EFFECTS OF MACROERGONOMIC ORGANIZATION FACTOR ON CONSULTING WORK SYSTEM PERFORMANCE

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B.S, Industrial Engineering, Dokuz Eylul University, 2016

Submitted to the Institute for Graduate Studies in
Science and Engineering in partial fulfillment of
the requirements for the degree of
Master of Science

Graduate Program in Industrial Engineering

Boğaziçi University

2019

ACKNOWLEDGEMENTS

First and foremost, I would like to convey my heartfelt gratitude to my advisor Prof. Dr. Mahmut Ekşioğlu for his continued guidance at every phase of this thesis study. Without his wisdom, direction, inspiration, passion, and expertise this study would not be completed. I could not have had a better guide and counselor for my master's study.

I would also like to thank my committee members, Assoc. Prof. Dr. Mehmet Güray Güler and Asst. Prof. Dr. Mustafa Gökçe Baydoğan, for their valuable comments.

I would also like to extend my thanks to my dearest friend from my department, Gizem Keçim, for her encouragement and motivation for the completion of the thesis. Gizem was always beside me when I have been going through some difficult times throughout my master's study. She never kept her support and warm friendship from me.

Last but not least, I would like to thank my family: especially, my parents Sevim Yavuz and Mehmet Yavuz, for their endless assistance, guidance, and patience during this research. Moreover, I could not express enough gratitude to them for their ultimate support while working through the long working days. Their encouragement when the times got rough is much appreciated and duly noted.

ABSTRACT

EFFECTS OF MACROERGONOMIC ORGANIZATION FACTOR ON CONSULTING WORK SYSTEM PERFORMANCE

It is known that the macroergonomic organization factor can have positive effects on work systems. In this study, the direct, indirect and total effects of the macroergonomic compatibility of organization-related elements on consulting work system performance were investigated. More specifically, the effects of the compatibility of seven organization-related elements (teamwork; organizational and safety culture; coordination, collaboration and communication; work schedule; social relationships; supervision and management styles; and performance evaluation, rewards and incentives) on three consulting work system performance variables (firm performance, client and employee) were evaluated. To conduct this evaluation, twenty-one hypotheses for direct and ten hypotheses for indirect effects were proposed and validated between the variables using a structural equation modeling (SEM) approach. Data collection regarding the considered variables was performed by a Macroergonomic Compatibility Questionnaire (MCQ) developed according to the requirements of the consulting sector. MCQ was administered among middle and senior managers of a sample of international management consulting companies operating in Turkey. The study results indicated that “supervision and management styles” has the most powerful effect on all performance categories. Furthermore, except work schedule, each of the considered elements has a significant effect with the varying degree on all performance categories. The developed SEM models may guide the decision-makers of the management consulting company to invest their resources effectively while carrying out the macroergonomic practices. In this regard, the developed model may help consulting companies to enhance service quality and increase their competitiveness in today’s business world.

ÖZET

MAKROERGONOMİK ORGANİZASYON FAKTÖRÜNÜN DANIŞMANLIK İŞ SİSTEMİ PERFORMANSI ÜZERİNE ETKİLERİ

Makroergonomik organizasyon faktörünün çalışma sistemleri üzerinde olumlu etkileri olduğu bilinmektedir. Bu çalışmada, organizasyonla ilgili unsurların makrogonomik uyumluluğunun danışmanlık iş sistemi performansı üzerindeki doğrudan, dolaylı ve toplam etkileri araştırılmıştır. Daha özel bir ifadeyle, organizasyonla ilgili yedi unsurun (ekip çalışması; organizasyon ve güvenlik kültürü; koordinasyon, işbirliği ve iletişim; çalışma programı; sosyal ilişkiler; denetim ve yönetim tarzları ile performans değerlendirme, ödül ve teşvikler) üç danışmanlık iş sistemi performans değişkeni (firma performansı, müşteri ve çalışan) üzerindeki etkileri değerlendirilmiştir. Bu değerlendirmeyi yapmak için, yapısal denklem modelleme (SEM) yaklaşımı kullanılarak değişkenler için yirmi bir hipotez ve dolaylı etkiler için on hipotez önerilmiş ve doğrulanmıştır. Dikkate alınan değişkenlere ilişkin veri toplama, danışmanlık sektörü gereksinimlerine göre geliştirilen bir Makroergonomik Uyumluluk Anketi (MCQ) ile gerçekleştirilmiştir. MCQ, Türkiye'de faaliyet gösteren uluslararası yönetim danışmanlığı şirketlerinin orta ve üst düzey yöneticileri arasında uygulanmıştır. Çalışma sonuçları, "denetim ve yönetim stilleri" unsurunun tüm performans kategorileri üzerinde en güçlü etkiye sahip olduğunu göstermiştir. Ayrıca, çalışma programı hariç, dikkate alınan unsurların her birinin tüm performans kategorileri üzerinde değişen derecelerde önemli bir etkisi olduğu görüldü. Geliştirilen SEM modelleri, yönetim danışmanlığı şirketinin karar vericilerine, makroergonomik uygulamaları gerçekleştirirken kaynaklarını etkin bir şekilde kullanmalarında rehberlik edebilir. Bu bağlamda, geliştirilen model, danışmanlık şirketlerine hizmet kalitesini artırma ve günümüz iş dünyasında rekabet güçlerini artırma konusunda yardımcı olabilir.

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LIST OF ACRONYMS /ABBREVIATIONS

AGFI	Adjusted Goodness of Fit
AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
CA	Cronbach's Alpha
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMIN	Chi-Square
CR	Composite Reliability
EFA	Explanatory Factor Analysis
GFI	The goodness of Fit Index
IDC	International Data Cooperation
IEA	International Ergonomic Association
IT	Information Technologies
KMO	Kaiser-Meyer-Olkin
MCQ	Macroergonomic Compatibility Questionnaire
MI	Modification Indices
MP	Macroergonomic Practice
NFI	Normed Fit Index
ODAM	Organizational Design and Management
RMSEA	Root Mean Square of Error Approximation
SEIPS	Systems Engineering Initiative for Patient Safety
SEM	Structural Equation Modelling
SPSS	Statistical Package for the Social Sciences
STS	Socio-Technical Systems
TLI	Tucker-Lewis Index
TQM	Total Quality Management

1. INTRODUCTION

In today's world, there is almost no environment where ergonomics (human factors engineering) does not interfere, whether in production or service companies. The International Ergonomic Association (IEA) defines ergonomics as "the scientific discipline and the profession that implements theories, concepts, data or methods for the improvement of human well-being and overall system performance." Although there are many other definitions of ergonomics in various books and studies, ergonomics, also known as the science of work, can be defined as the discipline that aims to learn about human capabilities and limitations and then applies this learning to design and improve workplaces, general work system designs, environments, and products interacted with people. The main goal of ergonomics is to design and manage human-centered work systems, technology systems, and environments. There are also essential sub-goals that will help various professionals and businesses which are interested in people's performance and well-being at work. These sub-goals include protecting workers from severe physical or mental damage, maximizing efficiency and product availability, and while maximizing health, safety, and well-being, improving both the working and daily life of an employee. Ergonomics is seen as a system-oriented discipline that spans all forms of human activity. In other words, ergonomics supports a holistic approach that takes into account physical, cognitive, social, organizational, environmental, and other related factors. The three main domains used frequently in ergonomics are physical, cognitive, and organizational ergonomics. These main domains can also be divided broadly into microergonomics and macroergonomics.

Even though researchers claim that human factors started when early humans first used simple tools or devices, the development of ergonomics began in the late 1800s and early 1900s in the industrial revolution with Frank and Lillian Gilbreth's works. Physical ergonomics mainly investigates how an individual interacts functionally with physical products, objects, and structures according to their anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity (in other words, adapting human to the system) (Hulme *et al.,* 2018). While physical ergonomics has been concerned with guidelines for the correct design of the physical interaction between

human and tools, cognitive ergonomics focusses its attention to consider the ability to help or hinder successful functional decisions within an individual's interaction with people and other components of the system in a range of mental constructs related to learning, general perception and motor reaction (Hulme *et al.*, 2018; Berry *et al.*, 2015). From the 1950s to the present day, the first two primary domains of the ergonomics field have been responding to human-work system mismatches successfully. However, unprecedentedly improving technology, the increasingly saturated marketplace, the competitiveness of both service and manufacturing systems, and the higher complexity of systems have produced a new design and organization-system interaction issues, which generate the need for an extensive system approach as offered by organizational ergonomics (Kleiner, 2006).

Microergonomic interventions are starting to be inadequate to enhance the efficiency of the whole system management as both the benefits of achieving potential successes in terms of system safety, health, work life quality goals, and operation costs. Organizational ergonomics, also known as macroergonomics, is focused on the optimization of socio-technical systems (STS) with all of their aspects such as structures, environment, policies, and processes while putting humans in the center of macroergonomic approaches. Macroergonomics generally includes related organizational development topics that make macroergonomics the organizational and design perspective of ergonomics (Nwaelele, 2015). With organizational elements of a work system being recognized by a rapidly changing, volatile, and diverse business world as being the main drivers for competitive advantage, macroergonomics has become an emerging trend in human factor engineering both in the world of business and academics.

A vital keyword to define macroergonomics is "compatibility." It has arisen from the need for a more thorough performance approach in the discipline of the human factor. Compatibility in the literature has been outlined in relation to the word "fitting" in various ways (Realyvásquez *et al.*, 2016). Macroergonomic compatibility can be described as "the ability of organizational constraints, technology elements, tasks, and the environment to integrate and work within a business system in an efficient, effective, appropriate, and orderly manner." (Realyvásquez *et al.*, 2018) The design of the work system is said to be harmonized if it is integrated and carried through from microergonomic to the

macroergonomic design of jobs and interfaces between humans and machines. Harmonized work systems are productive, safe, have greater worker engagement and job performance, and fewer job hazards (Spohrer *et al.*, 2007).

The primary domain of this research, macroergonomic compatibility, can provide many advantages to service work systems as well as production work systems to improve the quality of working life and optimize processes once macroergonomic techniques are used in the development of the system (Robertson, 2001). Manufacturing work systems consisting of human participants or machines perform various tasks using information, technology, and other resources to produce products while service work systems include people and technologies that form both service providers and service clients who work collectively to deliver value in complex systems and networks. Clients and providers may be individuals, corporations, government agencies, or any physical and technological organization. Through the past half-century, service systems have become the most substantial part of most industrialized nations' economies. Popularity and importance of the term "macroergonomic compatibility" and, more particularly, macroergonomic compatibility of organization elements and the rising value of service industries have made the investigation of the interaction between these elements and service industries more appealing (Carayon *et al.*, 2006). With the understanding of the importance of effectively managing valuable macroergonomic factors in the success of a company, the processes for improving the macroergonomic compatibility of a company have accelerated. Parallel to this situation, the performance of companies with high levels of macroergonomic compatibility has proliferated. As a result, the macroergonomic compatibility of a work system is an essential understanding that will enable them to succeed by preserving sustainable competitive advantages.

This thesis is structured as follows: Section 1 provides brief information about what ergonomics and macroergonomics are and their daily uses. Section 2 reflects the approach accepted in this research of the literature review, presents findings of ergonomic and macroergonomic implementations, continues the literary research with a detailed analysis of its elements of the concept of macroergonomic compatibility. Moreover, it deepens the review with a brief introduction to the consulting industry generally, and the management

consulting industry specifically and investigates the performance categories that are used in this field of business. Section 3 contains the study's rationale and objectives. The methodology used in this scientific research is explained in Section 4. Section 5 provides in-depth information about the models to be used. It also offers an introduction to two-level factor analysis to identify direct, indirect, and total effects of macroergonomic elements on the performance of the management consulting work system. This section finishes with a brief discussion and general findings of the data analysis. Finally, the research is concluded and in Section 6, and the overall results and suggestions for future studies and practitioners have discussed at the end of the section.

2. LITERATURE REVIEW

2.1. Macroergonomics

Fundamentally, the excellent work of designing materials, processes, modules, and even subsystems of a system is thoroughly possible with microergonomics (Hendrick, 2002; Murphy *et al*., 2014). Unfortunately, it fails to achieve relevant and sufficient goals of systems performance due to failure to model the system macroergonomically. Hendrick (1987) found that early attempts to incorporate ergonomics were not sufficient to reduce the cost of white-collar jobs and work system productivity, to improve intrinsic job satisfaction and to reduce symptoms of high work stress (as cited in Hendrick, 2000). Because of the differentiation and high levels of interdependence between departments and business expertise in the organization, the need for a sub-branch which directs human factors attention to fulfill work design issues at a broader manner and go beyond purely workplace-based approaches in order to ensure effective subsystem integration has occurred (Hendrick, 1987; Bolis and Sznelwar, 2016).

Hendrick (1987) defines macroergonomics as "the study and design of jobs, organizational structure, incentive systems, and training programs while researching, developing, and applying ergonomic and organizational design principles at a macro-level." Moreover, Hendrick (2000) states that the macroergonomics seeks by means of its own methods and tools, to accomplish both the macroergonomic and microergonomic standards and a wholly harmonized and compatible work system. Although Hendrick (2000) sees the concept of macroergonomics is a "top-down" approach to work system design, he believes that in practices, macroergonomics involves "top-down, bottom-up, and middle-out" analyses and continual implementation.

Generally, a fully macroergonomic intervention is not possible at the initial stages. In the beginning, the ergonomist or the responsible team has to take care of the work system by making microergonomic improvements that deliver positive results (the "picking the low hanging fruit" strategy). The macroergonomics methodology has been shown to provide

robust methodologies to analyze, model and evaluate work systems with 50 percent to 90 percent or higher confirmed improvements in performance when the work system is macroergonomically designed, whereas traditional ergonomics are in the 10 percent to 20 percent range (Hendrick, 2000; Hendrick, 2007; Kleiner, 2006; Murphy *et al*., 2014).

Historically, Dr. Hal W. Hendrick conceptualized and initiated macroergonomics in his report in the year 1980 that has written on the apparent need to incorporate organizational development and management factors in research and practice to meet the anticipated requirements of the next two decades and beyond (Hendrick and Kleiner, 2001). Since then, there has been massive reproduction of macroergonomic research resulting in expanding the ergonomics field into the multi-level, multi-phase field research which is exceptionally appropriate for dealing with complex, dynamic systems characterized by a constant interaction between agents, levels and organizational units (Holden *et al*., 2008; Karsh and Brown, 2005). According to many types of research, macroergonomics is seen as the third generation of ergonomics, while classical human/machine interaction is the first and human/interface interaction (human-computer interaction) is the second generation of ergonomics (Murphy *et al*., 2014; Hendrick 1987). On the other hand, Hendrick (1997) explains that a work system has at least five identifiable subparts namely, human/machine interaction, human/environment interaction, human/software interaction or cognitive ergonomics, human/job interaction, human/organization interaction, in other words, macroergonomics (as cited by Robertson, 2001). In order to achieve overall harmonized human-system interaction, each one of them needs to be focused on a related design.

First four of these subparts have significantly improved safety, productivity, and quality in a wide range of industries. The macroergonomics is, however, the final touch to these industries, so as to reach as many good safety, satisfaction, quality, and productivity measures as possible because the overall work system design cannot also be corrected by the adjustments of human factors problems at the single employee level (Hendrick, 2000).

Macroergonomics came along during the 1980s as a whole new subdiscipline of ergonomics when the managers in the late 70’s recognized the lack of ergonomics in the overall organization, which connects the subparts of a work system explained above. In

addition to that, Hal Hendrick (1987) argued that attention to interactions throughout an organization does not merely mean an end in themselves; rather, lower level or microergonomic interactions should be understood and managed adequately with a macroergonomic approach (as cited by Holden *et al.*, 2015). Hendrick (2000) added that taking a macroergonomic approach has been contended to benefit safety and quality performance when lower-level interactions have appropriately managed. Moreover, Hendrick (2007) said that ergonomics would realize its full potential and respond to industry needs only if the research and practice of ergonomics combine organizational design and management factors. He also predicted that correct macroergonomics interventions generally could result in improvements in one or more organizational effectiveness criteria by 50 percent or more. In this manner, Kleiner and Drury (1999) suggested that here and in the other literature at the factory level, both the advantages of a macroergonomic strategy have been proven in terms of quality enhancement between 50 and 100 percent (as cited by Kleiner, 1999) and at the community level where the economic results have increased, as calculated by job retention or expansion. Their work led to a specific macroergonomic analysis approach and design in order to improve safety and performance.

Carayon and Smith (2000) researched the work organization and its ergonomics relations and the idea of a structured work system and a stable organization. They have highlighted that "work and organizations are multidimensional, can have multiple (positive and negative) impacts on people and can be redesigned to accommodate both human and organizational needs." In terms of creating a balanced work system, this research follows a macroergonomics framework and incorporates an extension to balance theory to concentrate on the development of work systems and the organizational layout.

Robertson and Courtney (2004) demonstrated the conventional reductionist method, which relies on strategies to minimize individual stressors, the multivariate complexity of health and performance challenges are frequently disregarded and may offer less than optimal solutions. O'Neill (1998) and Levenstein (1999) have noted that companies were allocating resources in response to rising jobs and compensation costs of office work systems challenges (as cited by Robertson and Courtney, 2004). To address this problem, Robertson and Courtney (2004) described a system that analyzes the approach to the performance of

employees in office work systems that integrates both the microergonomic as well as macroergonomic aspects. Likewise, Azadeh *et al.* (2005) showed in their work the impact of macroergonomic factors on employees' work performance and aspects of environmental protection. It has been shown that a macroergonomic approach is much more effective within the scope of employees' work performance than a conventional approach to design. In addition, it is noted that the system and its human element are optimized within the scope of employees' work performance rather than locally by developing and implementing a macroergonomic approach. This research reveals that the use of a macroergonomic approach is preferable to traditional design.

Habibi *et al*. (2012) told that there is a powerful interaction between macroergonomic compatibility score and job satisfaction score, meaning if macroergonomic condition score is higher, it indicates a better work condition, and therefore the employee's job satisfaction is more elevated. Murphy *et al.* (2014) argued that macroergonomics is one of the robust fields with its unique strengths for safety and ergonomics research. The strengths of macroergonomics in one area can be used to offset weaknesses in the other areas. Guimarães *et al.* (2014) demonstrated that participatory ergonomics could identify problems and solutions, and macroergonomic approaches focused primarily on the organization of work have achieved positive results for employees, safety and production outcomes. The pre-and post-intervention worker evaluation showed increased overall job performance and increased dedication to the company's performance and objectives. In this sense, Robertson *et al.* (2017) examined the impact of a macroergonomic-based longitudinal field office intervention. Results from their research showed that using a macroergonomic method coupled with ergonomics learning will help office-workers and computer-based organizations and enhance their work environments.

Jasiak and Dewicka (2015) reported that in complex production systems, the human psychological and physical limitation is the most common direct and indirect source of accidents and near misses in the working process. They stated that the use of macroergonomic design would eradicate such injuries and near misses. They concluded that once a macroergonomic system is properly planned, implemented, and maintained, there

will be no significant anomalies, and the best cost-benefit balance is achieved based on up-to-date operational requirements.

In today's world, people work in an environment in which employees' well-being has a direct impact on a company's results. Holistically, it is crucial to view well-being issues in the workplace from both detailed and systemic perspectives. Together, these views can provide more sustainable solutions than local safety fixes. The third generation of ergonomics, macroergonomics, is a wholly harmonized work system at both the macroergonomic and microergonomic levels, which leads to improved productivity, job satisfaction, health, and the engagement of employees. Macroergonomics provides a viewpoint as well as strategies and techniques for planning, growth, intervention, and application of more successful human factors and ergonomics. Furthermore, macroergonomic field research and organizational field research generally require additional guidance on the complete process implementation and management (Holden *et al*. 2008). Macroergonomic intervention including the systematic implementation of the microergonomic design and modification of jobs and associated environment for human-machine can lead to dramatic improvements in organizational effectiveness, with authentic leadership and employee engagement at all hierarchical levels of the organization (for example, Robertson *et al*., 2017; Bolis and Sznelwar, 2016).

2.2. Macroergonomic Compatibility

Compatibility, as a word, comes from Middle French "compatible," from Medieval Latin "compatibilis (in compatible beneficium, a benefice which could be held together with another one)," from Late Latin "compati (to suffer with)" Compatibility has been defined as "the capacity of living or performing in harmonious, agreeable, or congenial combination with another or others; and capable of orderly, efficient integration and operation with other elements in a system." (Morris, 1978 as cited by Karwowski, 2000) The Century Dictionary explains the word "compatible" to describe two or more things that work well and easily interact together in a harmonious combination. In the ergonomics, the idea of compatibility is expressed in a disorderly manner by using the term "fit," and it is acknowledged as the condition or result of the "ergonomically-designed" work systems (Karwowski, 2000).

Based on the above uncertainty, Karwowski (2000) stated that a universal matrix for compatibility measurement is needed that is critical to the credibility of ergonomics as a discipline as it cannot improve the fit of the system unless compatibility can be determined, calculated, and evaluated.

For this reason, Karwowski (2000) developed a new science called "symvatology" by combining two Greek words which are syvatotis (compatibility) and logos (study of something) to explore "the fundamental principles of compatibility, propose theories of compatible systems, and develop a quantitative matrix for measurement of artifact-human (in other words, objects or systems made and/or used by humans in the state of work) compatibility." Karwowski (2000) added that compatibility between an individual and a system should be considered covering all levels, including physical, perceptual, cognitive, emotional, social, organizational, and environmental considerations, and should be quantified by the system's inputs and outputs which characterize a set of system-human interactions. In the research later, Karwowski (2005) supported that idea by stating the system can develop solid ergonomic bases if the symvatology is applied.

Compatibility can be associated with different sub-discipline of ergonomics; in other words, microergonomics and macroergonomics. Compatibility associated with microergonomics because it indicates the extent to which system elements can interact without adversely affecting themselves or the purpose of the system. It can also be said that macroergonomics-related compatibility is facilitated by a productive relationship between the personnel subsystem and the organizational subsystem, including its interaction with existing environmental features (Realyvásquez *et al*., 2015; Lange-Morales, 2011). The microergonomic design of the work system and its aspects are driven while ensuring the ergonomic compatibility of the system elements with the overall structure of the system when an effective macroergonomic design is applied. According to Emery and Trist (1965), the only way that optimal results, such as worker welfare and system performance, can be achieved through the work system design compatibility (as cited by Carayon *et al*., 2006).

Karwowski *et al*. (1988, 1994) introduced the Complexity-Incompatibility Principle, that can be stated as: "As the artifact-human system complexity increases, the compatibility

between system elements, expressed through their ergonomic interactions at all levels, decreases, leading to greater ergonomic entropy of the system, and decreasing the potential for effective ergonomic intervention" (as cited by Karwowski, 2000). At this point, macroergonomics comes into play since, in most of the work system, there is a considerable complexity which affects every component of the system.

The theories of Karwowski (2000) and symvatology are the basis of the macroergonomic compatibility. It draws attention to the ability to integrate and perform in a structured, efficient, and reliable way within a work system with the human factor and to accomplish specific goals through organizational elements. Macroergonomic compatibility in work systems and ergonomics is seen as one of the most complex structures to measure. When compared with ergonomics' sub-branches, it is more complex, more challenging to measure and evaluate than microergonomic compatibility because it comprises all employee-work system interactions. Figure 2.1 illustrates the ergonomic compatibility complexity that is necessary to optimize ergonomic compatibility at both microergonomic and macroergonomic levels.

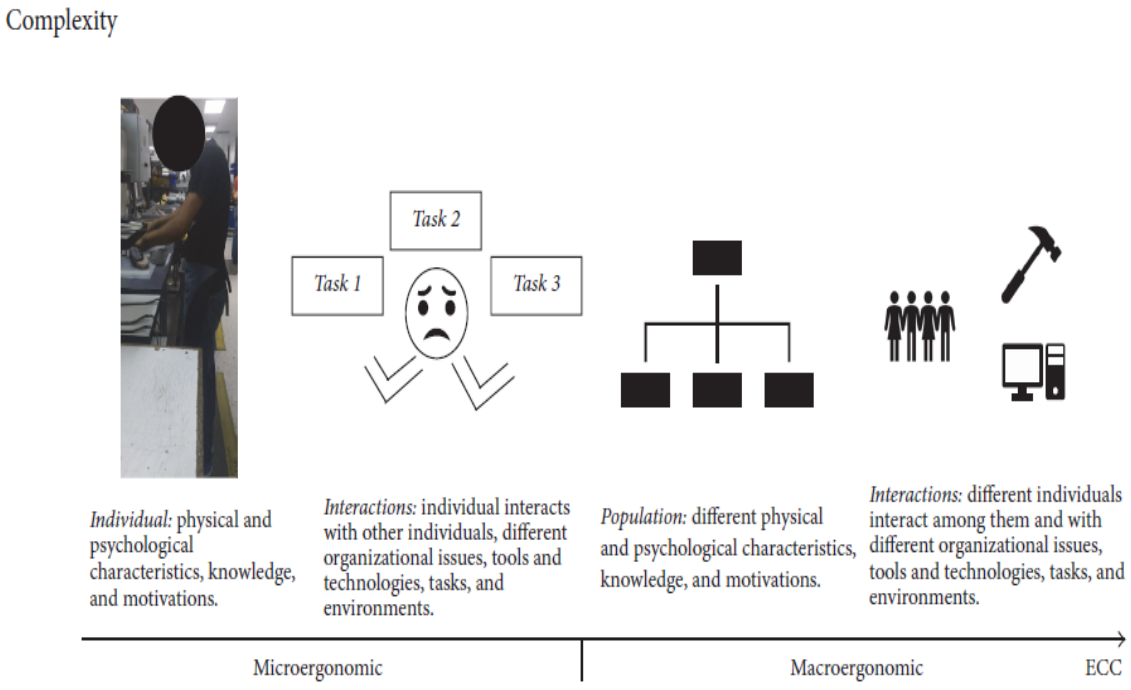

Figure 2.1. The ergonomic compatibility complexity (source adapted from Realyvásquez and Maldonado-Macías, 2018).

