking can facilitate evaluation of a current situation by dealing with new inputs, and through the logical examination of the need for change in a global quality system. This theory also enables exploration of the relationships among the various components of the system, and might also be applied to analyses the entire system, its sub-systems, and the interrelationships linking the whole, its parts, and the business environment.

To conceptualize this topic of discussion in a visual manner, we will present the new basic concepts based on GST in Figures 3-5, below.

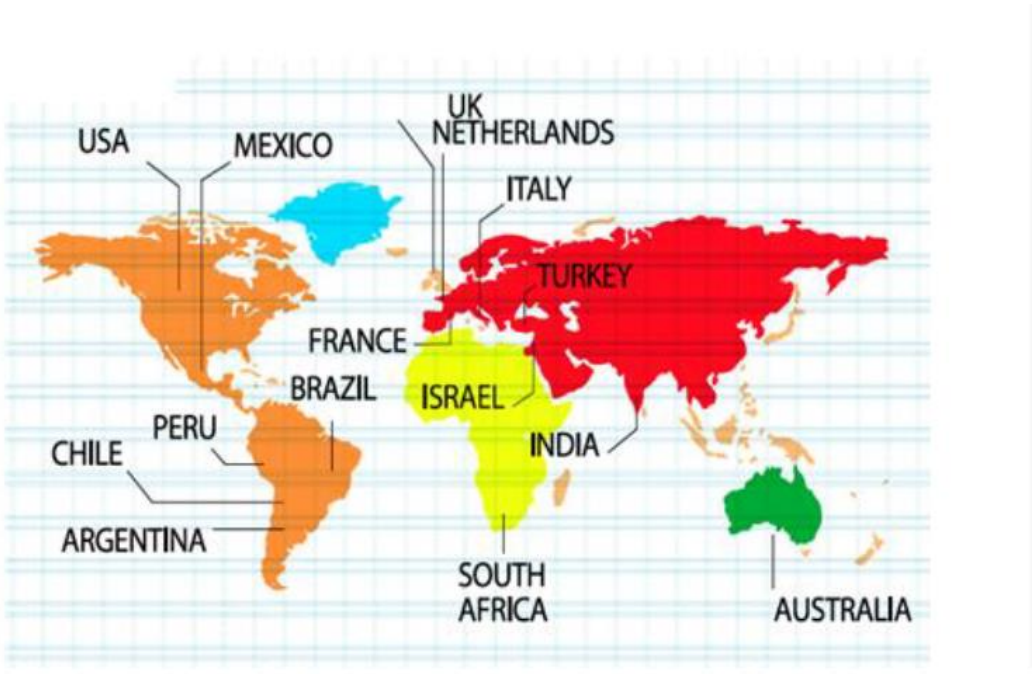

Figure 3. Possible geographical distribution of a multinational company

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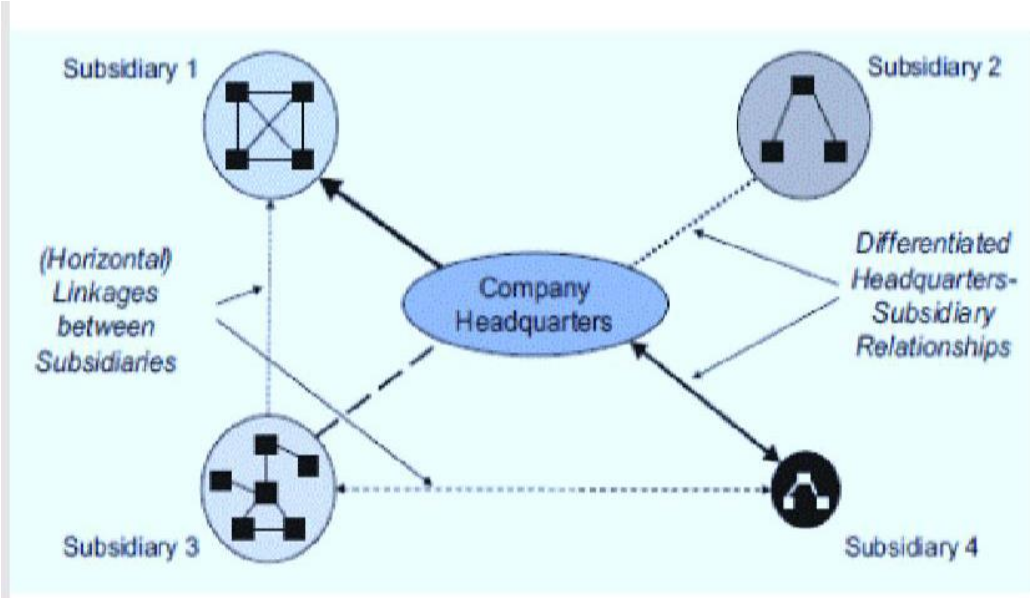