Maldonado-Macías *et al.* (2015) applied an Ergonomic Compatibility Survey (ECS) to measure the ergonomic compatibility of system elements. They used Karwowski's (2000) concepts of human-system compatibility as guidance and directed it subjectively to measure the probability of design to meet ergonomic requirements using a fuzzy environment. Moreover, Maldonado-Macías *et al.* (2017) suggested that such a technique could contribute more thoroughly and efficiently to the decision-making process while recognizing human factors, ergonomic aspects, and tangible and intangible ergonomic compatibility attributes.

2.3. Macroergonomic Factor and Elements for Work System Design

A factor is described by The Cambridge Dictionary (2017) as "a fact or situation that influences the result of something," and "an element is described as a part of something." Since macroergonomics refers to the ergonomics, subdiscipline focuses on the development and harmonization of the overall work system. A macroergonomic factor can be seen as a variable focusing on the performance, design, and harmonization of a company entirely and composed of elements. In the recent past, numerous researchers have been argued and suggested macroergonomic models with various macroergonomic factors and even more simpler components, named as macroergonomic elements (Realyvásquez *et al.*, 2018).

Carayon and Smith (2000) said that ergonomics' primary goal is to improve efficiency, safety, and health. The concept of work organization is, therefore, at the center of ergonomics. Recently, the expressions "work organization" or "organization of work" are progressively used in discussions of worker safety and health. National Institute for Occupational Safety and Health (2002) told that the organization of work refers to "the work process such as job characteristics and to the organizational practices that influence job design." In this concept of work organization, they also added external factors, such as the legal and economic environment, political situation, demographic forces at the national or international level, and technological factors that promote or enable new organizational practices.

Carayon and Smith (2000) told that considering only a small number of work organization factors can be misleading for work system design issues. They, therefore,

emphasized a system approach that considered all elements of the work system to improve health, safety, and performance. According to them, the environment factor of a work system is composed of elements of lighting, noise, temperature, air quality, and workplace layout. These elements are very crucial since they affect worker occupational stress and emotional irritation, heat exchange, energy expenditure, and difficulty of work, and great attention should be paid to them while designing any work system. With respect to the task factor, Carayon and Smith (2000) said that they constitute elements that are stressful in both physical and psychological terms, which include job demands, job content, machine-pacing, job control, repetitiveness. While many physical workloads may increase stress and musculoskeletal issues, lack of difficulty, poor variety, intellectual impairment, and the under-use of abilities can contribute not only to numerous physical but also psychological problems.

On the other hand, regarding the technology factor, Carayon and Smith (2000) again mentioned using adequate skills while interacting with technology because inadequacy of skills can lead to lower motivation and performance levels and higher stress levels. However, they also told that a proper application of new technologies could enrich work content and bring positive effects both at the individual and corporate levels. Regarding the organization factor, the authors told that organizational support, ability to grow in a job and promotion probability has a significant effect on workers' stress, motivation, and performance. For the last factor, namely individual factor, the authors claimed that certain elements constitute person factor but not limits it, such as physical and psychological health status, abilities, personality, experiences, motives, goals, and needs. They claimed that those work system components harmoniously explained above balance system work to achieve both individual and organizational goals.

Carayon *et al.* (2006) claimed that it is essential to determine points of improvement or intervention and describe briefly and coherently the interactions between people and their environment To achieve this goal, they have used the concept of work system suggested by Carayon and Smith (2000) as a framework and have improved Donabedian's (1978) design by creating the Systems Engineering Initiative for Patient Safety (SEIPS) model. According to the model that was developed, macroergonomic factors were explained reasonably: an

individual performs several tasks in a specific physical environment and under certain organizational conditions, using different tools and technologies. The authors break down macroergonomic factors and elements into more particular categories that continuously interact with each other. The authors added that the developed model has lots of benefits since it is useful to focus on the whole work system, rather than handling just one aspect of the work system alone. Different than other work system models, the SEIPS model provides a generic and adaptable framework on how to think about all the related work system factors (technological, organizational, job, environmental, and personnel), their relationships, and their potential outcomes. Moreover, Carayon *et al*. (2006) stated that the SEIPS model could direct performance measurement by indicating changes that could result in success or failure in the work system.

Later on, Chui *et al*. (2012) decided to build on the Carayon *et al.* (2006) SEIPS model, as they found it a valuable tool to use in structuring and researching interviews with pharmacists into the work system variables and features. In line with Carayon *et al.* (2006), they have used the SEIPS model to understand the equilibrium and interconnectivity of two-sided arrow components. In comparison, Carayon (2012) is compatible with Carayon *et al.* (2006) with most macroergonomic variables and features. The former, however, vary primarily in the motivation and expectations of workers, social relations, the leadership and supervision styles, and the layout of workstations.

Authors Dul *et al.* (2012) and Realyvásquez *et al.* (2016) stated that optimization of these macroergonomic factors improves operational efficiency, profitability, product quality, and the health comfort and safety of the employees. Since the primary objective of macroergonomic models is to analyze the companies departing from the macroergonomic factors and elements, work systems (manufacturing and service systems) can benefit from the use of such models to improve and optimize their design. Realyvásquez *et al*. (2016) mention the independence of the macroergonomic factors, and because of that, the authors told that changes in any of these factors and elements to enhance the macroergonomic compatibility of the work system, affect the other factors and its simpler components.

Considering above literature review, we can quickly bring to an issue that the most discussed macroergonomic factors are: (i) the Person factor, (ii) the Organization factor, (iii) the Technologies and Tools factor, (iv) the Tasks factor, and (v) the Physical Environment factor (Carayon *et al.*, 2006). Figure 2.2 presents the five macroergonomic factors and their elements.

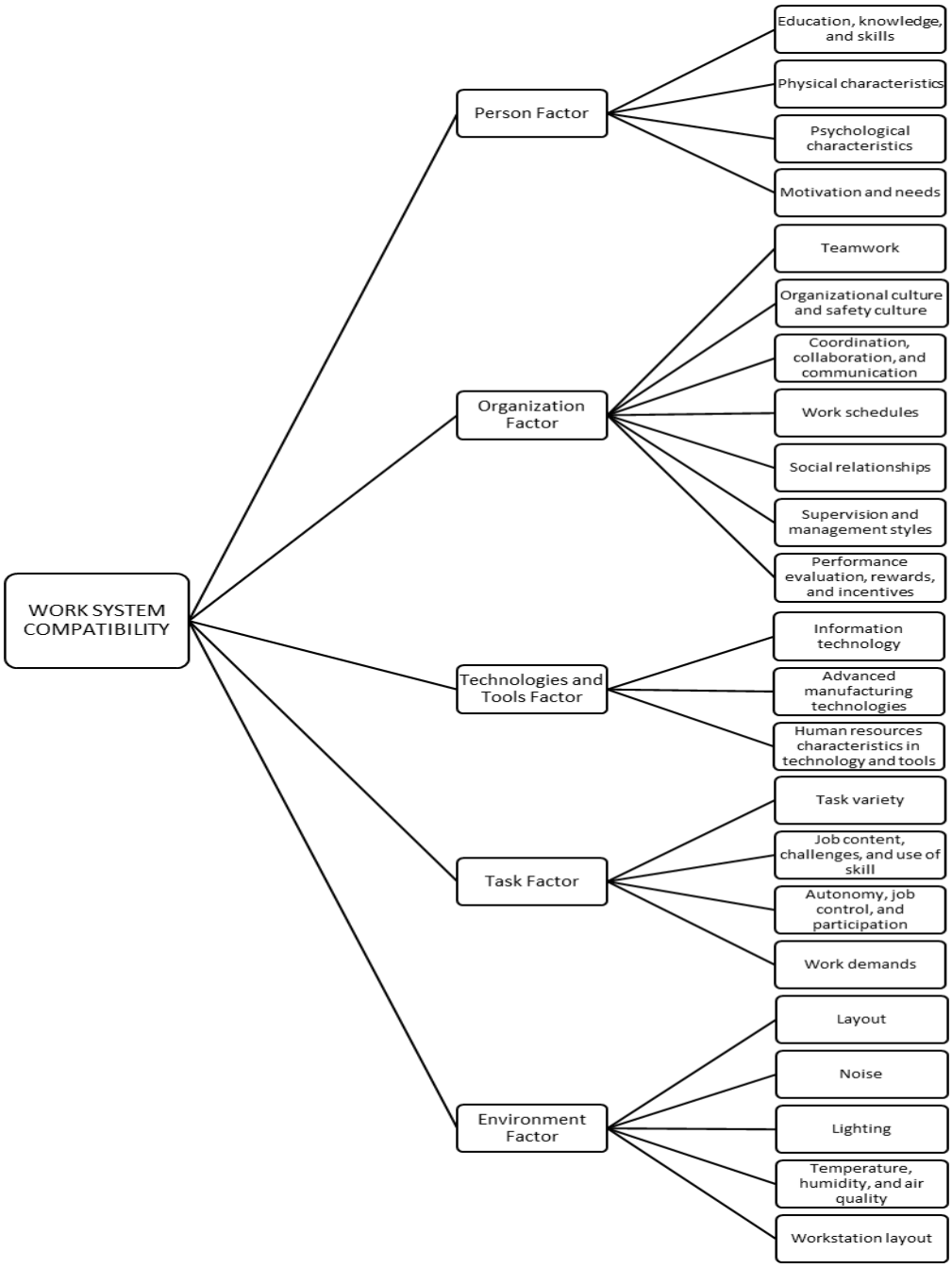

Figure 2.2. The five macroergonomic factors and their elements (source adapted from Realyvásquez *et al.*, 2018).

Realyvásquez *et al.* (2018) have the most in-depth research in the literature which contains the macroergonomic factors and elements and their direct, indirect, and total effects on three manufacturing system performance variables: Customers, production processes, and organizational performance. The authors told that there are also effects such as health and safety, job satisfaction, creativity, and individual performance for the worker, as well as the impact ranged from problem-solving and reducing employee absenteeism to higher customer satisfaction and loyalty, thereupon increasing the company's productivity and competitiveness. As for the person factor, Realyvásquez *et al.* (2018) investigated the effects of its three elements, namely: Physical characteristics, psychological characteristics, and motivation, and needs on manufacturing system performance measures. The authors concluded that physical characteristics and psychological characteristics are indispensable for success in work system designs. They also added that customers have the most substantial total effect on both organizational performance and production processes, which can lead the conclusion that interrelated variables with customers such as loyalty, complaints, and satisfaction must be well considered if manufacturing work systems want to aggrandize their competitiveness.

As far as organization factor concerned, Realyvásquez *et al.* (2018) investigated the effects of its three elements, namely: organizational culture and safety culture, coordination, collaboration and communication, and teamwork on manufacturing system performance variables. The authors found that, although direct and indirect effect values of each element vary, all organizational macroergonomic elements have a significant total effect on system performance. Therefore, to achieve customer satisfaction, excellent organizational performance, and reliable production performance, the macroergonomic compatibility of all elements of the company should be given high importance.

Also, Realyvásquez *et al.* (2018) investigated the effects of tools and technologies as a macroergonomic factor on manufacturing system performance. In particular, the authors investigated the effects of Information technology, human factor characteristics of technologies and tools, and advanced manufacturing technology on selected system performance variables. They said that the macroergonomic compatibility of the information

technology element is the most important one for manufacturing work systems' competitiveness.

Last but not least, Realyvásquez *et al*. (2018) examined the interaction between tasks, as a macroergonomic factor, and the performance of manufacturing work systems. A macroergonomic element of the task factor, namely work demands, has analyzed in the cause of this research. Macroergonomic compatibility of work demands has a powerful effect on all the dependent system performance categories, which means positive results for the manufacture performance can be achieved when macroergonomic compatibility of work demands is administered.

In the vast literature of ergonomics, the researchers mostly focused on performance improvements at the worker level, because they believed that in the long run, better worker performance causes better organizational performance, eventually. Ergonomics, with all sub-branches (microergonomics and macroergonomics), tries to improve both employee performance and corporate performance by increasing health and safety levels, customer satisfaction and loyalty, employee creativity, and reducing occupational risks and hazards. Like every other long-term intervention, ergonomics, exclusively macroergonomics, does not put forward any good of a sudden. In order to achieve high macroergonomic compatibility, it is indispensable to dedicate all the employees of the different hierarchical levels, which can understand the relationships between all the macroergonomic factors and elements and their effects and eager to perform for the sake of employee well-being and system performance.

2.4. Organization Factor and Its Elements

According to the above literature, the organization factor composed of seven elements: (i) teamwork, (ii) organizational culture and safety culture, (iii) coordination, collaboration, and communication, (iv) work schedules, (v) social relationships, (vi) supervision and management styles, and (vii) performance evaluation, rewards, and incentives.

2.4.1. Teamwork

Teamwork is a method in order to achieve a specific objective or objectives in a group of people. People build teamwork through their skills and provide constructive feedback despite any personal conflict. Teamwork depends mainly on people working to accomplish shared goals in a cooperative atmosphere by sharing knowledge, experience, and skills (Harris and Harris, 1996).

In the communities of today, people focus more on separately at work than on the notion of teamwork to accomplish their occupational objectives (Sanyal and Hisam, 2018). As a key component of new work organization forms, teamwork is essentially a specific organizational measurement that presents a variety of characteristics in companies (Kyzlinková *et al.,* 2007). It is evident that teamwork is positive with the results of the employee. Improved efficiency of employees can be accomplished by adapting teamwork practices across the company. Teamwork and its elements are closely linked to the performance of the service sector employees (Sanyal and Hisam, 2018). Most experts believe that teamwork should contribute to enhancing the quality of work life and the productivity of employees. Besides, it also increases the quality of work life by learning new things in one's job. In this context, teamwork leads to the advancement of employees, both personal and professional character. Teamwork has, therefore, obviously a positive impact and contributes to an organization's learning environment (Kyzlinková *et al.,* 2007).

When considered from the subjective perspective of the service sector, teamwork has become essential as it is linked to the work system's performance results. Babiker *et al.* (2014) told that effective teamwork could affect clients, employees, and performance outcomes promptly and positively. Due to the growing co-morbidity and complexity of work systems and relationships between client and service provider, the need for efficient teams is growing over time. A company's strong teamwork capabilities can result in very excellent customer service quality. For example, strong teams ensure consistency of customer communication, it is more likely that the target dates will be reached and all individuals take responsibility for their actions. A fragile team demonstrates itself in the customer's eyes through bad customer service like the left-hand side, not understanding what is done with

the right side, missing or revising obligations, and lacking ownership of actions and problems (Macaulay and Cook, 1995). Considerable client interactions can take place with team members working with a shared vision and collective approach to producing the type of experience that clients care about. Teamwork is critical to ensuring that individuals and processes are supported so that outstanding client experiences can be delivered more consistently.

Great group dynamics will boost productivity and contentment of workers while allowing teams to meet their goals on schedule. Teamwork allows this to result in three respects: increasing positive feelings that expand employees' resources and skills by enhancing people's relationships with each other and enhancing their creativity and capacity to think creatively, buffering against adverse occurrences such as stress, enhancing employees' capacity to recover from challenges and problems, attracting and strengthening employees, making it possible for them to work together. According to Yun *et al.* (2007), teamwork is profoundly affected by employee performance and job satisfaction. It is also indicated that empowering leadership, as well as formative leadership, positively linked to job satisfaction. Abuzid and Abbas (2017) added that the elements of teamwork and their effect on organizational performance are of immediate positive significance, and constructively connected to organizational support and team leaders' willingness to make teams efficient and eventually improve organizational efficiency.

As regards to macroergonomics, teamwork is seen to be the most productive element when enhancing the work system performance (Realyvásquez *et al*., 2018). Azadeh *et al*. (2007) told that an all-around characterized macroergonomics program for business productivity enhancement requires teamwork between operators, supervisors, and managers at all levels. McGreevy (2006) told that teamwork is anything but a limited project yet a procedure of continuous enhancement and development. To accomplish high work system performance, improved competitiveness, and enhanced quality of work life for employees, teamwork must be successfully developed within the whole organization. In line with this conclusion, Tabassi *et al*. (2012) added that organizations that focus their energy to enhance their teamwork operations get better work system performance and face fewer issues and harm in their undertakings. Flores-Fillol (2017) also told that, in addition to the different

indicators of firm performance, there is proof of the positive connection between teamwork and firm profitability. Teamwork is correlated with the various firm and specialists' results, for example, firm profitability, innovation, or job fulfillment. Teamwork prevents time loss and contributes to the success of corporate innovations, generates new ideas, and carries the risk of satisfying the customers.

Moreover, Sadikoglu and Zehir (2010) told that, if managed successfully, teamwork activities will increase workers' awareness of their jobs and continuity in their actions and boost firm efficiency in areas such as lower cost and improved quality, as the understanding of organizational decisions and improvements will be strengthened. Working in a team increases the quality of employees and indirectly enhances firm performance through creativity as employees jointly produce ideas to improve the competitive position of an organization concerning new products or services. To these authors, teamwork has enormous benefits for both employee level and corporate level. For the employee level, teamwork can increase the degree of engagement of employees, quality of work, turnover rates, absenteeism, morals, and motivation. According to Rochon (2014), teamwork is a leading achievement factor for employee performance and corporate performance. The author depicted teamwork as a group of employees who work to accomplish a specific objective. As it were, teamwork is a synergistic and merged movement that is coordinated towards achieving requested common goals. Likewise, Hanaysha (2016) told that teamwork has a positive effect on organizational job commitment, and it is one of the significant corporate engagement contributors. In this way, teamwork practices will allow the companies an area that encourages learning and exchanges of knowledge where it is necessary to improve job self-sufficiency and better employment efficiency. Therefore, when a worker is happy with his or her activity, the dimensions of the pledge to the organization will be expanded. In terms of the corporate level, teamwork allows the organization to assess existing and increasing customer expectations, evaluate rivals, and introduce new products or services to boost company performance. Badowski (2018) said that the integration and enhancement of teamwork skills of professionals must be ensured in order to achieve high firm performance. For this reason, the author identified teamwork and collaboration skills as critical competencies for employees who work in service firms. Boakye (2015) showed the positive impact of teamwork on organizational performance, which has studied by early researchers.

He claimed that teamwork is an efficient way to succeed in the work system or the organization. In addition to the researches have done in the manufacturing environment, Combs *et al*. (2006) stated that in the service work system, teamwork enables the active exchange of information and resources, which ultimately increases productivity.

All in all, the companies achieve considerably higher rates of organizational efficiency when they implement positive, virtuous teamwork practices, including financial results, client satisfaction, and productivity. The more excellence in teamwork, the higher the profitability, efficiency, client satisfaction, and employee engagement.

2.4.2. Organizational Culture and Safety Culture

Organizational culture can be defined as "the values and behaviors that contribute to the unique social and psychological environment of an organization." (Peters *et al*., 1982) It is believed that organizational culture impacts the efficiency and performance of the company and offers guidance on customer service, product quality, and safety, participation, and timeliness, as well as an environmental concern. The definition of organizational culture exists in numerous adaptations in literature. For example, Kilmann (1985) defined organizational culture as "shared philosophy, ideology, value, assumption, beliefs, hope, behavior, and norms that bound the organization together." Moreover, organizational culture is related to the term "fit" by some practitioners (Kotter and Heskett, 1992; Peters *et al*., 1982). They related the organizational culture, which would inevitably be a definite strategic advantage for the organization, to the compatibility between an organization and its environment. Organizational culture has seen effective on firm performance in the recent literature.

Kotter and Heskett (1992) explored the correlation between organizational culture and performance of the organization and the impact on this relationship of stability or volatility in the internal and external environment. They find that an accurate analysis of organizational culture empowers the company, based on its steadiness, internal, and external environment, to achieve desired operational productivity measures. Hogan and Coote (2014) established an experimental design rationale focused on the conceptual model of Schein

(1992) for service firms. They found that the layers of organizational culture have an impact on innovation and firm performance. Similarly, Wang and Rafiq (2014) examined the interaction between organizational culture and the results of new product innovation and variations between high-tech firms. The authors found that a substantial construct of organizational culture helps to create a balanced new product innovation portfolio, which essentially means that there is a strong interaction between organizational culture and product innovation and performance measures. Duygulu and Özeren (2009) empirically studied not only the effect of organizational culture typologies but also the collective impact of particular leadership styles on the firm's innovativeness in Turkey. The authors found that organizational culture has significant explanatory value on the firm's innovativeness. Eventually, Realyvásquez *et al.* (2015) revealed through a Structural Equation Modelling (SEM) analysis that the macroergonomic compatibility of the organizational culture and safety culture has a direct positive effect on the productivity of production processes and directly or indirectly affects all other variables.

Organizational culture can be defined as "the brand or personality of an organization." (Realyvásquez *et al.* 2015) From that point of view, it can be seen as the factor that makes the company unique. Company culture is about how the organization is perceived by employees, future employees, clients, and the public. Company culture is a crucial element that may have a positive or negative impact on sales, revenues, recruitment efforts, and employee morale. An excellent company culture draws people who want to work with a company or do business. It can encourage employees while lowering turnover to be more productive and positive at work. Employees are valued in influential company culture and employees who feel appreciated and can make choices reach a more significant performance level. Strong company cultures also provide possibilities for employees to develop. It is possible to preserve employees motivated by offering promotions, career growth programs, or additional training, which in turn increases efficiency. People much more want to join (and stay) in a company culture that fosters versatility, encourages employee development and promotes a balance between work and life. Improving employee satisfaction through an active and positive corporate culture will reduce retention, recruitment, and training costs while raising moral standards and increasing profits (O'Toole, 2002).

As regards the safety culture, it is defined as “the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization’s health and safety management.” (Stemn *et al.,* 2019) Communications based on mutual respect, collective understanding of the importance, and respect in the efficacy of preventive measures are the hallmarks of a company with an influential safety culture (Health and Safety Executive, 2005). Since it was first introduced, the idea of safety culture has gained further interest from both academic and industrial circles. O’Toole (2002) told that if the safety culture, which is generally defined by the management of the company, is demonstrated, employees’ perceptions of the safety management process will be positively influenced. Based on this effect, an influential safety culture will eventually reduce injury rates and occupational safety problems. Stemn *et al.* (2019) investigated the correlation between social safety maturity and the level of injury by using a maturity model of safety culture, and they found that the safety culture rates of the work systems at lower incidence rates are consistently higher than those of those with greater incidence because of the negative correlation.

In comparison of the explanatory variables related with gender, position, size of the vessel, operating conditions, and the impact of health and workplace accidents on different factors, Nævestada *et al.* (2019) investigated the impact of national safety culture, the safety emphasis of the business and corporate security culture on safety habits. The study found that the safety behavior of organizational safety culture is found similar results to the previous studies; in other words, it reduces the negative impact on safety behavior and, consequently, on workplace injuries in challenging working conditions. They also said the negative impact of the safety culture on other organizational levels could be minimized by the positive safety culture at one organizational level.

Safety culture becomes ingrained, and employees are more mindful and engaged when performing their duties. Everything from sales to recruitment becomes more and more difficult in today’s extremely competitive company environment. One way to make everything convenient is to be a company with which individuals want to do business and work. Smart organizations understand that one of their most significant assets is a robust, favorable corporate culture (Tsai, 2011). By embracing the following principles, the

company can learn how to implement and enhance its culture in a way that increases the chances of excellent economic and operational performance. A reliable company and safety culture enable employees to fulfill their objectives and duties and be satisfied with their jobs. Organizational culture is “a significant explanatory variable for workplace behavior and efficiency” and affects the results of teamwork and intervention (Strasser *et al*., 2002). Besides, job satisfaction is predicted by organizational culture (Tsai, 2011; Lund, 2003; Brazil *et al*., 2010).

All in all, these studies established that organizational culture and safety culture have noteworthy and constructive outcomes on work systems, including both manufacturing and service work systems, and ought to consequently be considered at the design period of these work systems.

2.4.3. Coordination, Collaboration, and Communication

Coordination is the conduct that deals with the interdependent relationships of activities with an everyday object. Malone (1994) defines coordination as the “management of dependencies among independent activities” (as cited by Boella and Torre, 2006). This definition is explicitly utilized in business and commercial settings. Wiltshire *et al*. (2018) told that teams which had a moderately steady level of movement coordination throughout the task performed superior to anything that had a sharp decline in their coordination. Therefore, coordination in teams is crucial for effective and efficient team performance.

Communication has drawn a massive amount of attention from several practitioners. Borca and Baesu (2014) described Organizational communication as “a field of study within the communication science which represents the way that businesses, firms, institutions or groups communicate in their internal environment.to their members or employees, and how the organization as a whole communicates with people outside its environment.” As for the ergonomic perspective, they told that organizational communication is vital to the wellbeing of an organization’s individuals, and the association with outcasts. Author le Roux (2014) told that to amplify their commitment to organizational performance; practitioners should concentrate on enhancing corporate communication skills. Similarly, Mitrofan and

Bulboreax (2013) conducted a study in a bank to recognize how communication can impact the employees' discernments on the significance of interpersonal relationships. They told that effective communication at the working environment built on tight connections of interpersonal communication among subordinates and managers is critical for the achievement or failure of an organization in the long haul. Also, Borca and Baesu (2014) emphasized that the style of communication is appropriate for the type and activity of the organization. They also said that organizational communication had influenced positively organizational performance, such as corporate engagement, performance, corporate social behavior, and work performance.

Collaboration is regularly observed as an activity that includes team members working on a project together. Nonetheless, genuine collaboration is more than a movement. It is a procedure with related practices that can be instructed and created. A group of people is exploring ideas to create solutions which go beyond a single person's limited vision. Wang *et al*. (2018) investigated the impact of interaction variables such as efficient communication, perceived value, and willingness to work together with a cross-sectional questionnaire on the perception of workers' participation and found that collaboration is altogether impacted by all those interactional factors. Tee *et al.* (2019) studied how organizations monitor interorganizational cooperation through a mixture of systems that promote collaboration and cooperation and provided an insight into cooperation both for coordination and cooperation, concentrating on the role of modularity and convergence in order to achieve successful cooperation. Jacobs *et al*. (2016) found out that employee satisfaction is affected by employee coordination, collaboration, and internal communication. The authors also added that in order to enhance corporate market performance, it should initially set up viable communication processes and invigorate employee satisfaction. Realyvásquez *et al*. (2015) showed that the macroergonomic compatibility of organizational communication has positive effects on overall work system performance indicators, which in this case, customer satisfaction, process reliability, and organizational performance.

Collaborative companies promote autonomy, decision-making, and teamwork, rather than a "us versus them" approach. Employees are given the opportunity to contribute, to play

roles, and to establish constructive relationships with managers and colleagues. Employees know their opinions and ideas are welcomed in companies that have proper coordination, collaboration, and communication practices. Once employees feel understood, the frustration that can contribute to absenteeism, destructive ethics, and dismissal is not conveyed. Improved engagement, creativity, and innovation often benefit from the interaction of the organization.

To summarize, these early studies showed that coordination, collaboration, and communication are essential components to sustain reliable employee, team, and organizational efficiency.

2.4.4. Work Schedules

Over the last two decades, many changes have added to the movement and expanding standardization of non-standard working schedules, incorporating changes in demography, technology, globalization, and legislation favoring deregulated international markets. Achievement in worldwide markets expects organizations to be adaptable and prepared to roll out fast improvements. For employees, this can mean an expanding measure of shift work or extended and rearranged working schedules (Winkler *et al*. 2018; Salminen, 2010). The realization of these changes has affected the service sector and the manufacturing sector in different ways and degrees. Compared with the manufacturing industry, the service sector seems more progressively dependent on non-standard work schedules (Alterman *et al*., 2013). Not only that but also the proportion of traditionally white- to blue-collar occupations working on non-standard work schedules This seems to have changed, with white-collar jobs now containing most non-standard work schedules (McMenamin, 2007 as cited by Winkler *et al*. 2018). In their work, Åkerstedt and Kecklund (2017) told that work schedules involving unpredictable working hours are, for the most part, identified with negative social impacts, while less than eleven hours off between shifts were identified with disturbed sleep, fatigue, and social difficulties. Similarly, Selvi *et al*. (2015) proved that employees that do not work in standard work schedules can have dangerous, unsettling influences on circadian rhythms and the sleep-alertness cycle and that these adjustments like this led to cognitive and behavioral issues such as attention deficit, impulsivity, and hyperactivity. Winkler *et al*.

(2018) added that compared with standard schedule employees, the risk of non-ideal health, drug usage, more prominent leisure devices, more horrible eating habits, stoutness, and anxiety might have been rising among people who have to work with non-standard work schedules. What is far worse, they also said that the correlation of chronic diseases and social disorder and daily clinical activities have a direct connection to nonstandard work programs. Similarly, Dembe *et al*. (2005) examined the effect of overtime and extended work hours on the risks of workplace accidents and conditions by a broadly administered study to working adults from the United States. They found a 37% increase at the level of hazards for working 12 or more hours per day and a 23% increase for the work of at least 60 hours per week.

On the other hand, adapting to the difficulties of work schedules and overcome them, can help enhance corporate performance by decreasing absenteeism, decreasing turnover intentions, and improving productivity. The literature demonstrates the importance of work schedules on individual performance and well-being. Peters *et al.* (2016) used moderated structural equation modeling in order to examine regardless of whether the interactions of individual and employment assets with work schedule requests anticipated work commitment and emotional exhaustion in the service sector. They concluded that at the point when working hours of employees complement with their personal lives, they are less likely to experience ill effects of diminishing work commitment and emotional exhaustion; thus, it is significant for their well-being.

Studies confirmed that employee autonomy, flexibility, and work schedule fit is essential for the macroergonomic compatibility of work schedules, which is essential to employee satisfaction, employee commitment to the organization, employee health and safety, and eventually, organizational performance of both manufacturing and service sector.

2.4.5. Social Relationships

Inside the area of psychosocial research, the social segment has generally been characterized as an issue of social help, operationalized as the degree to which noteworthy others, for example, associates, supervisors, and friends can lighten individual or business-related issues (Saksvik *et al.*, 2013). From the organizational perspective, the literature takes

note that social capital is a precious resource that originates from access to assets made available through social relationships effect on organizational performance has been studied at numerous dimensions utilizing distinctive performance measures (Krause *et al*., 2007). Still, in today's studies, the advantages of social relationships and networks on organizational life are frequently inspected (Kirkbesoglu, 2013).

Krause *et al*. (2007) investigated the relationship between social capital accumulation with critical suppliers in the United States, and firm performance and provided information about social capital dimensions relate to firm performance. Apart from the early studies, they hypothesize relations between social capital dimensions and improved company performance based on social capital rather than cognitive capital. They found that employee commitment and social capital aggregation with key providers can enhance firm performance remarkably. Moran (2005) analyzed the effect of managers' social capital on their managerial performance while considering two types of social capital, the structural embeddedness and the relational embeddedness of a manager's work relations. He found that both dimensions of social capital have a significant but different effect on managerial performance. With this study of Moran's, he added value for the understanding of individual-level social capital in several ways and clarified the multifaceted nature of social capital. Similar to Moran's study, Kirkbesoglu (2013) examined the structural and relational dimensions of social capital within two managerial reputations, namely individual and family-based. He found that the impact of relational embeddedness is stronger than structural embeddedness while explaining an individual reputation. He, too, both strengthened and explained the multifaceted nature of social capital. From another perspective, Kiecolt-Glaser *et al*. (2010) told that social relationship impact could be observed in both healthy participants and individuals with chronic medical conditions since it changes the microelements of a person's biomechanism. Those who were lacking macroergonomic compatibility of social relationships are more likely to be in depression, emotional stress, and to do different practices impeding personal wellbeing. Rhoades and Eisenberger (2002) directed an investigation on the relationship among employees and their supervisors and subordinates, bringing up that work support from supervisors to subordinates can enhance employees' enthusiasm for excellently finishing their assignments. Analogously, Chen *et al.* (2016) developed the scale of employee well-being and employee relationships and

investigated the effect of employee performance relationships on employee well-being through experimental analysis of 571 people in the manufacturing and service industries. They concluded that the dimensions of all employee social relationship quality have positive effects on employee well-being. Moreover, they found that the most influential factor was the employee-manager relationship inside the work environment.

All in all, social relationships are proven by the literature that they have positive effects on employees and organizations when addressed from an ergonomics point of view.

2.4.6. Supervision and Management Styles

Supervision and management styles is an accumulating body of research that has been associated with better individual and organization performance, higher motivation, higher creativity levels, and psychological and physical well-being. In the past, several studies have demonstrated that companies solely try to improve financial performance (Wang *et al*., 2010). However, nowadays, it is essential to give a considerable amount of attention to intangible assets and leadership performance rather than past tangible financial performance. In this sense, Kanat-Maymon *et al*. (2018) found that supervisor authenticity intercedes the relationship between the motivating supervisor style and essential business-related results. They told that authenticity is a one of a kind motivational power that can affect organizational performance. Zehir *et al*. (2011) investigated the data collected from 295 employees in national and global firms with several industries such as manufacturing, telecommunication, and finance in Turkey to reveal the relationship between organizational culture types, leadership types, and firm performance. They empirically demonstrated that there is a direct, strong, and positive relationship among supervision and management styles, organization culture, and corporate performance, and therefore, they are essential components of organizational success. They also told that higher corporate performance could be accomplished with active subordinate involvement and engagement under participatory leadership behavior. Erturk (2012) examined the impacts on employee innovation abilities of psychological empowerment and supervisor trust. He observed that supervision trust was closely and positively connected to creative employee capability and company performance. To that degree, Duygulu and Özeren (2009) investigated the impacts

of supervision and management styles, namely employee orientation, production orientation, and change centered leadership and organization culture on corporate's innovativeness. They found that organizational innovativeness is depended on the interacted evaluation of both organizational culture and supervision and management styles, and in order to understand the innovative capability of employees, organization culture and supervision and management styles should be jointly investigated.

Moreover, Wang *et al*. (2010) investigated the relationships between supervision and management styles, organizational performance, and, accordingly, the human resource management strategy. This research disclosed that charismatic, transformational, and visionary of the leadership style has a positive effect on organizational performance. Similarly, Chan *et al*. (2008) analyzed the impact of trust on interactions between supervision and management styles and performance results for employees. They found that supervision and management styles were closely linked to trust and positive subordinate outcomes, including job satisfaction, high performance, and willingness to turnover.

Adverse effects on firm performance and employee well-being occur when there are inappropriate supervision and management styles. Liu *et al*. (2012) researched the role of the manager in the creative work of the employees and found the negative relationship between the authoritarian supervisor of the department and the creativity of the team. This research also indicated how and when abusive supervision might course down to hurt employee creativity. Martinko *et al*. (2011) told that subordinates' antagonistic attribution styles were emphatically identified with subordinates' view of abuse and adverse behavior and represent a considerable extent of the variability in subordinates' view of abusive supervision. They likewise discovered proof that the harsh supervision and leader-member exchange constructs are confounded.

Excellent group dynamics will improve the efficiency and morale of employees and encourage the teams to meet their goals on time. Teams with outstanding dynamics still need continuous supervision, clarification, and guidance; organizations should, therefore, be willing to continue to provide the leadership and training they need to succeed. Once again, the above literature suggests that by developing high compatibility of a macroergonomic

element of organization factor, which in this case, adequate supervision and management styles, firms can achieve excellent business performance.

2.4.7. Performance Evaluation, Rewards and Incentives

The last organizational macroergonomic element is performance evaluation, rewards, and incentives. Early studies have been directed in order to examine the effects of this macroergonomic element on individual and corporate performance.

Providing financial incentives in the past is a collective methodology to enhancing the performance and motivation of an employee since they are prime factors that are strongest determinants of employee attitudes, motivation, and behaviors on employee motivation (Garbers and Konradt, 2014). Some studies told that there is a positive interaction between differential pay allocations and performance (Kepes *et al*., 2009; Gardner *et al*., 2004). Garbers and Konradt (2014) investigated 146 studies that include a total of 31,861 employees in order to study the effect of individual and team-based financial incentives on employee's performance. They found that there is a positive effect on individual and team-based incentives on performance. Gardner *et al*. (2004) researched the motivational effects of salary on employee performance. The results showed that the pay level influences the self-esteem of employees, which, in turn, affects the performance of employees and organizational performance because it gives a sense of the employees' importance.

Similarly, Danish and Usman (2010) showed the impact of reward and recognition on employee motivation and job satisfaction while working within a company. Their analysis revealed that there is a tremendously positive effect of reward and recognition on employee motivation and job satisfaction. Kepes *et al*. (2009) told that it is not merely just the width of the compensation extent yet additionally the variables responsible for the width that clarify the impacts of the compensation on worker and organizational results. Albeit more extensive pay ranges have beneficial outcomes, the analyses uncover a mind-boggling example of connections among the premise of pay allocations and pay range width from one perspective and workforce efficiency and organizational performance on the other. Bustamam *et al*. (2014) researched to investigate the impact of rewards, namely base salary

raises and recognition on employee performance and job satisfaction. The results showed that there is a significant and positive relationship between rewards and job satisfaction, while financial reward has more explanatory power on job satisfaction as compared to the non-financial reward.

In conclusion, increasing numbers of researchers are conducting studies on macroergonomic elements of organization factor that can affect work systems, including service and manufacturing systems. As can be seen from the above literature, the macroergonomic elements can have important effects on employees and work systems. As for employees, these effects may include aspects such as health and safety, job satisfaction, creativity, and individual performance. Regarding the work systems, these effects may include system performance, process quality, and client satisfaction. These macroergonomic elements have positive effects on employees and work systems if they are approached from a macroergonomic viewpoint.

2.5. Consulting Industry

The term “industry” is closely linked to the products that the system offers. Service industry, also known as “the tertiary sector,” produces intangible goods, more precisely services instead of goods, and according to the U.S. Census Bureau, “service industry comprises various service industries including warehousing and truck transportation services, information sector services, commodities, professional, technical and scientific services, health care and social assistance services, and arts, entertainment, and recreation services.” Today’s ongoing economic activities are mostly composed of the service sector.

A service work system includes people and technology that respond to the changing nature of expertise in a system. In recent decades, services have turned into the most significant piece of most industrialized countries’ economies. Service can be characterized as the utilization of capabilities to assist another (Kotter and Heskett, 1992), which can be understood as service is a type of activity, execution, or promise that exchanged for payment between the service provider and service clients by close contact activities. While working

together in harmony, the general purpose is to create value in complex work systems and networks (Spohrer *et al*., 2007).

Consulting service is a sort of professional service. The consulting company, when all is said in done, is an expert service company that gives business strategy to their clients, dependent on building up the management theories and their rich experience. As for the consulting industry, it covers the companies which provide services such as consulting services and financial advisory services and providing clients with advice and support in the execution of such approaches on management strategies and financial strategies (Nagayoshi *et al*., 2015).

The consulting industry is able to trace its roots back to the end of the nineteenth century, when the world's first modern consulting companies were established, with an emphasis on technology and finance in the beginning of the turn of the century, progressively picked up landscape in the business world, despite the fact that it was not until the 1930s, that consulting firms began to develop their size beyond a couple of establishments and small groups.

In the most recent decades, the consulting industry has been proliferating because of a "booming economy, a growing demand for the combination of up-to-date technical skills, intelligence and energy in the top tier talent, also a value orientation among younger professionals in order to take control of their careers rather than joining a prestigious firm and putting their destiny into its hands" (Stumpf and Tymon Jr, 2001 as cited by Aguilar and Vallejo, 2007). According to Forrester's Global Technographics Business and Technology Services Survey (2015), "58% of global company's decision-makers reported that they are planning to increase their spend on management consultants by at least 5%, and 23% each consecutive year." Plunkett Research Ltd. determined that the total consulting industry revenue is about $491 billion by the end of 2018, which represents consistent growth from $488 billion during 2017. The company's emphasis on the understanding of the market and the business will explain the development of the consulting industry to make them competitive and to guarantee their market survival and market success.

Consulting service exists because of two main reasons. One of them is management skills, techniques, and knowledge are best learned through exposure, introduction, and engagement with a wide range of organizations in different industries, and generally, client managers do not have this exposure. The other reason is the client managers want external and unbiased perspectives on management issues in order to see things are blocked by business blindness (Drucker, 1979 as cited by Aguilar and Vallejo, 2007). Therefore, consulting service is a form of service provided externally or outsourced. The quality of a successful consultant relies on how he or she adapts to the developments surrounding volatile markets and improves face-to-face time with technologies. Consulting firms convey massive value to clients, their customers, and the economy. Some consulting firms with good consultants often convey extraordinary returns on investments exceeding 1,000 percent, which, in other words, ten times the investment (Law, 2009). Thus, the consulting industry has turned into a vital component in current management and in modern society since an ever-increasing number of organizations look for advice from outsourced professionals so as to take care of issues that they either lack experience or capacity to deal with (Gross and Poor, 2008; Kipping and Clark, 2012).

Figure 2.3 represents the categories of consulting companies. There are four different types of consulting companies:

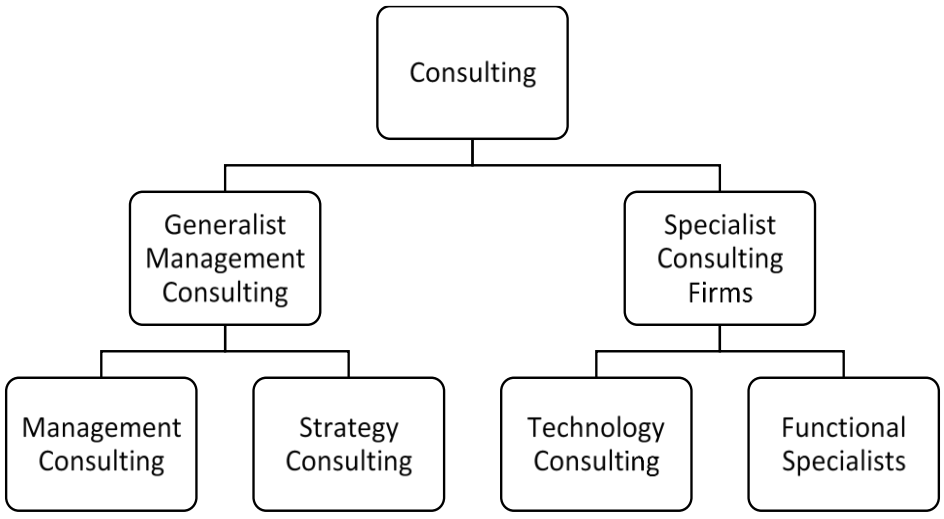

Figure 2.3. Consulting company categories (source adapted from Aguilar and Vallejo, 2007).

(i) Management Consulting: Such major consulting companies offer a wide range of services, from strategic planning and recruitment to IT and, in some instances, international outsourcing. They help improve the structure, leadership, performance, and competitiveness of an organization and prepare short-term and long-term growth strategies. According to the Institute of Management Consultants of the USA, "common management consulting specialties include administration, financial planning and control, human resources management and labor relations, incentive compensation, information technology, manufacturing, organizational planning and development, physical distribution, research and development, sales and marketing, strategic and business planning, and wage and salary administration." With digitization, these consulting companies begin to provide the Internet of Things, Business Digital Transformation and Digital Enterprise Services. Many of these companies came from the accounting and audit companies, for example, KPMG Consulting, PriceWaterhouseCoopers Ernst and Young, Deloitte and Touche, and Cap Gemini.

(ii) Strategy Consulting: This category of consulting covers companies such as McKinsey, Boston Consulting Group, and Bain and Company. Most of these companies are multinational and provide companies with strategic advice on a project-by-project basis. Some of the projects are including recommending a new strategic direction for a growing company, evaluating market conditions in different geographies to support growth aspirations and providing merger and acquisition support both in buyers and sellers side.

(iii) Technology Consulting: Several organizations within IT consulting service companies have been established, for example, LogicaCMG, IBM Business Consulting Services, and Computer Sciences Corporation. Consulting firms in technology help to create a new vision for a company to take a big step forward in the digital arena. Enterprises look forward to introducing the best solutions to enterprise technology to meet current problems and turn their company into a future-oriented perspective. IT consulting firms may help customers plan and execute IT systems or create improved IT processes. They teach employees in IT fields, such as the set-up of hardware/software installation and administration of networks, as well as search engine marketing.

(iv) Functional Specialists: As a result of consultants who left larger companies and set up consultancies in a specific sector, or provide a specialist service, many consulting firms were set up. In some projects, these firms offer specialists to help companies on how to structure the sale of its utilities via an auction, to improve research and development processes, and to conduct market research and quantitative surveys to project product demand. They include organizations like Nielsen, Mercer, Hay Group, Watson Wyatt, Everis, Fujitsu Consulting, Roland Berger (Aguilar and Vallejo, 2007).

Even though there are many overlapping areas in the consulting industry, a few firms spend significant time and effort in one zone while others have divisions for an assortment of fields. Some consultancies also offer expertise in a solitary sector, including defense, insurance, retail, health care, educational, environmental, telecom, engineering, or publishing. In addition, government consultants frequently specialize in the type of agency.

All in all, consultants are critical players in the business world, and they are here to stay. As Law (2009) told in his paper, increased demand for management consulting has a significant impact not only on the economy but also on most aspects of modern life more than it should be since consulting services can be found in the most significant organization in the business environment. Consulting companies are now required to facilitate clients to optimize their profits from all their massively expensive investments over the past decade. Consultation firms must be flexible and competitive in tandem with new technological developments, rapidly changing business and consumer demands, and industrial change. It requires specialist knowledge, resulting in an increase in demand for consultants with sufficient experience to understand the nuances of a customer's business model. Experienced and insightful enough to determine the temporary solution to achieve the long-term competitive benefit of the customer. There is little uncertainty that that consulting will continue to grow and prosper because the consulting industry is a natural home for the talents that are creative, change-oriented, and innovative.

2.6. Management Consulting

The Cambridge Dictionary describes management consulting as “the job of advising other companies about the best ways of managing and improving their businesses.” According to Wikipedia, management consulting is “the practice of helping organizations to improve their performance, operating primarily through the analysis of existing organizational problems and the development of plans for improvement.” Furthermore, management consulting is referred to as an example of a professional independent advisory service that is best used to identify, analyze, and solve business and management issues (Canback 1998 as cited by Back *et al*., 2014). According to Armbruester and Kipping (2001), management consultants are viewed as vital to helping companies outsource indirect workforce experience and to exchange unambiguous information with different organizations, and to help conceal it in their client organization. Rapid growth was described as the development of the contemporary management consulting industry. Especially in the 1980s and 1990s, there was a prominent massive advancement in the consultation industry. While today’s days have ended with two-digit growth levels, management consulting has become a significant part of the industry (Bronnenmayer *et al*., 2016).

As reported by Werr and Stjernberg (2003), not at all like manufacturing firms that can get their upper hand from patented innovations, financially savvy areas, or unique products, management consulting firms gain their upper hand virtually from being able to make and support knowledge assets and institutional capital dependent on authenticity. In addition to that, Reihlen *et al.* (2009) told that also consulting firm’s reputation and client relationships are the decisive elements for corporate performance. Therefore, members of the consulting industry have heavily focused their energy and attention on their reputation, projects, and personal relationships in order to convince people of the high performance of their management services.

The centrality and perceived legitimacy of market discourse and the marketing of consulting services suggest that their competitive success mainly relies on the company’s ability to support value-enhancing assets and skills by efficiently managing the company’s resource decision contexts (Oliver 1997, as cited by Reihlen *et al*., 2009). Therefore, the

strategies for managing these contexts in order to build or sustain firm reputation and legitimacy are essential to consultancy firms' success. Reihlen and Nikolova (2010) implemented a strong awareness of the strategic repertory of management consulting firms by examining a set of five interrelated strategies that management consulting companies can use their external environment to exploit the dimensions of industry and increasing their competitiveness. Kipping and Engwall (2003) told that, in order to create high-performance management practices and set up the knowledge management industry, management consulting firms also need to not only compete but also cooperate with academic institutions and media companies. This relationship can be seen in Figure 2.4.

Faust (2002) stated that progressively knowledge-intensive and dynamic economies had given management consultancies a chance to build up strong economic and social impact. There are other reasons such as developing IT innovations, declining profits, decreasing market share, new products or markets, environmental or political regulations, interruption in the modern or classical ways of doing business, which leads to the constant change of companies. Management consultants positively influence the consistently changing spaces and passing snapshots of organizational change by providing external expert knowledge to clients who might be, in any event incidentally, attempting to stay aware of current patterns and achieve business success.

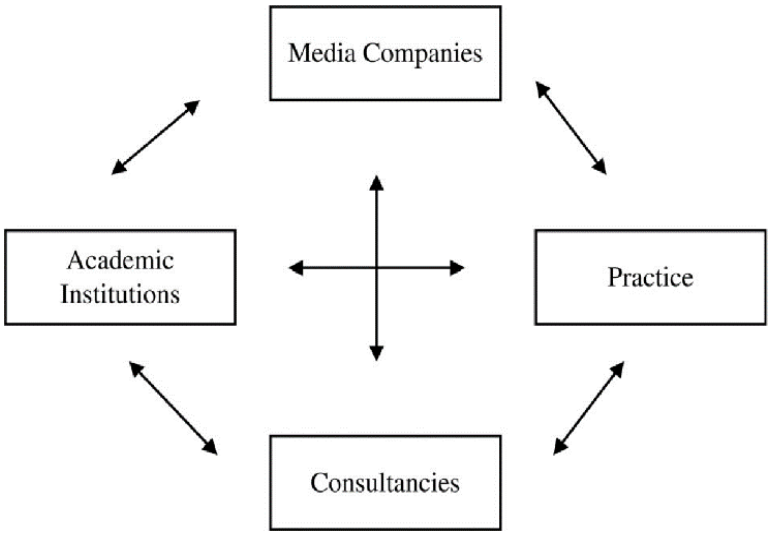

Figure 2.4. Management consulting model as an essential part of the more extensive information business (source adapted from Kipping and Engwall, 2003).

Client organizations are as far as anyone knows, specialists in what they usually do. On the other hand, management consultants guarantee to be specialists in various sorts of organizational “peculiarities.” A management consultant usually introduced to the moment an organization is being investigated with the necessity to provide additional equipment, experience, and resources to help the change (Nuorkivi, 2009). Simon and Kumar (2001) surveyed 171 executives in the top 500 companies in Australia and found five main reasons why consultants are hired. The study showed that insufficient in-house expertise, objective advice, gaining additional help/resources, insufficient workforce in-house, and quick resolution of issues are the most important rationales for getting help from a management consulting firm.