Figure 4. Aggregate structure of subsidiary companies

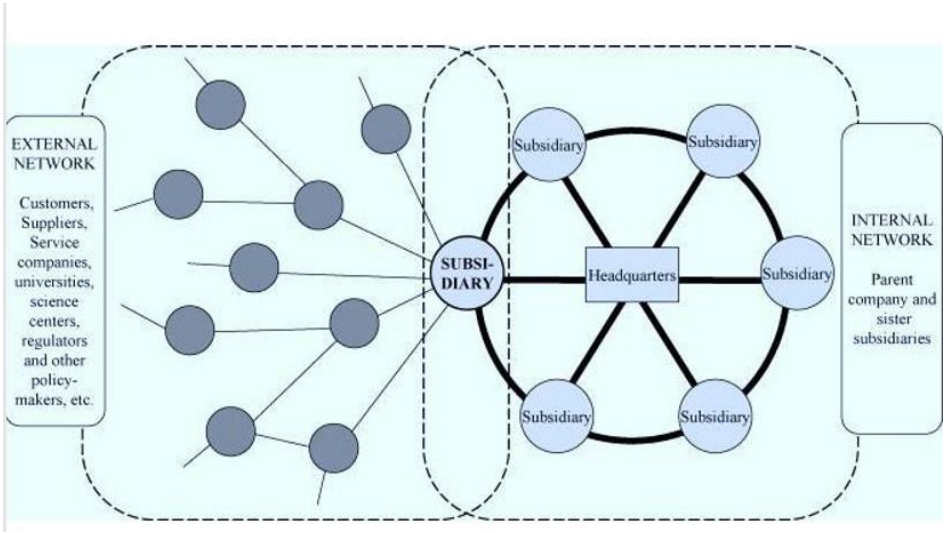

Figure 5. Global distribution of a dynamic and changing network structure

Mergers, acquisitions and strategic partnerships change the operational, marketing and mutual deployments in the network structure. The operational and marketing characteristics of a complex system and its distribution (network structure) include:

- Multiple sites – production, development with global distribution,
- Multiple subsidiaries (in most cases, each subsidiary has its own subsidiary companies),
- Multiple branches,
- Partnerships with a business orientation,
- Multiple operational and marketing systems,
- Multiple customers – global customers,
- Multiple suppliers – global suppliers,
- Multiple processes – change from a closed processes system to an open system,
- Multiple interfaces and resources,
- Multiple interrelationships, operational and marketing strategies,
- High level of change dynamic within the company and business environment,

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- High levels of complexity and diversity.

The network structure presented in Figure 5 shows the need for creating an **aggregate quality system,** with global distribution. An **aggregate quality system** is a group of quality systems that becomes necessary because of strategic steps taken by the company in order to achieve competitive advantages: being closer to customers and/or suppliers, acquiring rival companies, and establishing global operational units (for more details see the key concepts, below).

5.2 Innovative key concepts for the healthy management of GQMS

Table 1, below, defines innovative key concepts, whose integration into the professional content and academic worlds of quality management have become a necessity, due to the global reality, which is both complex and dynamic.

These key concepts are based on the principles of GST, which connect the steps taken by multinational companies to achieve expansion with the changing role of the quality system, which becomes a decentralized system, rich in interrelationships. The definitions of key concepts that appear below focus on the role of the quality system on a global level, emphasizing the relevant GST-based systems view.