Fincham *et al*. (2016) told that management consulting firms have three aspects in common. Firstly, they offer help in diagnosing as well as dealing with management problems. Secondly, they are outer to the issue that is being tended to, with no responsibilities. Lastly, their support is provided temporarily. Furusten (2009) told that management consulting companies contribute to the decrease of the number of elective personalities an organization can be related to, both inside and from its partners, by ensuring improvisations. Moreover, he said that this process also reduces the number of choices that an organization like them needs to look over in specific circumstances. Stabilization of situations is very beneficial for the organization since it deals with uncertainty and risk that comes from combinations of multiple variables and increases focus on the organization’s core processes. Back *et al*. (2014) argued that collaboration with the management consulting firms is essential because these companies can fill institutional deficiencies such as necessary information, and knowledge and along these lines enable companies to actualize innovation activities. Management consulting firms enhance practically all sorts of organizations by giving them extraordinary expertise that not accessible inside the organizations as well as in situations where the organizations were eased back to react to the environment. This blend of the absence of symptomatic aptitude with the absence of speed of reaction in client companies gives a massive chance to management consulting firms to increase the value of their client companies through their critical thinking abilities (Srinivasan, 2014).

Clients that have the financial muscle to implement innovation will proceed to draw in and remunerate management consulting companies for their assistance. Be that as it may, the monetary and social stakes related to management consulting are presently much too high to even consider leaving the procedure to happenstance. For both consultants and clients, management consulting represents a world full of opportunities (Law, 2009).

2.7. Consulting Systems' Performance

In today's business environment, managers and decision-makers deal with expanding intricacy more often than not. Consequently, it is essential under such conditions to always evaluate the performance of an organization to guarantee that straightforwardness is cultivated, and to which degree the characterized targets are accomplished — encouraging an evaluation of the performance and handling of multifaceted nature in order to make effective decisions in a changing environment is achieved through the definition of relevant and specific metrics and performance reports (Wilberg *et al*., 2015). Performance measures show how well the multiple strategic goals fit in with the organizational strategy implemented. Companies use performance measures to evaluate their performance to extract information that covers short, medium, and long-term perspectives.

Concerning a professional service work system, business measurements are also crucial as they assess the company's success and how well it performs. This is why it is crucial for management consulting firms to control these metrics frequently. Although there are hundreds of system performance measures, with the industry changing so dramatically, management consulting firms need to understand and select which performance metrics can help them effectively traverse this dynamic environment. The performance indicators of management consulting firms' processes should be harmonized with firms' vision and objectives (Bisogno *et al*., 2016). Well-performing management consulting firms, regardless of their firm size or firm type, tend to have a more disciplined approach composed of the right tools and systematic processes to collect and report on data in order to measurement and tracking. Based on the management consulting work system structure and the work they usually do, it can be said that there are three categories of performance measurements which are client, firm performance, and employee.

2.7.1. Client

A service system represents the "value-in-use" idea. In this respect, the value is co-created with each other but ultimately is defined by the client (Vargo and Lusch, 2004 as cited by Laihonen *et al.*, 2014). Without clients, professional service firms would not exist. Every business, government, or not-for-profit organization that has clients must ensure it provides to its clients and fulfills their needs and expectations. Firms need to gain deeper visibility and the capacity to manage the lifecycle of the client and project. Cosier and Dalton (1993) told that since repeat business constitutes a large part of the management consulting firm's portfolio, there is a conspicuous need to satisfy the client, which, at the same time, creates challenging balance. They also added that management consulting firm and client interaction can be painful and harmful in the short-term since the client is not always right, and the consultant does not only say what they want to hear. Simon and Kumar (2001) also added that consultants must note that they do not entirely agree with their customers about what constitutes successful performances. Nevertheless, in order to achieve a successful relationship in the long term, those exchanges must be made. (Cosier and Dalton, 1993)

Unlike in the service sectors, important operational performance indicators will rely on the identification of critical success factors related to demands made by consumers. I-Ming *et al.* (2005) examined the relationship between service quality, customer satisfaction, and customer loyalty and found that client satisfaction has a significant positive effect on client loyalty through regression analysis. They also found that service performance is positively affected by client loyalty; thus, client satisfaction. Richter and Schmidt (2006) used the performance assessment information identifying with specific consulting projects to develop performance measures such as client orientation, goal achievement, resource requirements, value for money, and knowledge transfer. The performance measures are aggregated in one performance factor since these different performance measures show high correlations and allow us to analyze them as components of a single reliable variable. Laihonen *et al*. (2014) told that customer-perceived performance of a service system, internal performance of the service network, and performance of individual organizations constitute the three perspectives of measuring the performance of a service system. They addressed in their research firstly the ability of the service process to meet the

client's needs, secondly the capacity of the network to work together to achieve shared goals, and the final one as the consulting firm's ability to achieve its objectives. McLachlin (2000), told that service quality is essential not only for the client but also it is essential for the consultant since every single one of client-consultant engagement matters quite prominent for consulting firms because the quality of services that they ensure and the reputation they establish depend on their future revenue streams. If the client company is confident that the consultant has served its requirements and expectations from a project, competent consulting is guaranteed that the company's reputation has been improved with future revenue flows projections.

On the other hand, satisfactory project management also leads to an excellent client-consulting firm relationship. For service providers that pursue to support their clients, it is of vital importance to provide services that consist of high-quality projects. By organizing high-quality projects, organizations can accomplish increased customer loyalty, reliability, and, hence, long-term profitability. Since the management consulting companies are project-based businesses and deliver more than 90% of their work on time and within budget, they continue to measure many metrics about projects as critical measures of ongoing business success. Kostopoulos *et al*. (2015) told that to create value for the client, service companies must guarantee that the service they provide to their clients is made of high-quality service processes and, thus, projects. Supported by more proposals, more projects, and more deals that have been rising from the information and technology era, with higher utilization, management consulting firms can achieve increasing critical financial performance metrics such as revenue and margin. In this sense, International Data Cooperation (IDC) also told that modern consulting firms mainly focus on the performance metrics that come from clients, projects, and employees.

Moreover, client lifetime value and client retention are the leads of the critical performance metrics list, followed closely by revenue and net profit. According to Yoon and Suh (2004), client satisfaction with the consulting service and outcomes and consulting project implementation degree are crucial ways of evaluating the management consulting firm's performance. Similarly, Yau and Sun (2015) gathered service performance evaluation indicators and establish a framework of performance evaluation in four aspects of client,

financial, learning, and growth and internal business processes. Aydiner *et al*. (2019) told that the performance metrics of client expectation fulfillment, productivity in a firm's business processes, and financial metrics that show a firm's sustainability to compete in the market could be seen as leading performance indicators of service firms. Simon and Kumar (2001), stated that in order to have excellent service process quality and project outcomes by the perspective of the client, consultants should have five strategic capabilities namely to listen to and comprehend the client, quality of service, client-consultant communication, integrity and honesty, and technical knowledge. They have also said that these capabilities are related to the top five consulting firms' performance indicators: achieving agreed objectives, satisfying customers, providing service quickly, making recommendations, and achieving measurable outcomes.

Management consulting firms must ensure, as with other service companies, that their services and products meet with the requirements and expectations of their clients and optimize the delivery of all those products or services. No matter how large and skilled the organization is and how much its clients demand, they must ensure that their service systems are as efficient and effective as possible.

2.7.2. Firm Performance

In the contemporary business world, a service firm's managers need relevant, meaningful, and explicit input to make viable decisions in a changing domain. There are various non-financial performance measures such as operational efficiency, employee performance, market extension, client satisfaction, capacity utilization, and innovativeness (Ittner and Larcker, 1998 as cited by Ryu and Lee, 2016). Very similar to non-financial measures, firm performance measures such as sales growth, net profit margin, and cash flow are too contributed to enhancing performance within a management consulting environment. Therefore, managers and decision-makers need to control these metrics frequently in order to monitor work system performance and maximize performance on those activities in which their performance is measured.

Most management consulting firms keep an eye on financial metrics such as backlog, pipeline, average order value, profitability, and revenue growth. These financial performance metrics indicate firms' cash flow and how successful they are in terms of growing the firm and delivering profit. As for the study by Greenwood *et al*. (2007), they measured the consulting firms' system performance with revenues per professional. Von Nordenflycht (2007) used two performance measures, namely: Growth rates and creativity (measured according to the number of awards) when examining inside and public ownership performance results of advertising agencies. According to Yoon and Suh (2004), while evaluating the performance of the consulting work system, there is one view related to firm performance, namely: benefit view. The benefit view includes financial benefits such as sales, profit, and return on investment, and productivity benefits such as lead time, inventory, and service quality. Fu *et al*. (2017) used both comparative organizational performance, which is composed of seven items from Delaney and Huselid's study (Delaney and Huselid 1996 as cited by Fu *et al*., 2017) and revenue growth (annual growth rate) while measuring firm performance in their research. Similarly, Ryu and Lee (2016) used sales growth through three years to measure firm performance. In addition to that, they also used four service innovation dimensions the firms had developed within three years to measure firm performance. They used the data collected from 198 Korean business service firms and explored whether there is an essential relationship between the success of innovation activities and firm performance.

2.7.3. Employee

Even though both service and manufacturing industries are starting to eliminate human jobs through the use of big data robots and artificial intelligence, for the management consulting business, one can safely say that employees are still the essential element of a company. However, manufacturing industries have more tangible resources, whereas the services industries have only one resource, in other words, employees, who are regarded as knowledge workers (Drucker, 1999 as cited by Imran *et al*., 2018). Quite much the same in any organization, employees are the ultimate determinants of firm performance. Service employees, both those who work in front of their clients and those who support them at the office, form an indivisible part of the service work systems, and their quality is vital for the

performance of the service delivery (Lovelock, 1985 as cited by Kostopoulos *et al*., 2015). Laihonen *et al*. (2014) discussed managerial information needs of the measures at three levels of a service system: "An organization-specific measurement which has employee performance measurements, network-level measurement, and customer-oriented measurement" in order to investigate the implications of the networked and open nature of the service business on performance measurement. In this sense, employee attrition and retention have a significant financial impact on the consulting business since they determine the ability to staff client projects, maintain client satisfaction, and adequately align skills with client needs. What is more, investing in their employees and setting them up for success is vital for firm performance. Companies need to embrace consultants' needs and expectations and ensure that they work in a healthy environment both physically and mentally because management consulting firms' performance, regardless of the area of business, is becoming more dependent on the participation, commitment, and more generally, loyalty of their employees. (Boltanski and Chiapello, 1999 as cited by Guillon and Cezanne, 2014).

Similarly, Jiang *et al*. (2011) told that employees' level of job satisfaction, which essentially means the employees' sense of fulfillment and enjoyment at the workplace, and determines their commitment to, and concern for the organization, is a significant organizational performance. Bakker *et al.* (2008) told that proper performance measures come from employees that can use all their mental and physical resources. They added that with well-dedicated and enthusiastic employees who are ready to invest their energy and motivation to the organization, companies could achieve more satisfied clients and, thus, higher performance results. Sanyal and Hisam (2016) concluded that the relations between independent variables, that is, coordination, confidence, management and organization, the assessment of results and incentives, and the performance of employees, are strong and powerful. Furthermore, Salman and Hassan (2018) found the positive and significant impact of effective communication, trust, leadership, and responsibilities between employees on employee performance.

As for the management consulting business, those three categories of performance metrics, namely client, firm, and employee, are posing importance for successful

management in the modern business environment of high competition and economic instability. The multiple authors have proved those metrics' significance for the performance assessment of the service work systems in the past literature. In order to enable constant improvement of management consulting service and to gain the ability of a quick-reacting to future success, it is crucial to implement relevant performance measurements and monitor them periodically.

2.8 Summary of Findings from the Literature

In literature, macroergonomics is generally seen as one of the "younger disciplines" of ergonomics (Hendrick and Kleiner, 2001). To summarize the vast literature of macroergonomics;

(i) It can be seen that benefits of the macroergonomics include performance-related benefits at the employee and, in the long run, company levels since many authors strongly believe that employee performance enhancement will be demonstrated in better organizational performance.

(ii) Macroergonomics affect organizational performance by ensuring benefits in employee levels such as safety and wellbeing, work-related risks reduction, satisfaction, increased employee loyalty, improved motivation, better work satisfaction, reduced absenteeism, increased employee creativity, and new skills acquisition.

(iii) Previous studies firmly stated that the work system needs comprehensive problem-solving approaches as the environment of companies becomes more complex and dynamic. In terms of organizational and social development, macroergonomics is the discipline for which answers can be established.

(iv) Macroerognomics is mainly investigated and applied in the manufacturing sector. Apart from the impact on worker performance, significant effects on material and equipment savings include reduced scrap, equipment saving, reduced production parts and materials, and reduced maintenance tools (Dul *et al*., 2004). Moreover, Hendrick (1987) and Hendrick and Kleiner (2001) added that macroergonomics results in improved procedures, better design of work, and increasingly effective utilization of

open innovation, increased productivity, good wellbeing, and safety when a microergonomic approach besides macroergonomic approach is successfully taken.

(v) In recent years, a wide range of methods has been implemented to evaluate work systems. The microergonomics–macroergonomics comparisons help us to understand the ability of macroergonomics to boost not only working conditions but also the total organizational growth of the whole product or service life cycle.

(vi) Qualitative methods have demonstrated that tools for examining work systems are reliable and valid. Such approaches may obtain valuable data on the responsiveness of work systems with individuals through interviews, questionnaires, and semi-structured surveys. Quantitative approaches, on the other hand, suggest measurement schemes for several macroergonomic factors such as technology, human beings, and external ecosystems. Quantitative methods are more structured than qualitative methods and provide an evaluation of the characteristics of a work system for the identification and correction of its deficiency. Finally, mixed methods offer alluring advantages for detecting symptoms of the problem and identifying potential macroergonomic actions, such as active participation by employees. Valuable tools have been offered in the mixed methods for design and assessment of work systems. (Realyvásquez *et al*., 2018).

(vii) A keyword to define ergonomics is "compatibility." For example, Karwowski (2000) and Lange-Morales *et al*. (2011) defined this concept in different ways by relating it to the term "fitting." Karwowski (2005) also studied the basis of compatibility in the work systems and found that strong ergonomic bases can be built by supporting a work system that supports the appropriate personnel subsystem and technologies, including its connection with external environmental attributes. Maldonado-Macías *et al*. (2015) measured the ergonomic compatibility of a work system by using the ECS and the concept of human-system compatibility introduced by Karwowski.

(viii) On the other hand, to the author's best knowledge, most comprehensive studies have been conducted by Realyvásquez *et al*. since they have investigated the direct and indirect effects of work system factors' elements over manufacturing systems' performance indicators (for example, Realyvásquez *et al*., 2015; Realyvásquez *et al*., 2016; Realyvásquez *et al*., 2018). Accepted opinion in the previous literature is that a work plan and a committee that works with employee welfare and corporate

performance are necessary to detect the effects of macroergonomic compatibility. Realyvásquez *et al*. (2018) said in their book that it is crucial to consider the commitment of all employees at the different hierarchical levels as well as the interactions and effects of all macroergonomic factors and elements.

Radical changes in paradigm leading to new models of organizations, different forms of social interactions, rapidly growing service industries, and an increased shareholder value focus in business. To understand these developments for the services industry, the companies are challenged to apply macroergonomic practices (Hendrick and Kleiner, 2001). Empirical interest thus continues to increase the awareness of aspects in which macroergonomics is implemented in the work system according to its requirements. Not surprisingly, much of this research has focused on manufacturing firms, while a few studies report processes promoting macroergonomic interventions by comparison to service companies that provide high-value-added services (Hogan and Coote, 2014). What is more surprising that despite the increasing attention to macroergonomic compatibility in the manufacturing sector and compatibility concept generally, there has been no study on the macroergonomic compatibility in the service sector that includes all elements of a macroergonomic factor altogether. A number of related studies are also shown in Table 2.1, Table 2.2, and Table 2.3 with their purposes, methods, and main findings.

Table 2.1. Summary of the selected studies from the literature review.

STUDY	PURPOSE	METHOD	MAIN FINDINGS
Realyvásquez *et al.* (2017)	Identification of relationships between two macroergonomic elements, organizational culture and teamwork, and manufacturing systems' performance categories (manufacturing processes, customers, and organizational performance).	Data is collected with MCQ to 188 employees of manufacturing companies. Then, an SEM was constructed to know and measure direct, indirect, and total effects occurring among latent variables.	The results showed that the same direct and positive impact on the performance of manufacturing work systems is accomplished by organizational culture and teamwork. Macroergonomic practices of organizational culture and teamwork contribute to improving the performance and competitiveness of manufacturing systems.
Realyvásquez *et al.* (2015a)	Examining the effects of organizational macroergonomic compatibility elements over manufacturing systems performance.	Data from four production processes are being compiled using MCQ for a complete survey of 158 individuals. The study was performed using an SEM.	The results showed that macroergonomic organizational elements affect clients and have an indirect effect on manufacturing processes and business growth.
Realyvásquez *et al.* (2018)	Analyzing the effects of the physical and psychological compatibility of employees with the performance of client-measured manufacturing systems, production processes, and organizational performance.	Data is collected from 188 manufacturing system employees using MCQ and evaluated with an SEM, which will propose and evaluate a hypothetical scenario analysis of the relationships between the variables.	Results showed that the highest total effects were found from physical characteristics to motivation and needs and psychological characteristics and from clients to organizational performance.

Table 2.2. Summary of the selected studies from the literature review (cont.).

STUDY	PURPOSE	METHOD	MAIN FINDINGS
Maldonado-Macías *et al.* (2017)	Design of the expert system for the choice of Advanced Manufacturing Technology for ergonomic performance evaluation.	Used a proposed novel axiomatic design methodology under a fuzzy environment, including two stages: the generation of fuzzy if/then rules using fuzzy inference system and the development of the system by mean of experts' opinion.	The expert system leads to the selection of the best alternative, like the one that better satisfies ergonomic requirements. Development and application of the system may help provide a more straightforward, faster, single, or group ergonomic assessment on Advanced Manufacturing Technology selection by promoting safer and more ergonomic workplaces in manufacturing companies.
Maldonado-Macías *et al.* (2015)	Developing the application of a fuzzy axiomatic design methodology for the assessment of ergonomic compatibility on advanced manufacturing technology selection.	Data collected with an ECS, and the procedure for the data analysis is described. The ergonomic compatibility construct was tested and validated using the Cronbach Alpha test.	The fuzzy axiomatic design approach presents essential advantages in the way it can guide to an acceptable and reliable solution when complete information regarding an ergonomic perspective.
Carayon and Smith (2000)	Examining the impact of sociotechnical and business trends on work organization and ergonomics.	The analysis is performed with the use of balance theory.	An expansion of balance theory, from the design of work systems to the design of organizations, is discussed. The issue of change is examined. Several elements and methods are discussed for the design of change processes.

Table 2.3. Summary of the selected studies from the literature review (cont.).

STUDY	PURPOSE	METHOD	MAIN FINDINGS
Carayon *et al.* (2006)	Describing the SEIPS model of work system and patient safety.	An application of the SEIPS model in one particular care setting is presented, and other practical and research applications of the model are described.	The SEIPS model provides a framework for understanding the structures, processes, and outcomes in health care, and their relationships can be used toward these ends.
Hendrick and Kleiner (2001)	Analyzing the impact of the different ergonomic areas on quality.	By surveying several articles, different areas of ergonomics are divided into five categories, including hardware ergonomics, environmental ergonomics, software ergonomics, work design ergonomics, and macro ergonomics.	To reach an acceptable quality, considering the ergonomic principles is an integral component of the organization policy.
Realyvásquez *et al.* (2016)	Analyzing the effects of macroergonomic compatibility of work demands of employees, as an independent variable on the manufacturing system with respect to production processes, clients, and organizational performance as dependent variables.	A macroergonomic compatibility questionnaire is developed and statistically validated, and an SEM is created to find the effects of macro-ergonomic compatibility of work demands of employees on the dependent variables, and also the effects among them.	Macroergonomic compatibility of work demands of employees do not have a direct effect on organizational performance, but on production processes and clients, and significant indirect effect on organizational performance. Macroergonomic compatibility of work demands of employees represents a source of clients' satisfaction, production processes' reliability, and organizational performance.

3. RATIONALE AND OBJECTIVES OF THE STUDY

3.1. The Rationale of the Study

Regardless of the sector that companies operate in, in today's business environment, they live in a culture in which the well-being of the employee directly affects the outcomes of a company, both tangible and intangible ways. It is well known that such outcomes cannot be achieved if the macroergonomic status of a company has overlooked. In this sense, macroergonomic compatibility can enhance the well-being and performance of the people, notably if valued and understood appropriately at all levels of the company. These levels include technological, personal, organizational, environmental, and task-related elements of a work system. One can assure that the system is macroergonomically compatible if macroergonomic factors and their elements operate together with the human factor in a safe, comfortable, and efficient way. Holistically, it is essential to look at workplace well-being factors from both broad and systemic perspectives. These factors together can provide more sustainable alternatives than local ergonomic solutions.

Despite the advantages of macroergonomics for the manufacturing and service industry, there are very few studies investigating the effects of macroergonomics factors on a work system's performance. For example, the most comprehensive study on this topic that performed by Realyvásquez *et al.* (2018). They have investigated macroergonomic compatibility and the effects of macroergonomics factors on manufacturing system performance. They have also established the work system factors and elements that are necessary for performing successful macroergonomics evaluations on manufacturing work systems. They have argued that the macroergonomics factors are crucial elements in order to achieve desired organizational performance and showed the impact of these elements over the performance of manufacturing work systems. Despite previous research efforts, there is still no study investigating the effects of all seven organizational macroergonomic elements compatibility over the service work system's performance. Therefore, it is a need to examine such effects, specifically teamwork; organizational and safety culture; coordination,

collaboration, and communication; work schedules; social relationships; supervision and management styles; performance evaluation, rewards, and incentives.

This study specifically focuses on the effects of organizational macroergonomic elements on one of the most substantial sectors in the service industry; the management consulting sector.

3.2. Objectives

Based on the rationale, the objectives of this study are as follows:

(i) To determine the basic building blocks (performance categories) of the management consulting work system.
(ii) To investigate the direct, indirect, and total effects of each organizational macroergonomic element on the management consulting work system performance.
(iii) To determine the ranking of the identified organizational macroergonomic elements for building a high performing management consulting work system.

4. METHODOLOGY

4.1. Study Steps

The study is completed in accordance with the steps indicated in Figure 4.1 to accomplish the main objectives. Essential organization macroergonomic elements and critical performance categories, including performance indicators for achieving high performing management consulting companies and high competitiveness, are examined by performing a literature review.

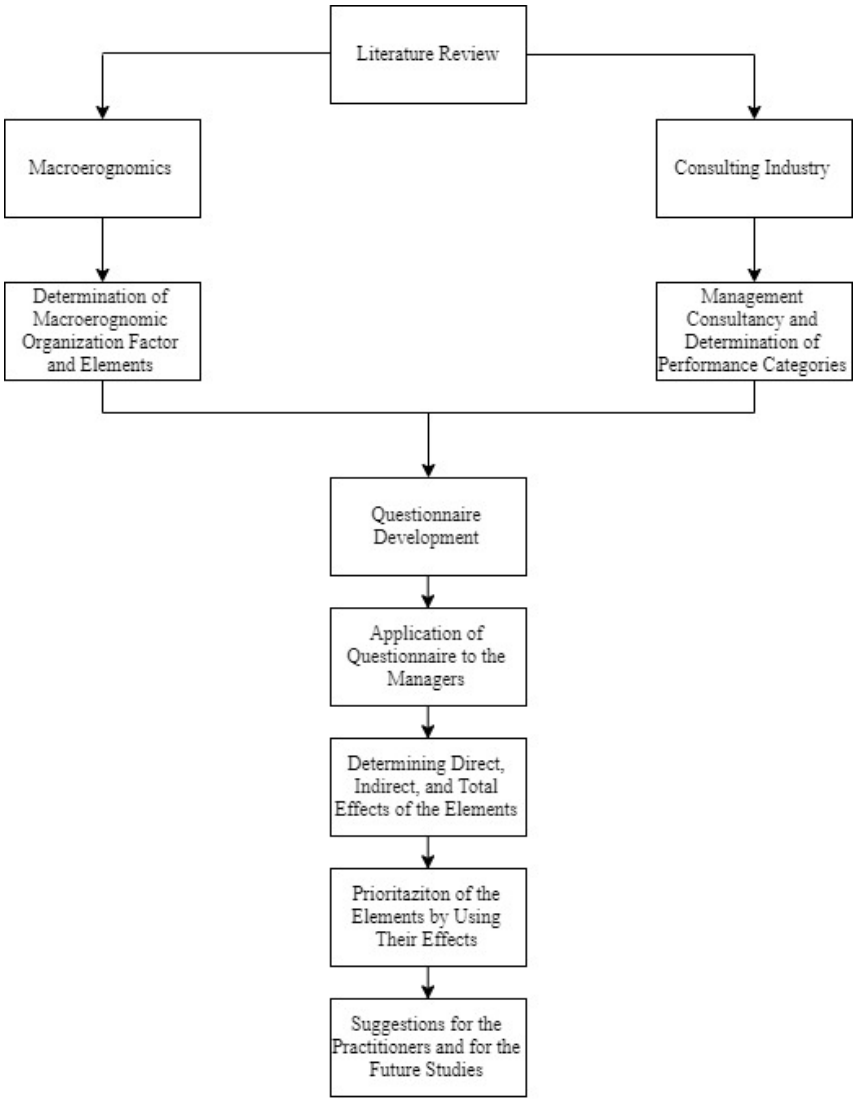

Figure 4.1. Flowchart of the research steps.

In order to find the most critical organization macroergonomic elements and to define each one, early studies formed a basis. After a comprehensive literature review is conducted, all critical elements and performance categories are combined and defined to build a model for determining which elements have higher effects on the performance indicators of a management consulting company. A questionnaire consisting of three sections is designed and applied to the middle and senior managers to collect the data for model development. The data analysis and data collection methodology is described step by step in the following. The first step is performed to reach the first objective and the remaining steps for the second and third objectives.

Step 1: Determining the important organizational macroergonomic elements and critical performance categories from the literature. With this step, the first objective of this study will be reached.

Step 2: Developing the macroergonomic compatibility questionnaire (MCQ) consisting of three sections to collect the required information for model development.

Step 3: Selecting an appropriate sample from the target population and performing demographic analyses to identify the certain aspects of the participants.

Step 4: Performing normality analyses on the considered variables of the study to determine the appropriate statistical methods (parametric or nonparametric).

Step 5: Performing reliability analysis to determine if the collected data is reliable for the factor analysis. A reliable scale will provide the same results (within some acceptable margin of error) at each point of measurement. It is very crucial not only the measurements to be accurate, but also the same answer should be achieved every time an instrument is used to measure a variable. The reliability of the data is measured by Cronbach’s Alpha for internal consistency and test-retest method for stability.

Step 6: Performing explanatory factor analysis (EFA) to determine the relationships between organizational macroergonomic elements in terms of a much smaller number of

hidden variables. It is used to explain the relationship of many observed variables by a relatively small number of factors without neglecting the score of the questions while reducing the data.

Step 7: In order to perform explanatory factor analysis first, the compliance of the data is checked with Bartlett Test, Kaiser-Meyer-Olkin values, total variance explained values, the number of samples, and Correlations between expressions.

Step 8: After the analysis performed, the validity of the new factors is checked. Convergent validity and divergent validity are used to determine whether the new construct is valid.

Step 9: Performing confirmatory factor analysis (CFA) to test the appropriateness of the factors determined by explanatory factor analysis to the hypothesis-determined factor structures. Confirmatory factor analysis is done with the most used methodology, structural equation modeling.

Step 10: Suitability of the developed model for SEM is examined by defined indicators. It is essential to assess whether a specified model ‘fits’ the data is one of the most important steps in structural equation modelling (SEM).

Step 11: In order to reach the second and the third study objectives, direct, indirect, and total effects of organizational macroergonomic elements on management consulting work system performance categories are calculated and prioritized.

To ensure the reliability of the study, the determination of the research methodology is essential. The main objective of this study is to analyze the effects of organizational macroergonomic elements on the management consulting company’s work system performance. In order to analyze the direct, indirect, and total effects of the macroergonomic compatibility of organization related elements on system performance of consulting work system, composing of 21 hypotheses for direct and 10 hypotheses for indirect effects, a total of 31 hypotheses are proposed and validated using one of the most used confirmatory factor

analysis methodologies; the SEM. To gather information concerning these variables, the author looked at several sources and the methods that researchers employed to determine the effect of macroergonomic elements. Eventually, the Macroergonomic Compatibility Questionnaire (MCQ), which has structured initially and used by Realyvásquez *et al.* (2015), acquired and developed for the needs of evaluating macroergonomic compatibility of consulting work systems. The developed questionnaire then administered among consultants, middle and senior managers of international management consulting companies.

4.2. Data Collection Instrument

Questionnaires have been frequently used in early researches since they were developed in 1838 by the Statistical Society of London. Moreover, today, they are still used in many varieties of researches. The questionnaire is defined as a method to obtain answers by using a form the respondent completes. A questionnaire mainly consists of a set of questions or other forms of feedback aimed at gathering information from an interviewee. These are usually a combination of closed questions and open questions; long-form questions allow the respondent to clarify his or her viewpoints. Questions that can be both qualitative and quantitative in that are usually used for research purposes. A questionnaire may or may not be submitted through a survey, but a survey is always consisting of a questionnaire. A questionnaire can be a useful tool for gathering data from the respondents who are scattered over a vast area in order to test a hypothesis. It also has many advantages, such as a very flexible tool considered other research tools, collects both qualitative and quantitative information, easy to plan and administer, and cost-effective. It is helpful when all the individuals from whom the responses are sought cannot be directly reached. In the early 1980s, Kraft and Martin (1997) agree that the questionnaire was becoming popular among service companies. The simple qualitative questionnaire derived from the guestbook was changed in the 1980s. Profoundly, the appearance was changed because of the increasing use of statistical analysis and benchmarking, as well as because computer power and statistical analysis tools are usable (as cited by Ogle, 2009).

4.2.1. The Macroergonomic Compatibility Questionnaire (MCQ)

4.2.1.1. Developing the Macroergonomic Compatibility Questionnaire (MCQ). In order to estimate the effects of the organization factor and its elements on consulting work systems performance, an MCQ for the management consulting sector was developed based on the manufacturing version of the MCQ (Realyvásquez *et al*., 2015). Although the MCQ can be applied to employees from all hierarchical levels (Realyvásquez *et al*., 2015), the best results in terms of system performance analysis and macroergonomic practices applications can be better achieved with applying this questionnaire to higher organizational levels such as employees from the senior management team. The primary purpose of the MCQ is to collect data about the application of organizational macroergonomic elements in the management consulting company and to assess the benefits of these practices. The developed MCQ for the consulting service sector is mainly composed of three sections:

(i) The first section of the MCQ gathers demographic information, such as gender, age, job position, seniority, company's name, highest education level, and the years of one's working life. This section includes nine (9) questions that were used in this thesis to conduct a descriptive analysis of the sample.

(ii) The second section of the MCQ mainly collects information regarding the implementation degree of macroergonomic practices (MP) in terms of organization factor elements. For complete analysis for the macroergonomic practices of consulting work system, all seven organization elements namely, teamwork, organizational culture and safety culture, coordination, collaboration and communication, work schedules, social relationships, supervision and management styles, and performance evaluation, rewards and incentives are used to develop the MCQ. The second section asks participants to rate the extent to which in their companies implement MPs and how often these elements are taken into account. Initially, this section of the MCQ contained 235 potential questions that gathered according to the examined literature review and many varieties of sources about organization elements such as forums, other questionnaires, and personal interviews. However, for the participants to do the MCQ more efficiently and to achieve greater participation and the assistance of

consultants and their colleagues, only 103 most suitable questions of the available 235 questions were identified with a five-point Likert scale for this study.

(iii) The third section of the MCQ collects data on the consulting company benefit gathered from macroergonomic practices with a total of 37 appropriate questions composed of three parts, namely client, firm performance, and employee. Questions have been organized according to the information gathered from the early literature about performance indicators.

Regarding the number of questions, it is very crucial to ensure the balance between the number of questions and the investigated aspects of a service work system. It may be misleading to decrease the questions dramatically since certain aspects of the work system might be overlooked or stay unevaluated. The total of 149 questions can be decomposed as follows: nine questions for the first section, 103 questions for the second section, and 37 questions of section three.

Figure 4.2 represents the process followed during the construction of the MCQ. After the research objectives and administration methods are determined, the questionnaire construction step began. The developed questionnaire according to steps in the construction process than administered to a few participants to pretest the questionnaire. While pretesting, the feedbacks regarding the questions are collected and accordingly some iterations between the construction step and pretesting step are performed to determine the questions.

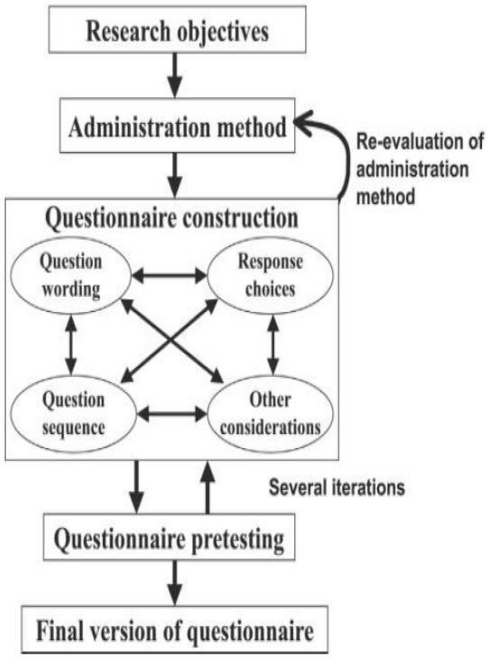

Figure 4.2. The process of developing a questionnaire (source adapted from Synodinos, 2003).

Different types of ratings or scale designs are used to assess ideas or attitudes' intensity. They create numbers that speak to a harsh ordinal dimension of the attribute, while information processes include records and parameters inferring that the subsequent scores are genuine numbers (Lalla and Facchinetti, 2004). The Likert scale method is the most widely used psychometric scale in survey research, which usually utilized as a standard psychometric scale to gauge reactions. This measurement scale has a strategy that encourages survey development and administration, and information coding and analysis. It primarily introduced by Rensis Likert in 1932. Principally, it asks participants to represent their levels of agreement with a declarative statement. There are many reasons why the Likert scale is popular in the world of research. For example, it can be easily and quickly developed and improved, numerical measurement results are utilized directly for statistical inferences, and measurements based on Likert scaling have been seen as extremely reliable by many researchers (Li, 2013).

A Likert scale-based questionnaire results in data chosen from a series of pre-fixed categories, which can usually be coded with integer numbers from one to five scales. One of

the most important things while developing a questionnaire is that the designed Likert scale should indicate clearly and use a suitable wording for scale points for the opinion, attitude, or belief that is measured. Although the scale labels may vary depending on what being measured (Li, 2013), the survey rating scale and its descriptors that are used in this study can be read as follows:

(1) totally disagree,
(2) disagree,
(3) neutral,
(4) agree,
(5) totally agree.

Table 4.1 includes the questions from the first section of the MCQ. In this section, the participants were asked to select the appropriate choice according to their characteristics and experience from a set of multiple predefined choices. Answer categories are gathered from related literature, which has sought to get the same demographics of a participant. Table 4.2 exemplifies a part of the second section of this questionnaire, related to the evaluation of the organization factor through seven macroergonomic elements. The table shows the sample of the questionnaire items in the left column and the rating scale (Likert scale) in the right column. Whole sections of the MCQ can be found in the appendices A7 and A8.

Table 4.1. The first section of the designed MCQ.

Questions
What is the highest level of formal qualification you have completed?
How long have you been employed in your current company?
How long have you been in your current position?
In your current position, do you manage other managers?
How many years have you been working in your life?
Which company do you currently work in?
Which of the following options better represents your position in the company?
Gender
Age

Table 4.2. A part of the second section of the designed MCQ.

Likert scale	Totally disagree	Disagree	Neutral	Agree	Totally agree
In your company,	**1**	**2**	**3**	**4**	**5**
Teamwork					
Training practices with task efficiency and teamwork improvement are given in company-wide.					
The company encourages the culture of teamwork success.					
Managers and employees are highly aware of the concept of teamwork.					
Organizational Culture and Safety Culture					
Service systems are defined and maintained proper Organizational Culture.					
The glue that holds the organization together is loyalty and mutual trust, and commitment to this organization runs high.					
Formal rules and policies are applied.					
Coordination, Collaboration, and Communication					
Our employees communicate widely, not just with their departments and functions.					
In the company, subtasks are integrated by coordination mechanisms such as plans, procedures, or schedules.					
Inter-organizational collaborations are managed through a combination of mechanisms that support coordination and cooperation.					
Work Schedules					
Management offers a wide array of communication tools to improve the possibilities for knowledge sharing within the company and with clients while the employees telecommute.					
The job does not require job schedules with long working hours.					
The company establishes protective measures for people working overtime.					
Social Relationships					
Managers are able to play the role of a counselor towards employees.					
The company encourages employees, including friends, as well as partners, to take place in work social events.					
Manager's awareness of how work practices impact on relationships is high.					
Supervision and Management Styles					
Employees are considered to have different needs, abilities, and aspirations from others.					
Managers effectively lead the project teams.					
Managers are effective in meeting organizational requirements.					
Performance Evaluation, Rewards, and Incentives					
Employees are received appropriate feedback and recognition for their contributions.					
Employees are satisfied with the amount and frequency of recognition from a supervisor when they have good performance.					
The performance evaluation of the employees agrees with what they actually achieved.					

The third section of the MCQ gathers data on the consulting company benefit acquired from macroergonomic practices implementation according to participant's knowledge and experience. This section contains a total of 37 appropriate questions composed of three parts, namely client, firm performance, and employee. It primarily asks participants to evaluate how often in their experiences and opinions, companies obtain the benefits listed in terms of clients, firm performance measures, and employee conditions. This section also uses the same Likert scale as section two. Table 4.3 shows a few questions of the third section of the MCQ.

Table 4.3. A part of the third section of the designed MCQ.

Likert scale	Totally disagree	Disagree	Neutral	Agree	Totally agree
In your company,	**1**	**2**	**3**	**4**	**5**
Client					
Service and product quality have been increased over time.					
Project Profitability has increased over time.					
Timeliness of service delivery (on-time project completion) has increased over time.					
The success rate of each project has increased over time.					
Firm Performance					
The company's market share has increased over time.					
Productivity has increased over time.					
The variety of products and services has increased over time.					
Billable consultant utilization has increased over time.					
Employee/Consultant					
Employee satisfaction has increased over time.					
Retaining talent has got easy over time.					
Physical and psychological well-being at work has increased over time.					
Employee engagement has increased over time.					

4.2.1.2. Administering the MCQ. In order to carry out the research, the information was collected from the top management consulting firms in the world, which are currently operating in Turkey. Vault Consulting publishes each year the list of leading consulting firms based on sales, prestige, global offices, history, and case success. In 2019, 15 leading consultancies (most in the strategy and consulting division) were as following:

(i) McKinsey & Company
(ii) Bain & Company
(iii) The Boston Consulting Group, Inc.
(iv) Deloitte Consulting LLP
(v) Oliver Wyman
(vi) Putnam Associates
(vii) EY-Parthenon
(viii) PWC Consulting Services
(ix) The Bridgespan Group
(x) Accenture
(xi) A.T. Kearney
(xii) KPMG LLP (Advisory)
(xiii) Strategy&
(xiv) L.E.K. Consulting
(xv) GE Healthcare Partners

Fortunately, most of these firms listed have offices in Turkey, and thus it was easier to get in touch with compared to the other offices. Initially, e-mails and LinkedIn messages were sent to gain contacts in big consulting companies in Turkey, Switzerland, Italy, Germany, and the United States. Due to the previous work experience of the author, however, contacts reached are located mostly in the Turkey consulting industry. The participants were provided with information about the study and questionnaire instructions in the invitation e-mail and detailed information in the questionnaire. Herewith, relationship building with the consultants has become more comfortable as the level of mistrust has become lower, allowing for faster communication and feedback. The selection criteria for participants have been varied. Although the MCQ is suitable for any worker at any organizational level, it has been administered to middle and senior managers because they know the business best in terms of functioning, shortcomings, and opportunities for improvement. Surveyed middle and senior managers included senior consultants, managers, senior managers, partners, senior partners, directors, and board members. It has been not easy to contact senior managers, but with the author's network and managers' willing to participate, 123 people have responded to the MCQ.

Statistically, in order to validate the analysis and provide unbiased information, the number of consultants had to be vast and varied. Consultants who have agreed to participate are therefore specialized in diverse areas of expertise such as administration, IT, accounting, organizational transformation, marketing, logistics, and so on. A total of 284 questionnaires were sent to consultants working in these consulting firms, and 43.3% of them were involved in returning the answered questionnaire. Although it was initially thought that the return rate would be higher, only 43.3% of the consultants took part in the project. As a result, the data is collected from 123 consultants from middle and senior management.

Although the questionnaire was the chosen original instrument to be used in this research, some interviews were subsequently conducted with the consultants from different hierarchical levels whom the author was personally in touch in order to better understand some of the responses gathered from the questionnaire or to clarify ambiguities in some of the questions and answers. The interview is characterized as an effective method in qualitative and quantitative research for the collection of information. In the business research interview, the objective is for the interviewer to obtain all kinds of information from the respondent (also known as the interviewee): The behavior of the interviewees or others, attitudes, norms, opinions, beliefs, and values.

Many kinds of interviews are available. In some cases, the interview was used only after the questionnaire when needed, usually in order to gain more in-depth knowledge about specific topics or to clarify misunderstandings, missing data, or contradictions like used in this research. Due to its pre-set spectrum of issues intended according to the goals of the researcher as well as the flexibility is given by incorporating fresh answers during the interview as exciting responses from the respondent emerge, the interview was chosen as the additional information gathering instrument.

4.4. Data Analysis Steps

The flowchart of the data analysis methodology followed in this study is represented in Figure 4.3. The data analysis of this study has been completed in accordance with these steps.

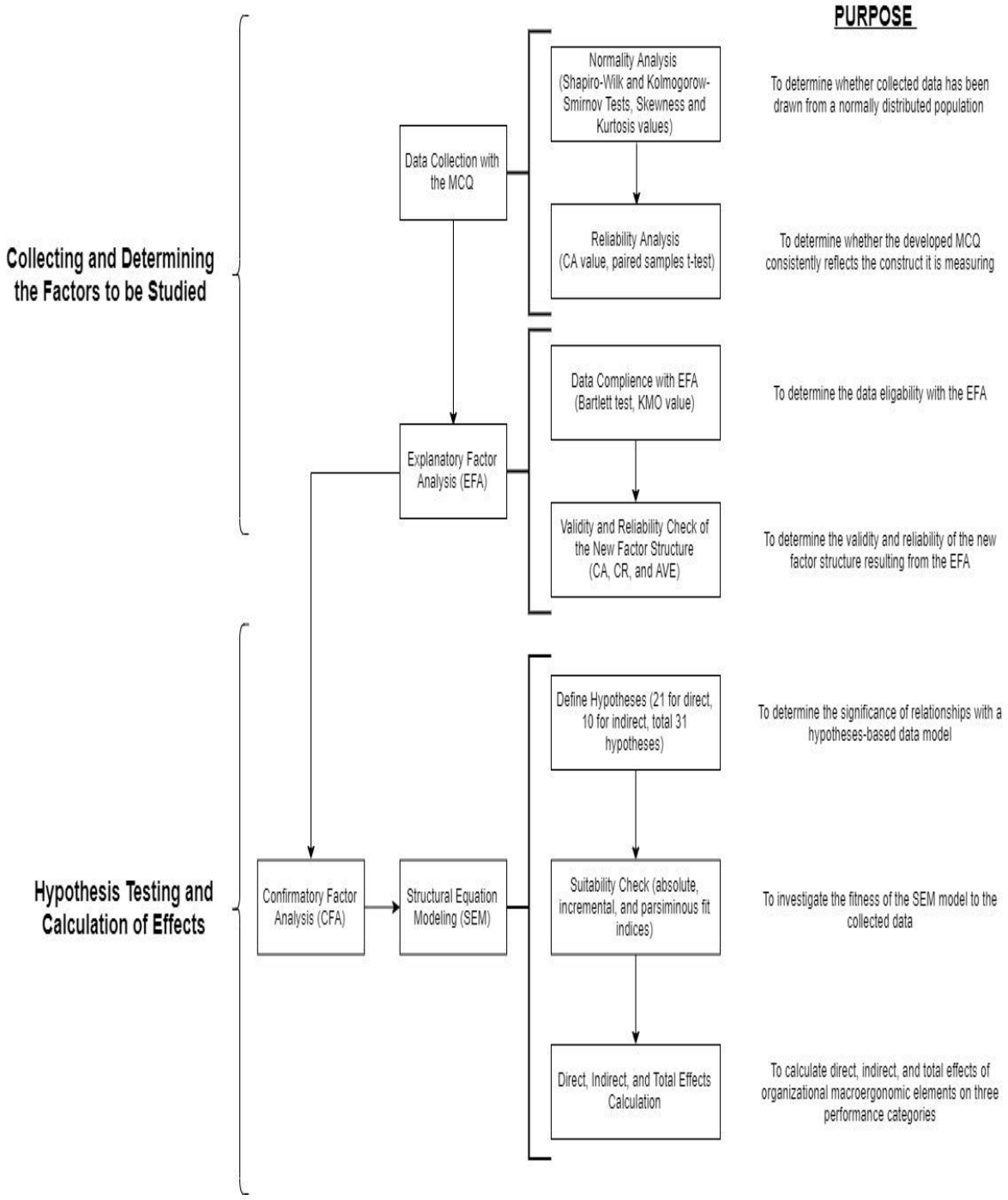

Figure 4.3. Data analysis methodology.

4.4.1. Factor Analysis

Factor analysis is an analysis carried out to understand the relationships between multiple variables that are thought to be related by reducing them to a lesser extent. Factor analysis is a method used to convert the related data structures into independent and new data structures and to reveal common factors by grouping the variables that are supposed to explain the formation (Floyd and Widaman, 1995). Factor analysis is generally designed for the use of interval data, but it can also be used for the ordinal data (for example, scores assigned to Likert scales) (Cornish, 2007). The goal of a factor analysis is to reduce the number of variables to explain and to interpret the results. This can be accomplished in two steps: (i) factor extraction and (ii) factor rotation. Factor extraction involves making a choice about the type of model as well the number of factors to extract. Factor rotation comes after the factors are extracted, with the goal of achieving simple structure in order to improve interpretability.

Factor analysis is a combination of statistical techniques aimed at reducing or simplifying complex data based on a correlation or covariance matrix. Therefore, factor analysis is a highly effective method for identifying substances or factor structures that best describe a structure (in terms of the amount of variance) than simple item analysis. The factor analysis was developed first in the 1900s. The factor analysis method uses two techniques: (i) Exploratory factor analysis and (ii) confirmatory factor analysis. Critical assumptions for factor analysis techniques are that the data type and quality are appropriate, the distribution of variables is known, and the sample size is adequate (Floyd and Widaman, 1995).

In order to briefly explain the first one, namely, exploratory factor analysis (EFA), it seeks to reveal and investigate the root influence in verbal representations of variables from one language to the other in a newly created or interpreted language. The second one is confirmatory factor analysis (CFA), which is used to determine if the scale previously used complies and how appropriate with the initial factor structure used in the current research (Suhr, 2006). If there is an effort to develop a scale, firstly, the EFA should be applied, and then the CFA, which requires the approval of this new factor structure (Suhr, 2006). In EFA, researchers aim to determine the optimal number of factors and to determine whether the

measured variables (items) are reasonable indicators of various latent dimensions (Holden *et al.*, 2015). CFA tests the compatibility of a hypothetical factor structure to the observed covariance structure of the measured variables. It is essential that the structure resulting from the EFA to be re-tested with CFA in order to make statistical conclusions from predefined hypotheses. The basic difference between EFA and CFA is that in CFA, a researcher's a priori assumption is that each factor (the number and labels of which may be specified a priori) is associated with a specified subset of indicator variables. The major limitation behind EFA is its simplicity. Hence, the researcher will not get a reliable inference. Therefore, EFA is used less as compared to CFA.

Exploratory and confirmatory factor analyses are multivariate statistical methods that involve similar assumptions as well as specific processes. In this study, as the exploratory and confirmatory factor analyses are used to achieve the effects, the processes that each method consists of, and the contents of these processes are mentioned. For this purpose, firstly, detailed information about exploratory, and then the confirmatory analysis is given.

4.4.1.1. Exploratory Factor Analysis (EFA). EFA seeks to uncover the underlying structure of a relatively large set of variables. The researcher has a priori assumption that any indicator may be associated with any factor. This is the most common form of factor analysis. There is no prior theory and one uses factor loadings to intuit the factor structure of the data. It is conducted to discover what latent variables are behind a set of variables or measures. In this study, EFA is conducted to uncover the real factors behind the questions by clustering them through the EFA process. Determined factors than will be used in the CFA for hypothesis testing and effect calculations.

The EFA method is step by step can be explained as follows:

Step 1: Determining data suitability for the EFA. In order to analyze the suitability, the values such as sample size, sample to variable ratio, factorability of the correlation matrix, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, and Bartlett's Test of Sphericity should be looked into.

KMO is a measure of how suited your data is for Factor Analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure of the proportion of variance among variables that might be a common variance. KMO value should be greater than 0.5 for satisfactory factor analysis.

Bartlett (1951) introduced the test of sphericity, which tests whether a matrix is significantly different from an identity matrix. This statistical test for the presence of correlations among variables, providing the statistical probability that the correlation matrix has significant correlations among at least some of the variables. As for factor analysis to work, some relationships between variables are needed, thus, a significant Bartlett's test of sphericity is required in other words $p<0.05$ for this study.

Step 2: Determining the criteria for factor extraction. The data extraction aims to reduce a large number of questions into factors. In order to produce scale unidimensionality and simplify the factor solutions, several criteria are available to researchers.

Step 3: Selecting the rotational method. Another consideration when deciding how many factors will be analyzed is whether a variable might relate to more than one factor. Rotation maximizes high item loadings and minimizes low item loadings, therefore producing a more interpretable and simplified solution. Researchers have several methods to choose from both rotation options, for example, orthogonal varimax/quartimax or oblique olbimin/promax.

Step 4: Validating the new factor structure. The validity of the new factor structure should be determined with convergent and divergent validity.

Step 5: Interpretation of the new factors. Interpretation involves the researcher examining which variables are attributable to a factor and giving that factor a name or theme.

EFA is a method intended to analyze a set of variables' covariance structure and to describe the relationships between these variables in terms of a much smaller number of hidden variables that cannot be detected (Stapleton, 1997). It is described as an analytical

technique aimed at reaching a small number of explanatory factors (comprehension) that explains the maximum variance and based on the relationships between observed variables.