Table 1: New Concepts

Aggregate Quality System	A group of quality systems belonging to subsidiary companies and their operational units, created by the strategic steps the company takes in order to achieve competitive advantages, such as being closer to customers and/or suppliers, acquiring rival companies, business models, and global, strategic partnerships. In practice, it is a group of local quality systems, each of which operates as a functional unit within a defined environment, and must support the local operational and marketing systems. Each of the local environments has its own environmental characteristics, processes, products, and defined needs that are supported by the quality system. There is also a group of QMS that belong to diverse operational units such as global production, development and geographical distribution. **The Aggregate Quality System, represents the QMS on an composite level, is based on the principles of the systems approach; it is a dynamic system whose sub-systems' structure and number change rapidly and frequently, due to diverse strategic steps taken by the multinational company, as part of its expansion process, including mergers, acquisitions and strategic partnerships. The different QMS interact with one another, as discussed in detail below. Moreover, the interrelationships between the parts of the aggregate quality system are of great importance: the whole is greater than the sum of its parts.**
Corporate Quality HQ	Behind every multinational company is a corporate quality system operated by the parent company, which is meant to direct the aggregate operations of the GQMS. In most cases, the corporate quality system is also an operational centre in and of itself.
Functional Global Integration	The functional integration of the GQMS depends on creating integration mechanisms, to ensure that the various systems in the aggregate remain connected to one another, and operate as part of a single organizational

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	entity – to reduce failure and encourage quality throughout global markets. The integration process is the outcome of the multi-disciplinary process that characterises GST. A strategic process, it relates to network-based functional management, and its goal is adding global value. In practice, it means finding new ways to integrate the company's operational network branches and operational systems located in different geographical areas, under the general auspices of a single organizational entity. The term *functional global integration* expresses the notion that every business function requires a special profile of integration mechanisms, in order to achieve efficient global integration between the organization's units. In the current context, we are considering the potential integration of the GQMS, whose aim is to create value by implementing the network's strategic, operational and marketing connections (interrelationships). The integration of global quality functions requires an understanding of international strategies, operations and marketing that provide a rationale for the method and level of integration necessary between systems. **According to GST, the term *development* encompasses the need for combined (integrated) management of the QMS in order to support the system's change dynamic in operations and marketing. The integration process is derived from the company's global strategy, and functions using feedback received from the GQMS of operations and marketing units.**
Local Management	The management of operational systems and their QMS in the context of local environmental systems, when both customers and suppliers are also local.
Global Development	The development of operational systems and their QMS external to the local system in various ways: 1) Customers, suppliers, inputs and resources are external to the local system, 2) Expansion of the company into other geographical areas using varied strategic steps: relocating operational units to low-cost countries (LCC); mergers; acquisitions; and strategic partnerships. **Global development reflects a dynamic situation in which closed systems become open systems, whose structures change and cross their own initial, local borders. According to GST, an open system must stop the entropy process and maintain order, which means adapting open systems to changing conditions, new needs, and new demands. In addition, this development must also see the forest and not just the trees, following the Forest Thinking approach.**
Global Management	Global management is required as a result of the above-mentioned global expansion and development processes, which are dynamic and create various systems of interrelationships: operational and marketing strategies among the different local units and the subsidiary companies. Operational units and their functional systems – including quality systems.

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	Global management is based on the principles of an open system, according to which mutual relationships exist between and among the system's various parts and components, and other systems that operate in its environment. It operates within a variety of internal and external interrelationships that influence it or which it can influence. Global management requires a systems approach that sees the whole and the interrelationships among the various components, making it necessary to develop cyclical thinking instead of the traditional linear thinking, and recognize the cycles of influence. A problem is not solved by breaking it down into individual parts; it is important to consider all of the implications, as every action of any component in the system influences the other parts and the whole.
Relatedness	*Relatedness* reflects the system of interrelationships among the multinational company's (local) operational units and their functional systems. On a functional level, the aggregate GQMS includes varied branches in a complex tapestry of interrelationships, created during the multinational company's expansion process. Within the system of interrelationships – joined by the strategic, operational and marketing-based rationale that motivates expansion – the system must be an integrated and responsive support system. These strategic relationships dictate the group's operational and marketing dependencies, and it is necessary to determine the correct level of integration that should be adopted to maximise the quality system's functioning. ***Relatedness* is based on GST in which interrelationships can act as a constraint, but they can also be perceived as *value-adding*. According to this approach, taking advantage of relatedness can cause significant improvement, making it possible to reach the *leverage* point. Moreover, the GST claims that the interrelationships between the company's various units are of utmost importance, because the whole is greater than the sum of its parts (the synergy principle).**
Strategic Relatedness	*Strategic relatedness* is an outcome of global development based on diverse strategic steps, such as: mergers and acquisitions, strategic partnerships, vertical integration, and more. The term *strategic relatedness* expresses the need to evaluate the level of integration and coordination that best suits the various aspects of the different strategic partners' quality systems. The relationships among the systems are formed by strategic perspectives, policy approaches, and future plans. Company decisions made on the strategic level must by supported by functional systems, including the QMS . **GST, which is characterised by a strategic perspective, prepares the system for long-term, multi-dimensional strategic consequences, which also affect other systems, and their respective economic and business environments.**

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Operational Relatedness	A multinational company's expansion process can occur in the branch where it currently operates, in fields related to its existing activities and abilities, or outside of its current branch, by penetrating another, attractive field where it can achieve a competitive advantage. The term *operational relatedness* expresses the similarity between types of resources, infrastructures, abilities, and acquisition sources that might may be exploited effectively on the level of a group or multinational company. The parent company strives to create integrative activity, exploit a pool of shared resources, and use existing capacities, and central acquisitions, etc., thereby facilitating operational relatedness, and the ability to contribute to achieving cost and competitive advantages. The term *operational relatedness* expresses the need to evaluate the level of integration required among the different QMS (in an aggregate quality system) to support this relatedness, quality assurance of resources, and the effective management of their derived processes. **Similar operational systems, characterised by similar or common resources, can merge their resources and capabilities in order to achieve operational effectiveness at the systems level, which influences the QMS that is responsible for resources and management quality. Similarities among these operational systems strengthen the central claim of GST, the similarity of all systems.**
Marketing Relatedness	Subsidiary companies or operational units geared towards identical local markets: products that are identical, competitive, complementary and/or dependent on common supply sources (purchasing from the same markets). Marketing relatedness facilitates cooperation when competing for clients in shared markets, in order to gain power by taking advantage of economies of scale. The term *marketing relatedness* expresses the need to evaluate the level of coordination and integration that should exist between the subsidiary companies' QMS or among the operational units that work with common/shared customers and/or suppliers. **Marketing systems can function independently; however, their integrated management and interrelationships – among themselves and with other systems – can serve as leverage on the systems level. Recognizing the mutual relatedness between sub-systems and the mutual influences between parts of the system is a principle of the systems approach. Figure 6 conceptualizes the different types of relatedness, as they are expressed in a single multinational company**.
Globalization Levels of the Quality System	Quality systems' level of development results from the varied strategic steps taken by the multinational company in its global expansion process. The various ranks (globalization level) reflect the organization's global development dynamic, on the strategic level, and how it is expressed in the operational and marketing structures, and the quality system. Different globalization levels may be characterised by implementing the principles of the systems approach, which takes into account holistic aspects, such as number of markets, the competitive environment, types of products/services, branches, processes, operational units, and different