The study of exploratory factors is included in various quantitative analyzes performed in previous studies. For general usage, most analyses benefit from the variables given by the original data collection, regression, comparison, discriminant analysis, and differential testing (Stapleton, 1997). EFA serves to reveal the real reasons behind the many characteristics that can be measured and seen.

An exemplary model for EFA is shown in Figure 4.4. This exemplary model has two factors, and these factors are symbolized as latent variables. The arrow linking factors between latent variables indicate variance or covariance between latent variables. X's symbolize each indicator. One-way arrows from factors to indicators show the factor load value in the direct effect exploratory factor analysis. Referring to Figure 4.4, there are measurement errors present in each measurement indicated by E. These errors are random, and the source of these errors is not defined. In other words, these are unique variances that cannot be explained by factors (Brown, 2006). As a result, EFA is used to determine whether the underlying factor of the data is sufficient for a hypothesis and to determine the number of factors. EFA is often thought of as a technique that produces theory rather than testing theories (Schumm and Stevens, 1993).

In this study, *X* indicates the questions related to an organizational macroergonomic element. And, latent factors are consisting of the factors that contain a certain set of questions according to their factor loads and eigenvalues.

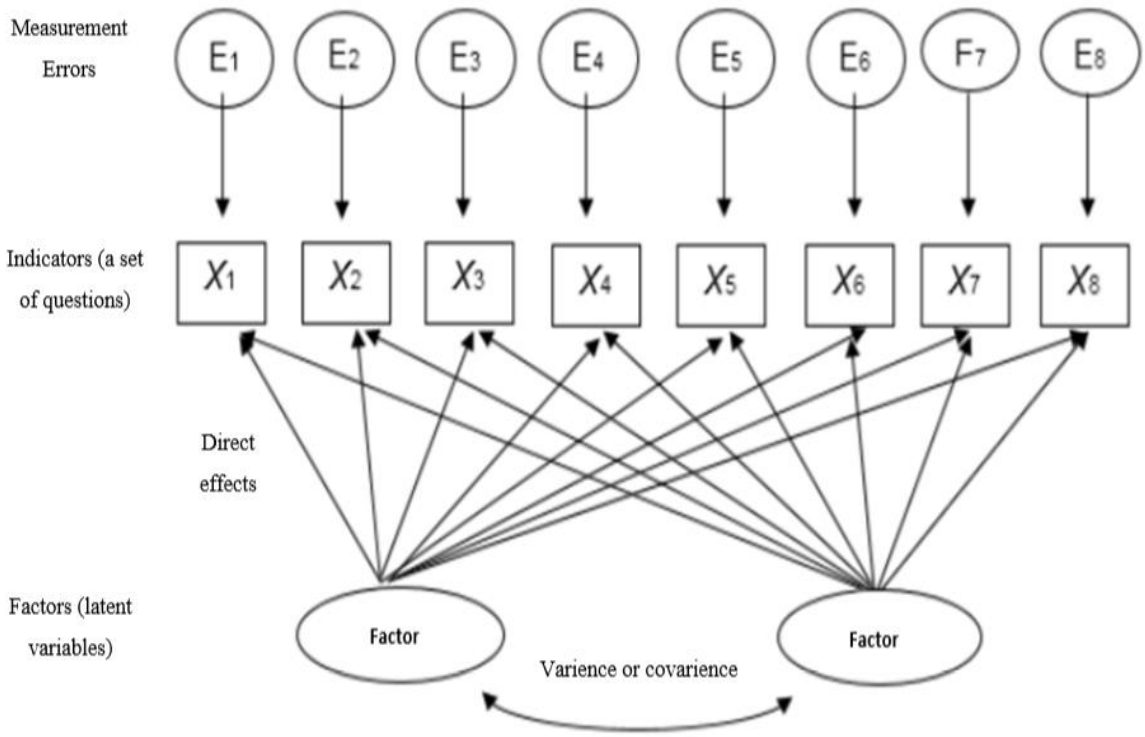

Figure 4.4. The exemplary model of the EFA (source adapted from Brown, 2006).

The primary operations of the explanatory factor analysis include checking whether the sample size is sufficient, selecting the factor extraction method used, examining the Kaiser-Meyer-Olkin (KMO) and Bartlett tests, examining the slope graph and factor loadings, selecting the factor rotation method, naming the factors and reporting the total explained variance rates (Hair *et al*., 2010).

Choosing an appropriate factorization method in the analysis is extremely important for the validity of the factor structure obtained. As the factor extraction method, although there are various methods such as principal component analysis, principal factorization analysis, maximum likelihood, image factorization, and alpha factorization, the most commonly used methods are principal component analysis and principal factorization analysis (Tabachnick and Fidell, 2007). In this study, one of the most used analysis techniques, principal component analysis is used because it is the most convenient method when the questions are reduced without completely removing them from consideration and new factors to be independent of one another.

In an EFA, factor rotation is used to maximize a load of each item on a given factor and to provide a better interpretation of the factor structure (Rummel, 1970). Factor rotation methods are generally divided into two as vertical and oblique rotation (Tabachnick and Fidell, 2007). Oblique rotation is usually used when the factors are interrelated; vertical rotation is used when this relationship is insignificant (Rummel, 1970). The most commonly used vertical rotation methods are quartimax and varimax methods. Quartimax, the number of factors that give a high load on multiple substances; Varimax method aims to minimize the number of substances with high factor loadings in more than one factor (Yong and Pearce, 2013). When deciding on the number of factors, more than one criterion is generally considered (Hair *et al*., 2010). Some of these methods are Kaiser's criterion (eigenvalues ≥ 1), slope graph test, total variance explained, and parallel analysis. The total explained variance rate in the applied sciences can generally be reduced to 50-60%.

Theoretically, each factor should have at least two or three items (the questions, in this study). Factor naming takes place in the final stage of the EFA. Although there is no definite rule at this stage, it is essential to make the best representation of the factor (Yong and Pearce, 2013).

4.4.1.2. Confirmatory Factor Analysis (CFA). CFA is conducted to test theories and hypotheses about the factors or latent variables. CFA is usually used to test the appropriateness of the factors determined by EFA to the hypothesis-determined factor structures. Hypothetically, this method is used to test the hypothesis that there is no significant relationship between latent variables and observed variables. CFA is used to determine whether there is a high correlation between factors and latent variables by using the variables determined in the EFA of the data matrix (Yong and Pearce, 2013). EFA is used when it is not known how many factors there are between the items and which factors are determined by which items while CFA is used if there is a strong theory about the structure. It is recommended to run an EFA and then a CFA to show the validity of the structure (Kline, 2011).

CFA is a commonly used and important method of analysis in the development of measurement models. This method is a process by which a pre-formed model produces a

latent variable dependent on the observed variables. It is often used for scale analysis or testing of a predetermined structure. AMOS (Analysis of Moment Structures) is the most common application that uses a variety of methods to estimate factor loads (Kline, 2011). By default, AMOS uses the Maximum Likelihood statistic. Researches have shown that the method used does not affect the results; however, their use may have different benefits for the user. The AMOS program provides two necessary information that will help us to see the errors in the model. (i) the first is the standardized residuals, and (ii) the other is modification indices. In addition to statistics on model errors for these two corrections and adjustments, there are also compatibility tests. Conformity tests provide an overview of the model and the ability to understand the model (Schumacker, 2010).

In CFA, the researcher establishes a hypothesis before the analysis. This hypothesis or model indicates which variables are related to which dimensions and which dimensions are interrelated. Thus, the model is based on a theoretical or experimental basis (Schumm and Stevens, 1993). CFA is a comprehensive technique used in testing theories of latent variables and at a higher level (Tabachnick and Fidell, 2007). Compatibility between the factors determined in EFA and the theoretically revealed factors is investigated by CFA. In other words, CFA is tested for compatibility between the variables that play a role in determining the theoretically revealed factors that are determined by EFA (Schumacker, 2010). In this context, CFA is used to evaluate the construct validity of the structures obtained by EFA (Stapleton, 1997). In CFA, the process starts with a correlation or covariance matrix. The researcher tests the model of the hypothesis established based on theory or theoretical basis. These models show the degree of the predetermined relationship between each of the common factors, only the degree of the relationship between the variables and one or more factors, and the determination of the correlation between certain factors.

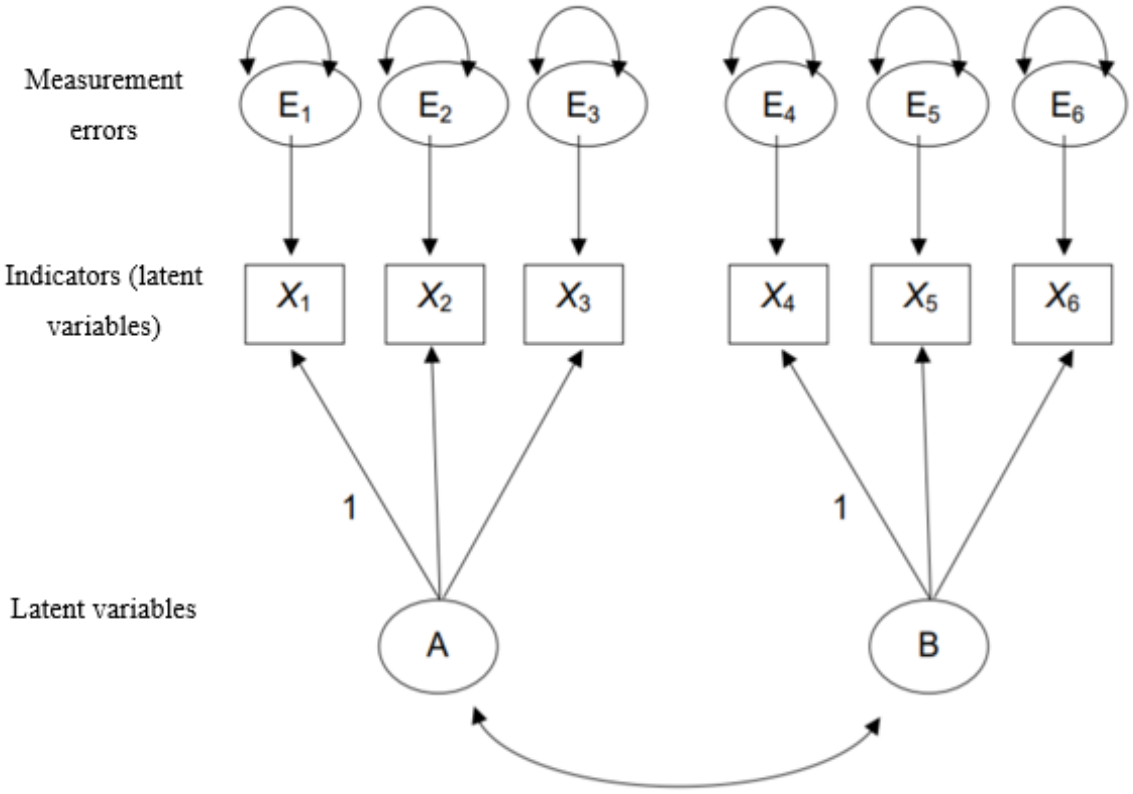

Figure 4.5. The exemplary model of the CFA (source adapted from Kline, 2011).

The model in Figure 4.5 is a standard CFA model with two factors and six indicators. According to the model, latent variables A and B are represented by indicators X and measurement error by E. These errors indicate all sources of variance that cannot be explained by factors. These measurement errors are exogenous variables that cannot be measured. This model shows that the indicators X_1, X_2, and X_3 measure factor A and the indicators X_4, X_5, and X_6 measure factor B and the assumption that the factors have a common variance with each other. The arrow from a factor to an indicator (for example, A to X_1) indicates the latent variable's causal effect on scores observed. In other words, it shows how many factors are reflected by indicators. Statistical calculations of these direct effects are called factor loadings. Factor loads are generally interpreted as standardized or non-standardized regression coefficients. The indications caused by factors are called "effect indicators." In this context, the indicators in a standard CFA model are called endogenous variables, and the variables that can easily change and change among themselves are called exogenous variables (Kline, 2011).

In this study, for example, the indicators (*X*) are the factors that determined in the EFA step. A and B are representing some of the organizational macroergonomic elements. The one-way arrows connecting the factors and elements are named as factor loads in other words, standardized or non-standardized regression coefficients.

4.4.1.3. Structural Equation Modelling (SEM). SEM is a multivariate statistical analysis technique that is used to analyze structural relationships. This technique is the combination of factor analysis and multiple regression analysis, and it is used to analyze the structural relationship between measured variables and latent constructs. This method is preferred by the researcher because it estimates the multiple and interrelated dependence in a single analysis. In this analysis, two types of variables are used endogenous variables and exogenous variables. Endogenous variables are equivalent to dependent variables and exogenous are equal to the independent variable (Schumacker & Lomax, 2010). SEM seeks to derive unbiased estimates for the relations between latent constructs. SEM experts agree on the six steps necessary in model testing. In addition to data collection, the steps are the model specification, identification, estimation, evaluation, and modification (Kline, 2011; Schumacker & Lomax, 2010). To this end, SEM allows multiple measures to be associated with a single latent construct. The steps that are taken while SEM analysis is explained as follows:

Step 1: Defining individual constructs and specifying the model. Model specification occurs when a researcher specifies which relationships are hypothesized to exist or not to exist among observed and latent variables. The factor structure obtained from EFA can be used as a basis for the SEM analysis and for defining the hypotheses.

Step 2: Developing the overall measurement model: The measurement model is also known as path analysis. Path analysis is a set of relationships between independent and dependent variables. This is shown by the use of an arrow. The measurement model follows the assumption of unidimensionality. Measurement theory is based on the idea that latent constructs cause the measured variable and that the error term is uncorrelated within measured variables. In a measurement model, an arrow is drawn from the measured variable to the constructs.

Step 3: Estimating the unknown parameters. Estimation involves determining the value of the unknown parameters and the error associated with the estimated value. As in regression, researchers include both unstandardized and standardized parameter values, or coefficients, as output. The unstandardized coefficient is analogous to a beta value in regression. Dividing the unstandardized coefficient by the standard error produces a z value that is analogous to the t value associated with each B weight in regression. The standardized coefficient is analogous to β in regression.

Step 4: Assessing the measurement model validity. Convergent validity and divergent validity should be assessed after the estimation of unknown parameters.

Step 5: Assessing the model fit. Once estimated, the model's fit to the data must be evaluated. The objective is to determine whether the associations among measured and latent variables in the researcher's estimated model adequately reflect the observed associations in the data.

Step 6: Modifying the model. Rarely is a proposed model for the best-fitting model. Consequently, modification may be needed. Modification indices should be looked into to see if the model could have better model fit indices.

The most commonly used confirmatory factor analysis technique is called SEM. It has become a commonly used statistical method since it was first launched in the 1970s (McQuitty and Wolf, 2013). This data analysis technique is a very general method of statistical modeling commonly used in behavioral and applied sciences. SEM provides a highly general and convenient statistical analysis structure that covers various traditional multivariate processes, including factor analysis, regression analysis, discriminant analyzes, and canonical correlations. It is used to investigate the relationship of structure between measured variables and latent constructs. The author prefers the SEM analysis because it measures the multiple and interrelated dependency in a single analysis.

SEM uses a confirmatory method for the examination of structural theories (in other words, hypothesis testing). Two significant elements of the method are explained: (i) Causal relations are depicted by a set of structural equations (regressions), and (ii) these structural associations designed graphically to conceptualize the theory to be studied better (Byrne 2013). Conceptually SEM can be used to answer any research question concerning one or more independent variables or an indirect or direct analysis of one or more dependent variables. SEM's primary objective, however, is to identify and validate a suggested causal process and/or model. Simultaneous and comprehensive analysis of the system can statistically test the resulting hypothetical model to determine its consistency with the data acquired. The interactions between factors are more likely to be viable if the fitness of a model is suitable. On the other side, the feasibility of the expressed relationships is rejected if the goodness of fit is not appropriate (Byrne 2013).

SEM utilizes different kinds of models to illustrate the links between observed factors, with a core purpose to provide a quantitative test of a researcher's theoretical model. Expressly, different theoretical models can be evaluated in SEM to hypothesize how constructs are defined by sets of factors and how these constructs are interconnected. The purpose of SEM analysis is to determine the extent to which the theoretical model is provided by sample statistics. Correspondingly, SEM uses a scientific hypotheses test method to test theoretical models to understand the complicated interactions between objects further. Different model combinations can be tested by SEM. The basic models include the models of regression, path, and confirmatory factor.

In order to better comprehend these basic models, a few terms need to be identified. First, there are two significant variable types: latent and observed. Latent variables are factors that cannot be immediately observed or measured. Latent variables are observed or measured indirectly and are, therefore, inferred from a set of observed variables that are effectively measured using experiments and surveys. The observed variables are a collection of factors we use to describe or infer the latent or construct variable. In order to identify the latent variable, researchers use sets of indicator variables; therefore, other sampling tools are used to acquire indicator variables. Variables can also be described as either independent variables or dependent variables, whether observed or latent. An independent variable is a

variable not affected in the model by any other variable. A dependent variable is a variable affected in the model by a different variable.

A regression model consists of only observed variables where a single dependent observed variable is predicted or described by one or more independent observed variables. A path model is also wholly specified with the observed variables; however, the flexibility enables for several independent observed variables and several dependent variables observed. Path models, therefore, test more complex models than regression models. CFA models consist of observed factors that are hypothesized to analyze one or more latent variables (dependent or independent). Understanding these basic models will assist in understanding structural equation modeling that combines the path and the analytical models of the factor SEMs consist of observed variables and latent variables, whether independent or dependent (Schumacker and Lomax, 2010). There are at least three main reasons for the popularity of SEM:

(i) Basic statistical approaches only use a restricted number of variables that cannot accommodate complex theories. This is limited by a few variables in order to understand complicated phenomena. The analysis of structural equations allows for statistically simulation and evaluation of complex phenomena.

(ii) The increased recognition was given by measuring instruments to the validity and reliability of observed scores. In many fields, for particular, measurement error has become an important issue, but measurement error and statistical data analysis are differently handled. While analyzing data, statistically, SEM methods specifically take account of measurement errors. SEM analysis includes latent and observable variables as well as specific model estimation error terms.

(iii) The third reason concerns the maturity of SEM in the last three decades, particularly the possibilities of analyzing advanced SEM theoretical models. Such contemporary SEM models and techniques have improved the capacity of many scientists to analyze complex theoretical models of phenomena, thereby decreasing their dependence on basic statistical methods (Schumacker and Lomax, 2010).

The phrase “structural relationship” refers to SEM’s core concept–handling latent variables relationships. These relationships are typically formulated by linear regression equations, represented graphically as path diagrams using arrows. SEM is highly flexible because it incorporates not just a single simple or multiple linear regression, but a system of regression equations. Typically path analysis involves the construction of a path diagram in which the relationships between all variables and the causal direction between them are specifically laid out. When conducting a path analysis, one might first construct an input path diagram, which illustrates the hypothesized relationships. In a path diagram, researchers use arrows to show how different variables relate to each other (Nachtigall *et al.*, 2003). For example, Figure 4.6 shows variable A affecting variable B, variable B affecting variable C, and variable A affecting variable C. Unlike ordinary regression analysis, SEM is simultaneously considering several equations. In the model shown in Figure 4.6, the total effect of A on C can be decomposed into the direct effect of A on C and the indirect effect mediated by B.

Path analysis is a form of multiple regression statistical analysis that is used to evaluate causal models by examining the relationships between a dependent variable and two or more independent variables. By using this method, both the magnitude and significance of causal connections between variables can be estimated.

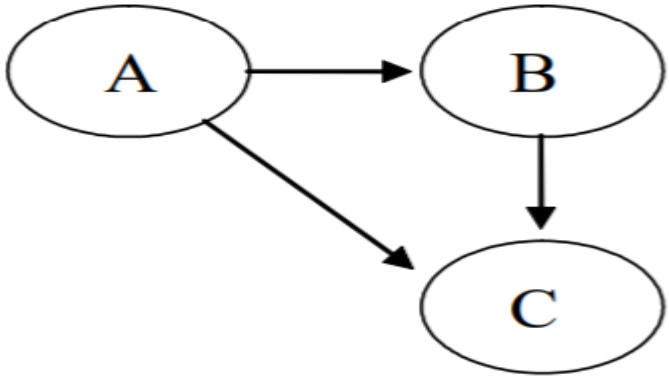

Figure 4.6. The exemplary model of path diagram (source adapted from Nachtigall *et al.*, 2003).

Over 85 years ago, Biometrician Sewall Wright (1934) developed path diagrams and the calculation of direct, indirect, and total effects. This technique is part of SEM, but it gives a lot more. Its most prominent feature is the ability to manage latent variables; in other words, no measurable quantities such as true-score variables or factors underlying calculated variables. Latent variables are linked to measurable variables by a measurement model (as cited by Nachtigall *et al*., 2003). Therefore, SEMs consist of a structural model representing the relationship between latent interest variables and measuring models representing the relationship between latent variables and their manifest or observable indicators, as depicted in Figure 4.7.

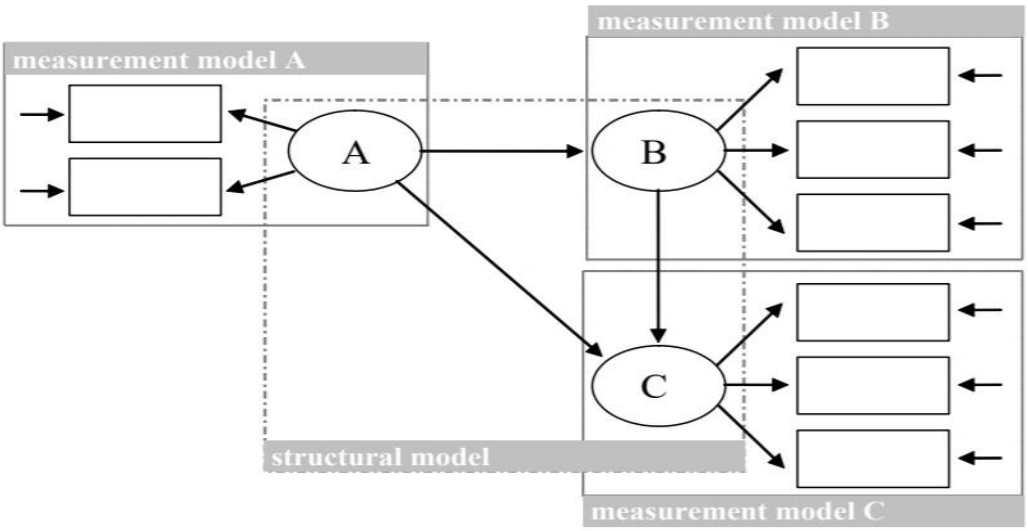

Figure 4.7. An extended model for the three latent variables with regressive dependencies (source adapted from Nachtigall *et al.*, 2003).

5. RESULTS

5.1. Descriptive Statistics

5.1.1. The Participants

The gender, age, position in the company, the highest level of formal education, and total experience duration distribution of 123 people who participated in the survey conducted during the quantitative data collection phase and working in the companies operating in the consulting sector are as follows.

37.4% of 123 people participating in the survey were women, and 62.6% were men (Table 5.1).

Table 5.1. Participant's gender distribution.

	Frequency	Percent
Female	46	37.4
Male	77	62.6
Total	123	100.0

From the sample consisting of the 123 respondents, 27.6% were aged from 30 to 34, 40.7% were aged from 35 to 44, 22% were aged from 45 to 54, and 9.8% were aged 55 or older (Table 5.2.).

Table 5.2. Participant's age distribution.

	Frequency	Percent
30-34 years old	34	27.6
35-44 years old	50	40.7
45-54 years old	27	22.0
55+	12	9.8
Total	123	100.0

From the sample consisting of the 123 respondents, 45.5% have a bachelor's degree, 38.2% have a master's degree, and 16.3% have a doctorate degree (Table 5.3).

Table 5.3. Participant's education distribution.

	Frequency	Percent
Bachelor's degree	56	45.5
Master's degree	47	38.2
Doctorate	20	16.3
Total	123	100.0

From the sample consisting of the 123 respondents, 31.7% have a total of six to 10 years of working life, 44.7% total of 11 to 20 years of working life, and 23.6% have a total of over 20 years of working life (Table 5.4).

Table 5.4. Participant's total professional experience distribution.

	Frequency	Percent
6 to 10 Years	39	31.7
11 to 20 Years	55	44.7
Over 20 Years	29	23.6
Total	123	100.0

From the sample consisting of the 123 respondents, 4.9% are senior associate or senior consultant, 28.5% are managers, 35% are senior manager or associate partner, 28.5% are partners, and 3.3% are a director (Table 5.5).

Table 5.5. Participant's position distribution.

	Frequency	Percent
Senior Associate/Senior Consultant	6	4.9
Manager	35	28.5
Senior Manager/Associate Partner	43	35.0
Partner	35	28.5
Director	4	3.3
Total	123	100.0

From the sample consisting of the 123 respondents, 35% are not managing other managers on a daily basis, and 65% are managing other managers on a daily basis (Table 5.6). This is also a significant percentage to assess the data reliability for the analysis.

Table 5.6. Distribution of the participants that manage other managers.

	Frequency	Percent
No	43	35.0
Yes	80	65.0
Total	123	100.0

From the sample consisting of the 123 respondents, 14.6% have been in their current position for one to two years, 61.8% have been in their current position for three to five years, and 23.6% have been in their current position for six to 10 years (Table 5.7.).

Table 5.7. Participant's total experience distribution in the current position.