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	suppliers and customers. *Globalization level* reflects the aggregate quality system's complexity level, expressing the interrelations of strategic, operational and marketing aspects, as well as dependent relationships/relatedness between the subsidiary companies, operational units and various branches. An increase in the quality system's globalization level is an outcome of the systems approach, which includes an expansion of the complexity, heterogeneity and interrelationship levels found in a global-network structure. *The systems' globalization level must be defined and mapped, as each level indicates the needs, challenges and strategic assessment responses that are suitable for a particular quality system. The dynamic of global expansion creates similar dynamic changes in the globalization levels of the operational systems and quality systems. This causes changing structural configurations, with differing levels of complexity and relationship arrangements. Each requires a solution at the global quality management level. **Systems that operate in a global environment become more complex both structurally and in their network of interrelationships. The systems' changing dynamics and level of complexity pose new constraints and challenges. According to GST, the quality system must therefore adapt itself to these changes, and each quality system must be managed according to the globalization level of the organization within whose framework it operates. The dynamics and possible changes in the organization's globalization level must also be taken into account; the company must prepare itself to deal with any and all possible developments.** **Using principles of GST facilitates examining cycles of influence, and the network of relationships that which characterise different globalization levels.**
Global Quality Value-adding	The advantages/benefits derived from the "meta-system" (the multinational company) strengthens the addition of local quality systems, and/or reinforces their integration (global functional integration). **This advantage is embodied by one of the leading principles of the systems approach, that the whole system is greater than the sum of its parts. In other words, the combination of skills, capabilities, and infrastructure of local systems in synergetic activity can provide higher value than the individual or cumulative contribution of each system.**
Local Quality Value-adding	The advantages/benefits derived from the local quality system strengthens its sense of belonging or joining the global quality system (to which it can contribute). **The local system can provide added value to the aggregate GQMS; to the same degree, integrated systems can offer the local system with added value. The local QMS can both contribute to and benefit from the global entity. This principle supports GST and strengthens the links between the various systems.** **According to GST, it is necessary to identify reinforcing feedback and**

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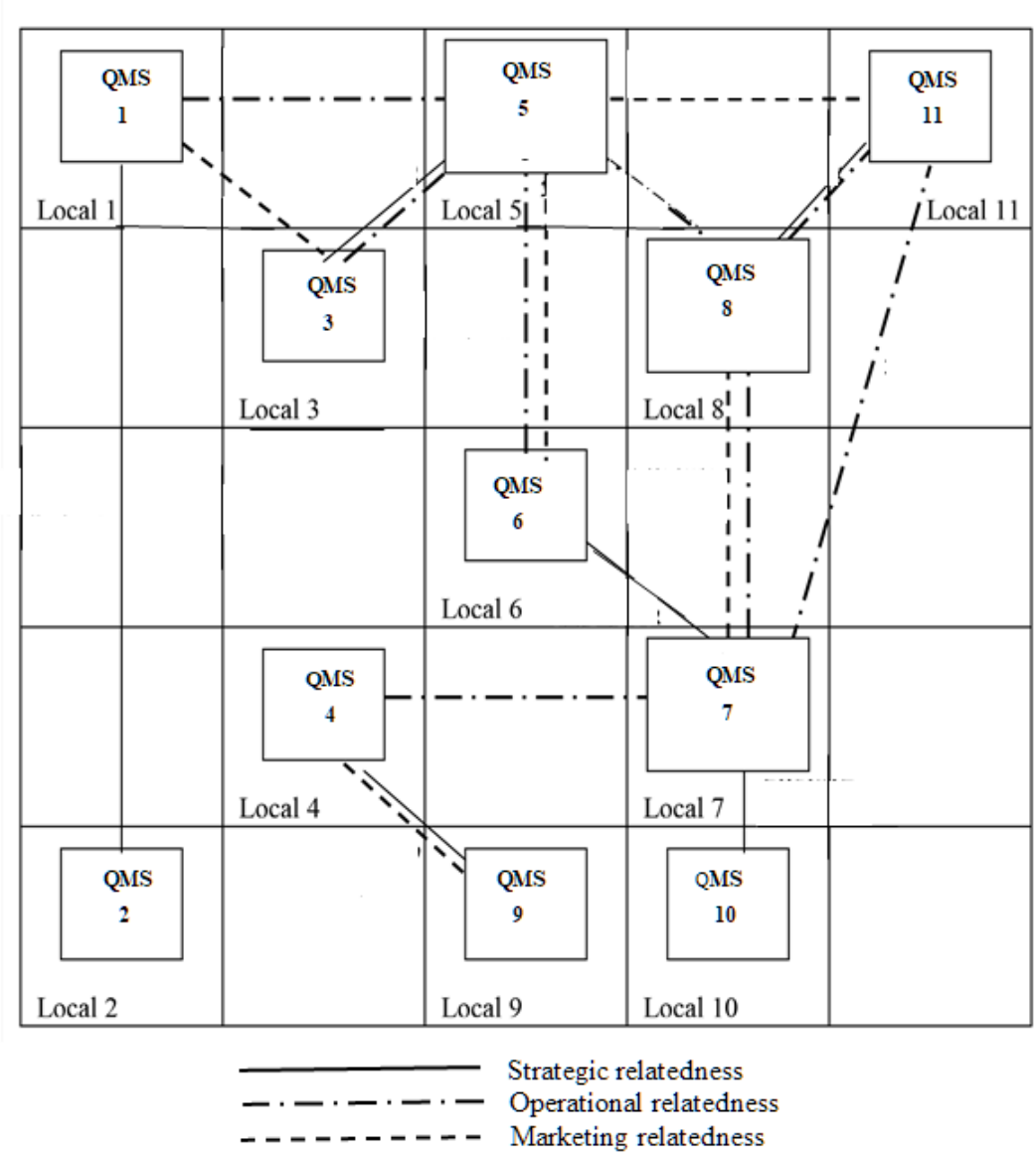
	balancing feedback processes, when examining the links between the various systems.

Figure 6 shows that there may be nodes (quality systems) characterized by broader and more varied mutual relationships with other units. It is likely that there are simultaneous operational, strategic and/or marketing relationships (as between quality systems 8 and 11, or



between quality systems 7 and 8).

Figure 6. Quality network

The management of a (global) aggregate quality system is influenced by its relatedness – strategic, operational, and marketing – and the company must express this in practice, on both the strategic and ongoing, operational levels.

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6. Research Summary and Contributions

The Literature Review showed that the unique change dynamic occurring in the global market does not find a suitable solution in current perceptions of QMS . Moreover, the existing literature does not provide a model for GQMS that can deal with the challenges that global organizations face in a rapidly-changing environment.

Based on a field study carried out among 18 multinational companies, this paper presents a research and practical paradigm, which utilizes the principles of GST to develop a new quality management model for global organizations. This multi-disciplinary combination is suitable for analyzing the activities of multinational companies and their functional systems, because it encompasses the many interrelated components, that engage one another and have mutual influence on the entire system. This type of systems approach strengthens the quality system's global identity, as a complex system; and the strategic, operational and marketing rationale through its work as a global system. According to GST, the QMS cannot be understood based solely by understanding its parts and their individual traits. Rather, GST facilitates understanding the relationships, interactions and processes between the quality system's components, which is why it is very important to adopt these principles for analyzing GQMS.

6.1 Study Limitations

To examine quality management in global organizations, the current study used the purposeful sampling method, in which researchers selected participants who best represent the population from which they were chosen in order to learn about the phenomenon under investigation. However, this method of sampling is limited because it is very difficult to generalize the qualitative findings to people and environments that differ from those in the study [47, 48]. In the process of constructing the sample, efforts were made to deal with this limitation and strengthen the generalizability of the sample with respect to the population, by studying multiple cases, conducting longitudinal research, applying selection criteria for interview participants, and using target focus groups. These methods increased the sample's generalizability to the population.

6.2 Directions for future studies

This study provides a foundation for additional research regarding the evaluation and implementation of a systems approach to quality management in global organizations. Directions that should be studied in order to deepen scholarly knowledge about global quality management from a systems point of view include:

- Mapping additional variables, developing quantitative measurements, and expanding key concepts that could aid the functional management of GQMS. We recommended including variables that represent different organizational structures, which can provide additional insights into the aggregate management of a global quality system.
- Expanding the professional terminology that deals with the complexity of GQMS is necessary for developing a body of knowledge and models that are relevant to this system in multinational companies.
- Developing computerized tools to map the different configurations of operational systems in the network that characterizes a multinational company. This mapping is meant to provide a representation of interrelationships (strategic, operational and marketing relatedness), and identify the global key groups (hubs) in the network, which require a response mechanism from quality systems.
- Expanding the terminology needed to manage multidisciplinary systems such as: global operations, global human resources, global marketing and more, by identifying the challenges and needs in different configurations of global development levels.

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