	Frequency	Percent
1 to 2 Years	18	14.6
3 to 5 Years	76	61.8
6 to 10 Years	29	23.6
Total	123	100.0

From the sample consisting of the 123 respondents, 24.4% have been in their current company for 3 to 5 years, 55.3% have been in their current company for 6 to 10 years, 12.2% have been in their current company for 11 to 20 years, and 8.1% have been in their current company for over 20 years (Table 5.8).

Table 5.8. Participant's total experience distribution in the current company.

	Frequency	Percent
3 to 5 Years	30	24.4
6 to 10 Years	68	55.3
11 to 20 Years	15	12.2
Over 20 Years	10	8.1
Total	123	100.0

5.1.2. The Dependent and Independent (Indicator) Latent Variables

On the one side, the macroergonomic elements of the organization factor were regarded as independent latent variables. On the other side, consulting work system performance variables, namely client, firm performance, and employee, were investigated

as latent dependent variables. Table 5.9 represents the independent and dependent variables that are used in the SEM.

Table 5.9. Independent and dependent latent variables that are used in the SEM.

Independent Variables	**Dependent Variables**
Teamwork	Client
Organizational culture and safety culture	Firm performance
Coordination, collaboration, and communication	Employee
Work schedules	
Social relationships	
Supervision and management styles	
Performance evaluation, rewards, and incentives	

Descriptive statistics of the latent variables are presented in Table 5.10. Mean, standard deviation, minimum, and maximum values of the latent variables are included as descriptive statistics.

Table 5.10. Descriptive statistics of the study variables.

Variables	**Mean**	**SD**	**Min**	**Max**
Independent Latent Variables (indicators)				
Teamwork	3.971	0.178	3.188	4.313
Organizational culture and safety culture	3.831	0.197	3.267	4.200
Coordination, collaboration, and communication	4.005	0.176	3.429	4.214
Work schedules	3.569	0.274	2.923	4.231
Social relationships	4.002	0.191	3.441	4.429
Supervision and management styles	3.960	0.188	3.412	4.286
Performance evaluation, rewards, and incentives	3.915	0.199	3.278	4.278
Dependent Latent Variables				
Client	3.488	0.332	2.733	4.176
Firm Performance	3.556	0.344	2.818	4.198
Employee	3.680	0.293	2.818	4.273

5.2. Checking the Normality

Checking the normality of response variables is an important first step before starting the statistical analyses, especially when the inference is an objective. Although it is not

always necessary to analyze the normality of the variables, if all the variables are normally distributed, the solution is generally considerably better (Tabachnick and Fidell, 2007).

The normality of variables is checked using either statistical or graphical methods. Analyzes from this stage of the research were performed with the aid of the SPSS statistical package. Normality is checked by using both graphical and analytical methods such as Shapiro-Wilk and Kolmogorow-Smirnow Tests. Shapiro-Wilk and Kolmogorov-Smirnov tests are widely used for normality tests. If the data is less than 30, Kolmogorov-Smirnov is not recommended. On the other hand, whichever test is going to be used, in order to assume a normal distribution, the p-value needs to be higher than the significance value (in this study, it has been stated as 0.05). The null hypotheses in both tests are the same: "The data is approximately normally distributed with a 95% confidence level". So, whenever the p-value > 0.05, we can accept H_0 hypotheses for all groups (Lind *et al.,* 2006).

The response variable for the analysis from this step included the mean of total questions regarding one element. For example, as for Teamwork element, with its 16 questions. The mean score of Teamwork calculating by summing the 16 questions' Likert score and dividing them into the number of questions. By this way, 123 mean scores for each of the element and performance category has collected. Also, the mean scores represent continuous variable characteristics.

When the data set used in the study is examined, it is observed that the skewness z-values vary between -0.078 and 1.24 kurtosis z-values at the 5% significance level between -1.56 and 1.29. The data is a little skewed and kurtotic, but still in the range between -1.96 and 1.96. Thus, the data do not differ significantly from the normal distribution. It can be concluded that the data are approximately normally distributed, in terms of skewness and kurtosis. Moreover, when looked Shapiro-Wilk and Kolmogorov-Smirnov tests, we can see that all p-values are higher than 0.05, thus, the null hypotheses in both tests are accepted, and we can say that the data is approximately normally distributed with 95% confidence level (Cramer, 1988; Doane and Seward, 2011; Shapiro and Wilk, 1965).

Using the analytical methods together with the graphical methods in the analysis of the assumption of normality, the evaluation of the results together can help us to make more definite decisions (McKillup, 2005; Abbott, 2014; Gnanadesikan, 1997). Thus, firstly histogram of the residuals should be looked at. If the data shows the normal distribution, when the bars representing the frequencies of the data are combined at their top points, the graph will look similar to the bell curve. This demonstrates that the data is approximately normally distributed. In addition, it can be commented on the kurtosis and skewness of the data by looking at the histogram graph.

Secondly, the Normal Q-Q Plot should be looked at (Gnanadesikan, 1997; Tabachnick and Fidell, 2007). In the normal Q-Q graph, the aim is to determine the level of deviation from the theoretical distribution of the unit values of the variables below and above the obtained linear line. The values (points) should be positioned as straight as possible and parallel to the given line. While the line formed with a 45-degree slope is formed by hypothetical, theoretical values, the values formed by points similar to circular rings are the real values.

Thirdly Detrended Normal Q-Q Plot should be looked at. The Detrended Normal Q-Q Plot displays the same information as the Normal Q-Q graph, yet differently. If the data is normally distributed, the dots on the graph are clustered on the horizontal line (zero lines) and are not expected to form any shape. The dots show the magnitude and direction of the deviation in the quantities observed. By subtracting the expected distribution from the observed distribution, each point will be calculated. This means that a point below the trend line in the Normal Q-Q chart will appear above the trend line in the Detrended Normal Q-Q chart, as the calculated value by subtracting the expected distribution from the observed distribution is higher than zero (Tabachnick and Fidell, 2007).

Lastly, Boxplots should be looked at. Boxplot; If it can be interpreted correctly, it is an advantageous chart type because it can provide a lot of information by itself. The minimum value of the bottom line of the figure, the bottom line of the box is the first quarter of 25%, the median line in the middle of the box is the second quarter of 50%, the top line of the box is the third quarter of 75%, and the top line of the figure is the maximum represents

the value. For the normal distribution assumption; the median line should be in the middle of the first and third quarter lines as much as possible and the distance between the minimum value line and the 1st quarter line and the distance between the maximum value line and the third quarter line should be as equal as possible. It can be concluded that the data is approximately normally distributed if these two conditions can be achieved (Wilcox, 2015; Lind *et al.,* 2006). The visual inspection of the data's histograms, normal Q-Q plots, Detrended Normal Q-Q Plots, and Boxplots showed that the data were approximately normally distributed.

5.3. Reliability Analysis of the Questionnaire

The analysis of reliability evaluates the accuracy of answers to a questionnaire based on a specified scale type. By accuracy, here is meant the consistency of answers to questions containing only ordinal scale answers. For example, reliability analysis does not apply to age, income, or yes/no answers to the questionnaire's questions. Nonetheless, a five-point Likert scale given to a question about any topic can, for example, be subject to reliability analysis, such as the evaluations from strongly disagree to strongly agree.

The primary analysis used for the reliability check is to find the Cronbach's Alpha (CA) value. Each item can have a single CA value, or all questions can have an average CA value. The CA value obtained for all questions indicates the total reliability of that questionnaire and is expected to be higher than 0.7, lower CA values indicate poor reliability of the questionnaire, and CA > 0.8 indicates a high reliability of the questionnaire. If it is desired to increase the reliability of the questionnaire, the CA value obtained for the individual questions is displayed, as previously mentioned. The reliability of the questionnaire is increased by subtracting the question in which CA value decreases the total CA value obtained from these questions (Hair *et al.,* 2010; Cronbach, 1951; Heckler and Hatcher, 1996). CA is calculated using the formula as follows:

$$\alpha = \frac{N \times \bar{c}}{\bar{v} + (N-1) \times \bar{c}} \tag{5.1}$$

Where N is the number of items, $\bar{c}$ is the average covariance between item-pairs, and $\bar{v}$ is the average variance (Tavakol and Dennick, 2011).

The reliability of the MCQ was tested using CA, considering 0.7 as the appropriate minimum value. CA coefficient as a result of the analysis of the questionnaire as a whole has been found as 0.868. The subtraction of questionnaire items does not help to achieve considerably higher average CA values; thus, the number of questionnaire items remain unchanged. CA analysis reveals that the items have an adequate level of inter-item reliability. As a result of analyzes, CA coefficient values related to the scales used are represented in Table 5.11.

Since the CA coefficients ranged from 0.787 to 0.911, the scales and the questionnaire were reliable (Hair *et al*., 2010).

Table 5.11. CA coefficient values related to the scales used.

Elements	**Cronbach's Alpha**
Teamwork	0.813
Organizational culture and safety culture	0.846
Coordination, collaboration, and communication	0.799
Work schedules	0.892
Social relationships	0.859
Supervision and management styles	0.911
Performance evaluation, rewards, and incentives	0.787
Client	0.832
Firm Performance	0.859
Employee	0.881

Reliability analysis is used to measure the consistency of responses to questions prepared on a specific ranking scale. Reliability analysis has five main components: internal consistency, stability, representativeness, equivalence, and objectivity. The reliability of the scale, which was developed for the answers to the questions, is only possible if the expressions in the scale are consistent with each other and stable; that is, they measure the same structure, and the measurement results show stability under different conditions (Field, 2013). Therefore, for better reliability analysis, the variety of reliability components should be considered as much as possible. In order to gain more insight into the reliability of the MCQ, not only the internal consistency but also the stability of the questionnaire has been

checked by reapplying the MCQ to the randomly selected 25 employees from participants, two months after the first phase data collection. Stability means that the items in the scale or test have a specific conceptual structure. That is, the scale items should measure the same structure with each other, and the measurement results are stable under the same and different conditions while they are not changing.

In two application-based methods (test-retest), the same sampling and the same tool is applied twice, leaving a specified time interval. The correlation between data sets obtained from applications is interpreted as the reliability coefficient. Investigated datasets are composed of average responses of each element. Reliability estimation based on the same test being applied to the same group twice at regular intervals is known as the test-retest reliability method, and the answers given to the test can be interpreted as the consistency of test scores over time. In order to test the response difference over time, since the sample size is less than 30, a paired-samples t-test assuming equal variances was used.

The paired samples t-test compares two means that they belong to the same person, entity, or group. These measures are typically used in two different times (for instance, pre- and post-test activities in two time points) or in two different conditions or categories (for example, left and right ears, twins), which are correlated with each other. This test is designed to assess whether statistical evidence exists that the average difference between pairing results on a particular result is significantly different from zero. The Paired Samples t-test is a parametric test. The null hypothesis (H_0) that is used in the analyses is “the difference between the paired population means is equal to zero” (Lucke, 2005).

Certain circumstances must be met before the use of the t-test data, in order to achieve a statistically accurate decision on an average sample with t distribution: both samples for comparison should be sampled independently, in compliance with the normality, and equal variance. Therefore, for the normality test, a variable composed of the difference between the first questionnaire application and the second has been generated. Then, this variable has been tested for normality using Shapiro-Wilk. The null hypothesis (H_0) for the Shapiro-Wilk test is that a variable is normally distributed in some population. The paired difference did not violate the assumption of normality as the statistics are changing between W = 0.892 and

W = 0.947 and, significance P = 0.331 and P = 0.590. Also, the paired samples have equal variances as we cannot reject the H_0 hypothesis which can be stated as "the difference between the paired population variances is equal to zero" for F-test (p-value < 0.05). After ensuring that all paired sample t-test assumptions are met, Table 5.12 represents the t-test results for all factors.

Table 5.12. T-test results for all factors.

Paired Samples Test					
			t	df	p-value
	95% Confidence Interval of the Difference				
Elements	**Lower**	**Upper**			
Teamwork	0.008	0.133	1.33	24	*0.191*
Organizational culture and safety culture	-0.123	0.086	-0.355	24	*0.725*
Coordination, collaboration, and communication	0.019	0.202	1.12	24	*0.268*
Work schedules	-0.163	0.087	-0.611	24	*0.545*
Social relationships	-0.079	0.090	0.128	24	*0.899*
Supervision and management styles	-0.164	0.003	-1.95	24	*0.058*
Performance evaluation, rewards, and incentives	-0.122	0.061	-0.675	24	*0.504*
Client	-0.198	0.068	-0.989	24	*0.329*
Firm Performance	-0.230	0.066	-1.12	24	*0.271*
Employee	-0.325	-0.098	-0.891	24	*0.378*

Since the significance value is above 0.05, the null hypothesis for the paired sample t-test cannot be rejected. Thus, the differences between the first application of the questionnaire and the second application are insignificant. From that t-test analysis result, it can be concluded that the stability of the questionnaire is high, and the questionnaire has been validated in terms of stability and internal consistency.

5.4. Results of the EFA

In order to explain the relationships between latent and observed variables in terms of a much smaller number of unobservable hidden variables, EFA is applied to the gathered questionnaire data. The aim of using EFA in this study is to achieve a small number of explanatory factors that explains the maximum variance and reveal the real reasons behind

the numerous features that can be measured and seen. Firstly, the compliance of the data with EFA should be checked, and after then, if the compliance achieved, the factor analysis can be done correctly.

5.4.1. Compliance With Factor Analysis

Not all variables and data collections may be appropriate for factor analysis. Several tests must be performed for the eligibility requirement (Hair *et al.*, 2010). Of these conditions, those related to the number of samples and expressions can be considered as prerequisites. These;

(i) the number of samples should be higher than the number of variables,
(ii) the number of samples should be at least 50,
(iii) the number of observations per expression should be kept high. The ideal ratio is one to five.

Correlations between expressions should also be examined before starting a factor analysis. If the correlation between expressions is examined visually, the data set is probably unsuitable if there is little or no value higher than 0.30. Partial correlation between variables should also be considered. If there are factors that we can call real in the data set, the partial correlation within this data itself will be expected to be low because the variables will be expressed by their load on the factor. A high partial correlation means that there is no underlying factor, which invalidates our analysis. Factor analysis will not give accurate results if the partial correlation is 0.7 and above (Hair *et al.*, 2010). The next test for compliance with factor analysis is the Bartlett Test. The Bartlett method typically tests the matrix of correlation and evaluates the statistical significance of this matrix of correlation. Bartlett's Test is the test for the null hypothesis (H_0) that the correlation matrix has an identity matrix. For EFA, the Bartlett Test should be meaningful, namely, the p-value should be less than 0.05 for this study. As a final step, the Kaiser-Meyer-Olkin (KMO) value was examined. KMO test is a test that measures the correlations between variables and the suitability of factor analysis. The value of the KMO test should be between zero and one.

KMO value is equal to one if any variable is estimated by other variables without error. Values higher than 0.8 can be considered excellent.

The formula for the KMO test is:

$$KMO_j = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} u_{ij}} \quad (5.2)$$

Where:

R=[r_{ij}] is the correlation matrix and $i, j = 1,2, \ldots n$

U=[u_{ij}] is the partial covariance matrix and $i, j = 1,2, \ldots n$ (Kaiser, 1974).

In order to do the factor analysis, KMO and Bartlett tests were performed for the sufficiency of the data set. Kaiser states that the value found is excellent as it approaches one, and below 0.50 is unacceptable (excellent in 0.90s, very good in 0.80s, mediocre in 0.70s and 0.60s, deficient in 0.50s) (Hair *et al.*, 2010). However, in order to make an in-depth interpretation, it is necessary to look at the suitability of the individual variables. KMO values below 0.50 should be excluded from the research, and factor analysis should be continued. These values are calculated in the inverse image correlation matrix, where we can examine the partial correlation. Before beginning to investigate the data compatibility to the EFA, the sample size should be looked at. Since the minimum sample volume required to perform factor analysis on a sample is 50, a sample of 123 data used in this study is suitable for subject factor analysis (Hair *et al.*, 2010).

Varimax rotation was used as one of the rotation methods in order to obtain an appropriate factor structure. It is almost impossible to find unrelated factors in real life. However, for the research is to form a model and to obtain the most appropriate number of "independent" factors as possible, the orthogonal method of varimax rotation is used.

After the factor rotation decided in order to work with, how many factors to work with should also be decided. A series of evaluations will be required to make this decision. Firstly, eigenvalues of the factors should be looked into. The eigenvalue is a factor that is taken into consideration both in calculating the variance explained by the factors and in deciding the

number of essential factors. Factors with eigenvalues greater than one are considered significant. The factor's eigenvalue is the sum of the squares of a load of each variable on each factor. Secondly, the explained variance table is also relevant, regardless of the factor analysis method. An important factor evaluation criterion is that the explained variance should exceed 50% of the total variance. Because of the created factor structure explains less than half of the total variance, it would be wrong to talk about representation ability (Costello and Osborne, 2005). Table 5.13 represents the EFA results in terms of a number of factors extracted, total variance explained, KMO value, and Bartlett Test. When looking at the obtained Table 5.13 according to the factor analysis for each macroergonomic element and performance indicators, it can be seen that total variance explained values are higher than 50% (range of 56.02% and 68.36%) for all macroergonomic elements and performance indicators, KMO values are above 0.50, which are acceptable (range of 0.639 and 0.811) and Bartlett tests are significant at 95% confidence level ($p < 0.05$).

Table 5.13. EFA for each macroergonomic element and performance indicators.

Element	Number of Questions	Number of Factors Extracted	Total Variance Explained	KMO	Bartlett Test
Teamwork	16	5	%56.25	0.639	<0.05
Organizational culture and safety culture	15	4	%54.18	0.796	<0.05
Coordination, collaboration, and communication	14	4	%56.02	0.804	<0.05
Work schedules	13	4	%59.39	0.767	<0.05
Social relationships	13	6	%68.36	0.744	<0.05
Supervision and management styles	14	5	%60.5	0.811	<0.05
Performance evaluation, rewards, and incentives.	18	5	%58.53	0.769	<0.05
Client	15	5	%65.39	0.712	<0.05
Firm Performance	11	3	%56.41	0.792	<0.05
Employee	11	4	%62.69	0.750	<0.05

Table 5.14 and Table 5.15 represents the factor loadings of each factor and the CA, average extracted variance (AVE), and composite reliability (CR) values of the factors. These values are going to be used for the reliability and validity test of the new factor structure

Table 5.14. Factor loadings and associated CA, AVE, and CR values of the factors.

Element	Factor	Factor Loading	Cronbach Alpha	AVE	CR
Teamwork	1	0.780	0.731	0.574	0.870
	2	0.743			
	3	0.740			
	4	0.711			
	5	0.810			
Organizational Culture and Safety Culture	1	0.720	0.784	0.547	0.828
	2	0.725			
	3	0.798			
	4	0.711			
Coordination, Collaboration, and Communication	1	0.801	0.745	0.565	0.837
	2	0.683			
	3	0.835			
	4	0.674			
Work Schedules	1	0.859	0.811	0.671	0.891
	2	0.820			
	3	0.827			
	4	0.767			
Social Relationships	1	0.755	0.852	0.667	0.923
	2	0.798			
	3	0.804			
	4	0.887			
	5	0.921			
	6	0.718			
Supervision and Management Styles	1	0.716	0.798	0.622	0.891
	2	0.842			
	3	0.726			
	4	0.811			
	5	0.837			
Performance Evaluation, Rewards, and Incentives	1	0.878	0.769	0.539	0.853
	2	0.708			
	3	0.682			
	4	0.674			
	5	0.711			

Table 5.15. Factor loadings and associated CA, AVE, and CR values of each factor (cont.)

Element	Factor	Factor Loading	Cronbach Alpha	AVE	CR
Client	1	0.776	0.919	0.667	0.909
	2	0.735			
	3	0.892			
	4	0.811			
	5	0.861			
Firm Performance	1	0.805	0.923	0.631	0.837
	2	0.759			
	3	0.819			
Employee	1	0.838	0.902	0.659	0.885
	2	0.747			
	3	0.893			
	4	0.759			

Table 5.14 and Table 5.15 are obtained after rotation. In order to define the significance of the variables under the factors, factor loadings of each variable to the factors are considered. Here, the most critical indicator of how many values are significant for the relevant factor is the number of samples. The higher the number of samples, the lower the acceptable load value. For example, in a questionnaire that contains 350 participants, loads over 0.3 can be considered significant when the number of samples drops to 200, it increases to 0.4, to 120 to 0.5, and 85 to 0.6. The acceptable value for 50 samples is 0.75. In samples of less than 50, factor analysis is not recommended (Hair *et al.,* 2010). Minus or plus factor loadings are related to the direction of the effect so that these values should be considered as the absolute value. Since the sample size is 123 in this study, the factor loadings higher than 0.5 are considered significant. In order to calculate CR and AVE, formulas represented in Table 5.16 are used.

Table 5.16. CR and AVE formula and parameters.

	Formula	Parameters
CR	$(\sum K)^2 / [(\sum K)^2 + (\sum 1 - K^2)]$	K = Loadings of each factor
AVE	$\sum K^2 / n$	n = number of factors in a model

According to EFA, new variables were defined by SPSS. In this direction, the questions included in a factor were summed and divided into the total number of questions in the factor, and a new variable was calculated. For example, in order to calculate total

answers of the first factor of Teamwork organizational macroergonomic element, determined answers to associated six questions were summed and divided into six to get the mean value of the first factor. The equation of this process can be written as follows:

$$L_a = \frac{\sum_{i=1}^{n} T_i}{n} \tag{5.3}$$

Where T_i is the question score, L_a is the factor score, and n is the number of questions in a single factor. The questions related to the factors of organizational macroergonomic elements and performance categories are represented in Table 5.17 and Table 5.18. Determined factors contain a group of questions that are correlated. In these tables, factor coding and related question identifications from Appendix A7 are represented.

Table 5.17. Related questions to the factors of organizational macroergonomic elements and performance categories.

E/P	Element	Factor	Related Question IDs
E1	Teamwork	1_1	TEA3, TEA11, TEA5, TEA8, TEA14, TEA10
E1	Teamwork	1_2	TEA9, TEA4
E1	Teamwork	1_3	TEA12, TEA7
E1	Teamwork	1_4	TEA15, TEA2, TEA6, TEA1
E1	Teamwork	1_5	TEA16, TEA13
E2	Organizational Culture and Safety Culture	2_1	ORG2, ORG6, ORG11, ORG3, ORG8
E2	Organizational Culture and Safety Culture	2_2	ORG9, ORG1, ORG5
E2	Organizational Culture and Safety Culture	2_3	ORG7, ORG4, ORG12, ORG10
E2	Organizational Culture and Safety Culture	2_4	ORG14, ORG15, ORG13
E3	Coordination, Collaboration, and Communication	3_1	COO7, COO11, COO9, COO14
E3	Coordination, Collaboration, and Communication	3_2	COO3, COO4, COO5, COO1, COO6
E3	Coordination, Collaboration, and Communication	3_3	COO2, COO13
E3	Coordination, Collaboration, and Communication	3_4	COO10, COO8, COO12
E4	Work Schedules	4_1	WOR5, WOR7, WOR11, WOR6
E4	Work Schedules	4_2	WOR13, WOR10, WOR12
E4	Work Schedules	4_3	WOR1, WOR8, WOR9
E4	Work Schedules	4_4	WOR4, WOR3, WOR2
E5	Social Relationships	5_1	SOC4, SOC7, SOC1
E5	Social Relationships	5_2	SOC10, SOC12
E5	Social Relationships	5_3	SOC3, SOC2
E5	Social Relationships	5_4	SOC13, SOC5
E5	Social Relationships	5_5	SOC6, SOC11
E5	Social Relationships	5_6	SOC9, SOC8
E6	Supervision and Management Styles	6_1	SUP5, SUP7, SUP8, SUP9
E6	Supervision and Management Styles	6_2	SUP4, SUP1
E6	Supervision and Management Styles	6_3	SUP13, SUP12, SUP3
E6	Supervision and Management Styles	6_4	SUP2, SUP11, SUP10
E6	Supervision and Management Styles	6_5	SUP6, SUP14
E7	Performance Evaluation, Rewards, and Incentives	7_1	PER15, PER14, PER17
E7	Performance Evaluation, Rewards, and Incentives	7_2	PER18, PER16, PER11, PER12
E7	Performance Evaluation, Rewards, and Incentives	7_3	PER6, PER7, PER4, PER2
E7	Performance Evaluation, Rewards, and Incentives	7_4	PER1, PER8, PER10, PER13
E7	Performance Evaluation, Rewards, and Incentives	7_5	PER5, PER3, PER9

Table 5.18. Related questions to the factors of organizational macroergonomic elements and performance categories (cont.).

P8	Client	8_1	CLI10 ,CLI6, CLI4, CLI13
P8	Client	8_2	CLI7, CLI8, CLI11, CLI14
P8	Client	8_3	CLI1, CLI2, CLI3
P8	Client	8_4	CLI12, CLI15
P8	Client	8_5	CLI5, CLI9
P9	Firm Performance	9_1	FIR7, FIR10, FIR11
P9	Firm Performance	9_2	FIR3, FIR5, FIR6, FIR1, FIR2
P9	Firm Performance	9_3	FIR4, FIR9, FIR8
P10	Employee	10_1	EMP4, EMP7, EMP6
P10	Employee	10_2	EMP2, EMP3, EMP1, EMP5
P10	Employee	10_3	EMP11, EMP10
P10	Employee	10_4	EMP8, EMP9

The investigated reliability analysis and their criteria after getting new factor values are summarized in Table 5.19. From this point, the evaluated variables are determined factors rather than the questions. As for the reliability of the new construct, internal reliability has achieved with the CA value of whole factors included is 0.831. Also, when the CR values of each factor are looked at, it can be seen that all CR values are higher than 0.6. Since CA is a statistic that tends to give high values when there are many variables, the CR value is used as an alternative to CA or as a control tool. The CR value is expected to be higher than 0.7, like CA (Margherita and Stephanidis, 2019). Thus, construct reliability is achieved. Moreover, the average percentage of variation explained by the factors in the construct is higher than 50% for all factors. In order to conclude, all reliability criteria were achieved, and it can be said that the new construct is reliable.

Table 5.19. Reliability measures and associated criteria investigated.

Reliability	Criteria
Internal Reliability	Internal reliability is accomplished when the CA value reaches 0.6 or higher.
Construct Reliability	The reliability and internal consistency assessment of the evaluated variables describing a latent construct. A value of CR ≥ 0.6 is required to achieve the construct reliability.

5.4.2. Validity

Convergent validity and divergent validity are methods to determine a measurement procedure's validity (Campbell and Fiske, 1959). The AVE is used as an indicator of

discriminant validity and convergent validity. Convergent validity states that expressions of variables are related to each other and the factor they represent. Discriminant validity (divergent validity) is that expressions of variables should be less correlated with factors other than their own.

Table 5.20 lists the required value of AVE and CR in order to achieve adequate validity. The CR reached the minimum recommended value of 0.70 in all cases (range 0.828 to 0.923). The value of AVE reached the minimum recommended value of 0.50 in all cases (range 0.539 to 0.671). This magnitude of AVE demonstrated that the measurement model has acceptable convergent validity and construct reliability in all cases.

Table 5.20. Requirements of each validity investigated.

Validity	**Requirements**
Convergent validity	When all factors in a measurement model are statistically significant, the convergent validity can be achieved. This validity could also be verified through AVE and CR. That is, all CR values for the scale are expected to be higher than AVE values and AVE values greater than 0.5 (Barrett, 2007).
Discriminant validity	When the measurement model is free of unnecessary factors, discriminant validity is achieved. The correlation between each pair of the latent exogenous construct should be less than 0.85 as a further requirement for discriminant validity. Other than that, the square root of AVE for the construct should be higher than the correlation between the respective constructs.

In order to measure discriminant validity, the below table has been calculated. To ease the comparison, the correlation matrix and AVE matrix is combined and represented in Table 5.21. The table demonstrates that the square root of the construct AVE is the diagonal values in bold, while the other values are the correlation between the individual factors. Discriminant validity is achieved when the bold diagonal value is higher than the row and column values. Table 5.21 also indicates that all diagonal values in bold are greater than the values in its row and column and less than 0.85, thereby achieving the discriminant validity.

Table 5.21. Pearson correlation matrix and the square root of the construct AVE.

	Teamwork	**Organizational culture and safety culture**	**Coordination, collaboration, and communication**	**Work schedules**	**Social relationships**	**Supervision and management styles**	**Performance evaluation, rewards, and incentives**	**Client**	**Firm Performance**	**Employee**
Teamwork	***0.758***									
Organizational culture and safety culture	0.487**	***0.739***								
Coordination, collaboration, and communication	0.450**	0.383**	***0.751***							
Work schedules	0.387**	0.464**	0.614**	***0.819***						
Social relationships	0.324**	0.436**	0.449**	0.357**	***0.817***					
Supervision and management styles	0.550**	0.360**	0.483**	0.310**	0.411**	***0.788***				
Performance evaluation, rewards, and incentives	0.460**	0.312**	0.423**	0.550**	0.479**	0.551**	***0.734***			
Client	0.390**	0.418**	0.501**	0.497**	0.319**	0.573**	0.691**	***0.817***		
Firm Performance	0.501**	0.582**	0.417**	0.332**	0.322**	0.615**	0.350**	0.741**	***0.795***	
Employee	0.410**	0.411**	0.657**	0.442**	0.320**	0.655**	0.421**	0.750**	0.635**	***0.812***
****Correlation is significant at the 0.05 level (2-tailed).**										

A correlation analysis was performed to evaluate the direction and magnitude of the relationship between these variables. Pearson correlation coefficient was used for correlation analysis. The Pearson correlation coefficient takes values ranging from -1 to +1, and the positive values of this coefficient indicate a positive relationship, while the negative values indicate a negative relationship. A Pearson correlation coefficient of 0 indicates that there is no correlation between variables, and a +1 or -1 indicates an excellent correlation between variables (Hair *et al.*, 2010). When the correlations in Table 5.21 are examined, it can be concluded that there are statistically significant ($p < 0.05$) positive correlations among all variable pairs.

5.5. Results of the CFA

In order to acquire direct, indirect, and total effects and test the hypothesized confirmatory factor analysis model, data were analyzed with SEM software AMOS 24.0. In the simultaneous analyzes of the entire system of variables, the hypothesized confirmatory factor analysis model can be tested statistically to determine its compatibility with the data. In SEM, there are multiple fitness indexes that show how to fit the data model is. At least one fitness index for each model fit category is recommended (Holmes-Smith *et al*., 2006). Table 5.22 contains information about the model fit category and its acceptance level in related literature. The table shows the model fit categories to be looked into while analyzing the SEM model. The acceptance level of discrepancy chi-square represents the p-value whereas other fit categories represent indicators. In order to have a great grasp of indicators and values examined during the testing of the suitability of the model, each of them is explained briefly.

Table 5.22. The model fit categories and their acceptance level.

Category Name	**Index name**		**Acceptance Level**	**Literature**
Absolute Fit	Chisq	Discrepancy chi square	p > 0.05	(Wheaton, 1987; Barrett, 2007)
	RMSEA	Root Mean Square of Error Approximation	< 0.08	(Browne and Cudeck, 1993; Rigdon, 1996)
	GFI	The goodness of Fit Index	> 0.90	(Shevlin and Miles, 1998)
Incremental Fit	AGFI	Adjusted Goodness of Fit	> 0.90	(Tanaka and Huba, 1985; Bollen, 1990)
	CFI	Comparative Fit Index	> 0.90	(Bentler, 1990)
	TLI	Tucker-Lewis Index	> 0.90	(Bentler and Bonett, 1980; Hu and Bentler, 1999)
	NFI	Normed Fit Index	> 0.90	(Bollen, 1989)
Parsimonious Fit	Chisq/df	Chi-Square/Degree of freedom	< 5.0	(Marsh and Hocevar, 1985)

5.5.1. Indicators and Values Examined During the Testing of the Suitability of the Model

Conformity statistics test the extent to which the model is compatible with reality, thus demonstrating the construct validity of the model. There are many conformity statistics, and these are related to the more superior and weaknesses of each other (Maiti and Mukherjee, 1991). Therefore, based on a single statistic, it would be wrong to say whether the model is

good or bad, and in order to comment on it, it is necessary to examine multiple statistics together in their conditions and model conditions (Byrne, 2013). Compliance statistics are analyzed in three main categories. The first of these is called absolute fit indices. Absolute fit indices check the compatibility of the preliminary model with the sample data; in a way, these statistics show the extent to which the model formed as a result of the data conforms to the designed pattern template. (McDonald and Ho, 2002). The statistics examined in this category are Chi-Square (CMIN), RMSEA, GFI values. Rather than using the raw chi-square value, the incremental fit indices compare this value with a reference model and process the null hypothesis (the hypothesis that all variables are unrelated) (McDonald and Ho, 2002). The statistics covered in this category are AGFI, CFI, TLI, and NFI. The last category is parsimonious fit indices which are relative fit indices that are adjustments to most of the ones above. The adjustments are to penalize models that are less parsimonious so that simpler theoretical processes are favored over more complex ones. This category includes the Chi-Square/df index.

5.5.1.1. Chi-square test (CMIN and CMIN/DF). The Chi-Square value is the most basic measurement used to test the overall suitability of the model. This value is used to test the null hypothesis that the sample covariance matrix and the model covariance matrix adapted by the model are the same (Hu and Bentler, 1999). An appropriate model is expected to give meaningful results at $p>0.05$ (Barrett, 2007). There are many limitations to the use of this statistic, although it has a popular place among eligibility statistics. Due to the limitations of the Chi-square statistics, the statisticians argued that this statistic should be evaluated at least from the degree of freedom and proposed to calculate Chi-square/df (CMIN / df). However, no specific consensus has been reached as to which threshold to take. Some sources accept a high value of Chi-square/df = 5 (Wheaton *et al*., 1977).

5.5.1.2. Root Mean Square Error of Approximation (RMSEA). RMSEA is a statistic that gives the researcher information about the compatibility of the covariance matrix of the main mass with unknown but optimally planned parameters (Byrne, 2013). In recent years, this statistic has been evaluated as one of the most reliable statistics about the model (Diamantopoulos and Siguaw, 2000). The number of variables and expressions in the RMSEA model tends to increase as the number of expressions increases, so it can be said

that there is a statistic that supports a small number of expressions. Subsequently, medium and low values between 0.08 and 0.10 were called good. However, more current approaches have slightly lowered the acceptable limit for this value. Therefore, it would be more accurate to say non-conformity test for RMSEA value. Because the values approaching and exceeding 0.1 are bad, the model can be said to be useful as it approaches zero by going down. Values that RMSEA can take in the 95% confidence interval can range from 0.03 to 0.08, values above 0.08 will indicate poor model suitability (Rigdon, 1996).

5.5.1.3. Goodness-of-Fit Index (GFI). The GFI statistic was created to eliminate the problem of Chi-Square statistic rising as the sample grew and was less sensitive to sample size. Basically, the model is a result of the ratio of covariance and variance with the measured variance and covariance. The GFI statistic is between zero and one and moves inversely proportional to the degree of freedom; therefore, it can be said that the sample size tends to increase as the ratio of freedom to size increases (Bollen, 1990; Hoelter, 1983). Traditionally, a threshold value of 0.90 is recommended, but when small sample sizes and factor loads are found to be low, an evaluation can be made up to a threshold of 0.95 (Shevlin and Miles, 1998). AGFI (Adjusted GFI) GFI statistic is free of degrees of freedom, but it is not recommended for use in complex and multi-expression models.

5.5.1.4. Normed Fit Index (NFI) and Non-Normed Fit Index or Tucker-Lewis Index (TLI). The NFI statistic compares the Chi-square value of the model with the Chi-square value of the zero models. The zero model (null model or independence model) is defined as the uncorrelated model. The NFI value is between 0 and 1, and a threshold value of 0.90 is considered to represent good suitability (Hu and Bentler, 1999). The missing part of the NFI statistic is that the models studied with less than 200 samples show low suitability (Mulaik *et al*., 1989). In order to eliminate the effect of sample size, NNFI (non-normed fit index) or TLI statistic was proposed. The TLI statistic tends to fall as the model becomes more complex, although it is sensitive to sample size, although not as much as the NFI, and at low sample sizes, other statistics show good fit, but low fit values. There are many different opinions in the literature as the threshold value of TLI. In addition to threshold values such as TLI > 0.80, high thresholds such as TLI > 0.95 are also found (Hu and Bentler, 1999).

5.5.1.5. Comparative Fit Index (CFI). It is an improved version of the NFI statistic, which takes into account the sample size and gives good results even in small samples, one of the most accepted and used statistics. Similarly, the NFI compares the zero model with the sample covariance matrix and obtains a value between zero and one. The closer the model, the higher the suitability of the model. Initially, a threshold value of 0.90 was accepted, and later 0.95 was determined as a good indicator of suitability (Bentler and Bonett, 1980). Since it is the least affected by the sample size, it is used in almost all packet programs (Fan *et al*., 1999).

Because of expressions in the model, and the size of the sample, the appropriate model fit values may vary. Table 5.18 reflects the values generally accepted by the researchers, but it should be noted that there is no single truth about model fit values (Holmes-Smith *et al*., 2006). In summary, structural equation modeling serves to show the researcher two results. The first shows factor loads, such as the analysis of necessary components and component or standard factor analysis. It will also provide information on error variances. However, the primary critical assessment is the conformity assessment. A model may give high factor loads, but the similarity between the covariance matrix of the sample and the designed covariance matrix; in other words, testing model fit is as significant as the presence of factor loads and factors. Confidence that the information provided by the scale is stable that is, error-free, and that the same results will be obtained in a second measurement for the same purpose. An unreliable scale is useless. Unified reliability; more than one number, heterogeneous, but is used to measure the overall reliability of similar expressions (Raykov, 1998 as cited by Yaşlıoğlu, 2017).

5.5.2. Developing Structural Equation Modelling (SEM)

5.5.2.1. Direct Effects Among Variables (Hypotheses Testing). As stated above in earlier sections, the model provided in this section evaluates the impacts of the organization factor on the overall results of consulting work systems through its macroergonomic elements. 21 hypotheses have been developed to evaluate these impacts and analyzed them statistically using the SEM method.

In order to formulate research hypotheses, a thorough evaluation of the literature has been carried out, especially in professional ergonomics and publications about the consulting and service sector generally. Surprisingly, it was discovered that there are no studies that investigated the interaction between organization factors' macroergonomic compatibility and consulting work systems performance. Similar studies to this research, however, have been carried out in other work systems or fields of knowledge, and such works have contributed significantly to the development of the hypothesized relationships presented here (for example, Realyvásquez *et al.*, 2015; Realyvásquez *et al.,* 2018).

Based on these explanations, the following hypotheses were tested in this study:

$H_{1.1}$: In consulting work systems, teamwork has a positive direct effect on clients.

$H_{1.2}$: In consulting work systems, teamwork has a positive direct effect on firm performance.

$H_{1.3}$: In consulting work systems, teamwork has a positive direct effect on employees.

$H_{2.1}$: In consulting work systems, organizational culture and safety culture has a positive direct effect on clients.

$H_{2.2}$: In consulting work systems, organizational culture and safety culture has a positive direct effect on firm performance.

$H_{2.3}$: In consulting work systems, organizational culture and safety culture has a positive direct effect on employees.

$H_{3.1}$: In consulting work systems, coordination, collaboration, and communication has a positive direct effect on clients.

$H_{3.2}$: In consulting work systems, coordination, collaboration, and communication has a positive direct effect on firm performance.

$H_{3.3}$: In consulting work systems, coordination, collaboration, and communication has a positive direct effect on employees.

$H_{4.1}$: In consulting work systems, work schedules has a positive direct effect on clients.

$H_{4.2}$: In consulting work systems, work schedules has a positive direct effect on firm performance.

$H_{4.3}$: In consulting work systems, work schedules has a positive direct effect on employees.

$H_{5.1}$: In consulting work systems, social relationships has a positive direct effect on clients.

$H_{5.2}$: In consulting work systems, social relationships has a positive direct effect on firm performance.

$H_{5.3}$: In consulting work systems, social relationships has a positive direct effect on employees.

$H_{6.1}$: In consulting work systems, supervision and management styles has a positive direct effect on clients.

$H_{6.2}$: In consulting work systems, supervision and management styles has a positive direct effect on firm performance.

$H_{6.3}$: In consulting work systems, supervision and management styles has a positive direct effect on employees.

$H_{7.1}$: In consulting work systems, performance evaluation, rewards, and incentives has a positive direct effect on clients.

$H_{7.2}$: In consulting work systems, performance evaluation, rewards, and ıncentives has a positive direct effect on firm performance.

$H_{7.3}$: In consulting work systems, performance evaluation, rewards, and ıncentives has a positive direct effect on employees.

The direct effects and corresponding hypotheses of the organizational macroergonomic elements and performance indicators are shown in Figure 5.1. In the Figure, the direct effects are represented by using arrows connecting independent latent variables and dependent latent variables. On top of the arrows, the related hypothesis of each relationship is represented. As stated above, 21 hypotheses are constituted for direct relationships in order to both tests the direct effects and evaluate the significance of hypotheses.

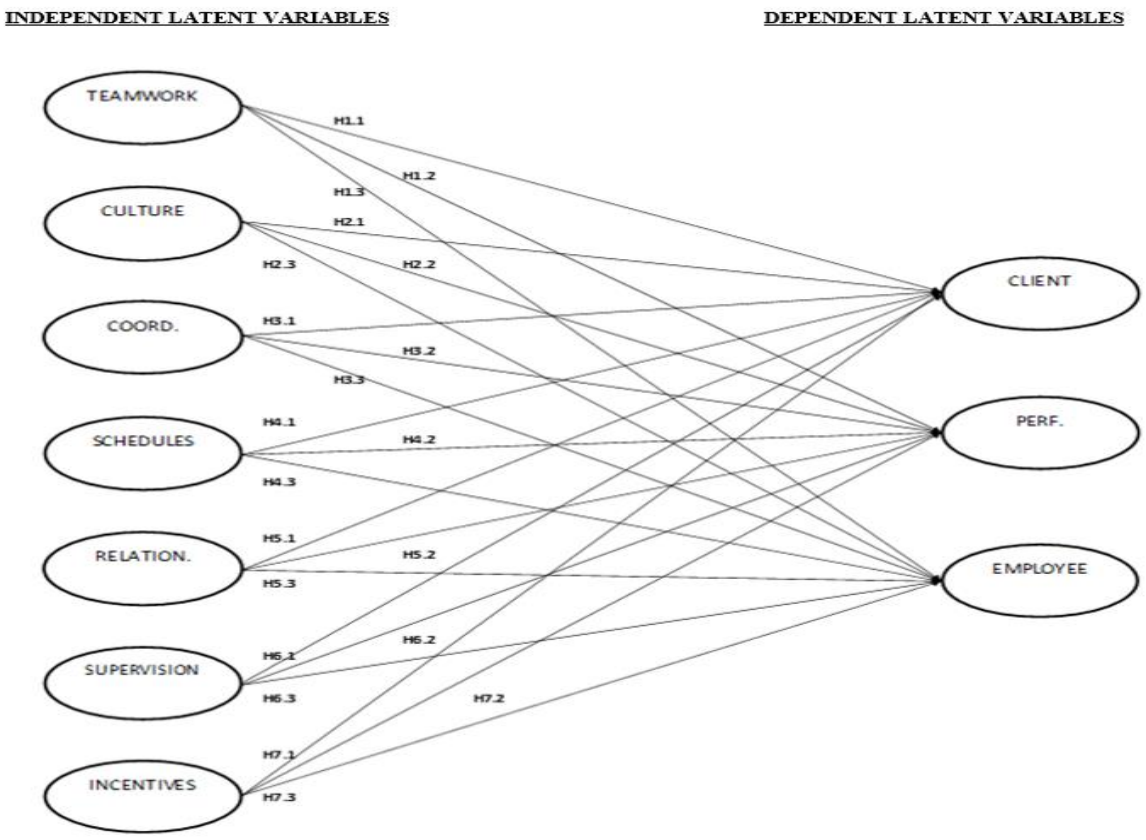

Figure 5.1. Hypothetical model (showing the direct relationships and corresponding hypotheses of the elements and performance categories).

5.5.2.2. Indirect Effects. Indirect effects (mediators) occur between dimensions and through other dimensions and emerge from the relation of several segments (Maldonado *et al.*, 2015). Indirect relationships can be tracked visually by following two or more model paths. These relationships are required to have complete visibility on the effects of organizational macroergonomic elements over performance categories because they may affect the magnitude of the total effect of an element.

In order to obtain relationships among elements, the form below represented in Table 5.23 is applied to the randomly selected 20 people to define which elements might affect other elements. This form is applied both verbally through a one-on-one interview and via mail communication.

Table 5.23. The form presented to determine relationships between organizational macroergonomic elements.

On / *Has effect*	Teamwork	Organizational culture and safety culture	Coordination, collaboration, and communication	Work schedules	Social relationships	Supervision and management styles	Performance evaluation, rewards, and incentives
Teamwork							
Organizational culture and safety culture							
Coordination, collaboration, and communication							
Work schedules							
Social relationships							
Supervision and management styles							
Performance evaluation, rewards, and incentives							

For example, regarding teamwork, it has been asked to the participants that “In consulting work systems, does teamwork have a positive direct effect on Organizational culture and safety culture?” This question asked for each pair of elements, respectively. After gathering results from participants, Table 5.24 is obtained by stating “1” as to say that there

is a positive direct effect and “0” as to say there is not any positive direct effect in order to build direct relationships between elements. Answer frequency is examined while deciding whether the relationship is “0” or “1”. If the frequency is higher or equal to ten for a specific relationship, then the relationship is stated as “1” and taken into account while analyzing the SEM. On the other hand, if the frequency is lower than 10, then the relationship is stated as “0” and not taken into account. The results of these values will be used to create additional relationships between organizational macroergonomic elements and to form related hypotheses.

Table 5.24. Summary of direct relationships between organizational macroergonomic elements.

On / *Has effect*	Teamwork	Organizational culture and safety culture	Coordination, collaboration, and communication	Work schedules	Social relationships	Supervision and management styles	Performance evaluation, rewards, and incentives
Teamwork		0	0	0	0	0	0
Organizational culture and safety culture	0		1(12)*	1(11)*	0	1(15)*	0
Coordination, collaboration, and communication	1(14)*	0		0	1(14)*	0	0
Work schedules	0	0	0		0	0	0
Social relationships	1(12)*	1(14)*	1(13)*	0		0	0
Supervision and management styles	0	1(12)*	0	0	0		1(12)*
Performance evaluation, rewards, and incentives	0	0	0	0	0	0	

* The values are in the bracelets represent the frequency of selection.

According to the direct relationships that were gathered from the 20 participants, an additional ten hypotheses formed from the analysis. These hypotheses are also used in the SEM and for a complete analysis, the indirect relationships resulting from those hypotheses are taken into the calculation of total effects. The ten hypotheses can be stated as follows:

$H_{8.1}$: In consulting work systems, organizational culture and safety culture has a positive direct effect on coordination, collaboration, and communication.

$H_{8.2}$: In consulting work systems, organizational culture and safety culture has a positive direct effect on work schedules.

$H_{8.3}$: In consulting work systems, organizational culture and safety culture has a positive direct effect on supervision and management styles.

$H_{9.1}$: In consulting work systems, coordination, collaboration, and communication has a positive direct effect on teamwork.

$H_{9.2}$: In consulting work systems, coordination, collaboration, and communication has a positive direct effect on social relationships.

$H_{10.1}$: In consulting work systems, social relationships has a positive direct effect on teamwork.

$H_{10.2}$: In consulting work systems, social relationships has a positive direct effect on organizational culture and safety culture.

$H_{10.3}$: In consulting work systems, social relationships has a positive direct effect on coordination, collaboration, and communication.

$H_{11.1}$: In consulting work systems, supervision and management styles have a positive direct effect on organizational culture and safety culture.

$H_{11.2}$: In consulting work systems, supervision and management styles have a positive direct effect on performance evaluation, rewards, and incentives.

Direct relationships and corresponding hypotheses among organizational macroergonomic elements are graphically presented in Figure 5.2. Relationships and related hypotheses are depicted by one-sided arrows.

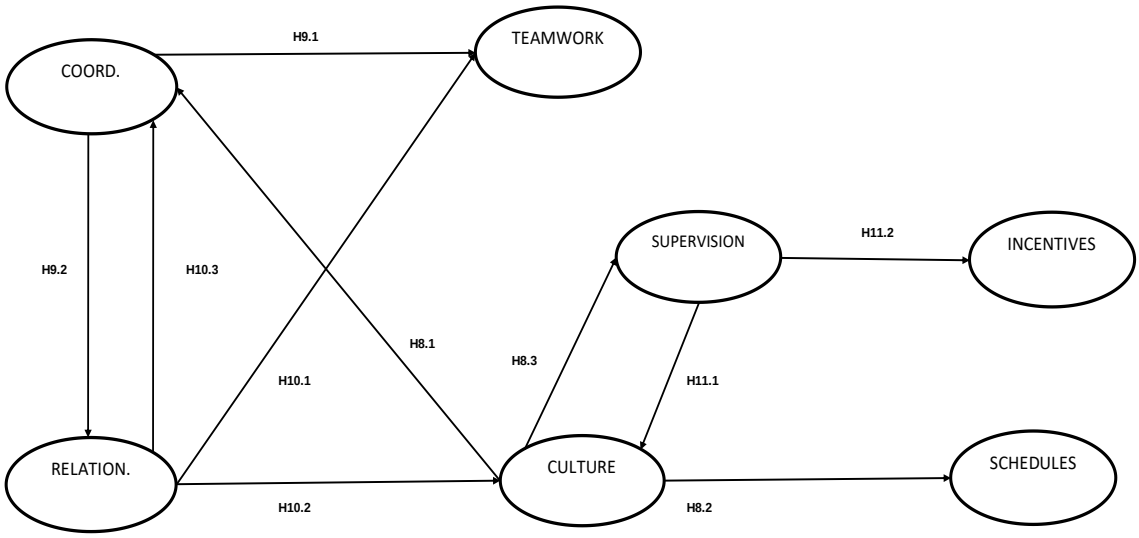

Figure 5.2. Additional paths to the hypothetical model (showing the direct relationships and corresponding hypotheses).

The initial SEM, including both direct relationships among organizational elements, direct relationships between organizational elements and performance categories, and indirect relationships, is represented in Figure 5.3 below. The model is graphically represented using the AMOS software. Relationships are represented using the one-sided arrow. The model also includes error (*e*) terms.

The SEM model includes all organizational macroergonomic elements and management consulting performance categories. For example, the Teamwork element with its five factors is represented in the Figure. The coding of factors as follows:

(i) Factor "1-1" means the first factor of the first element (Teamwork),
(ii) Factor "1-2" means the second factor of the first element (Teamwork),
(iii) Factor "1-3" means the third factor of the first element (Teamwork),
(iv) Factor "1-4" means the fourth factor of the first element (Teamwork),
(v) Factor "1-5" means the fifth factor of the first element (Teamwork).

Also, the factors have respective error terms from e_1 to e_5 and error term of Teamwork element e_{49}.

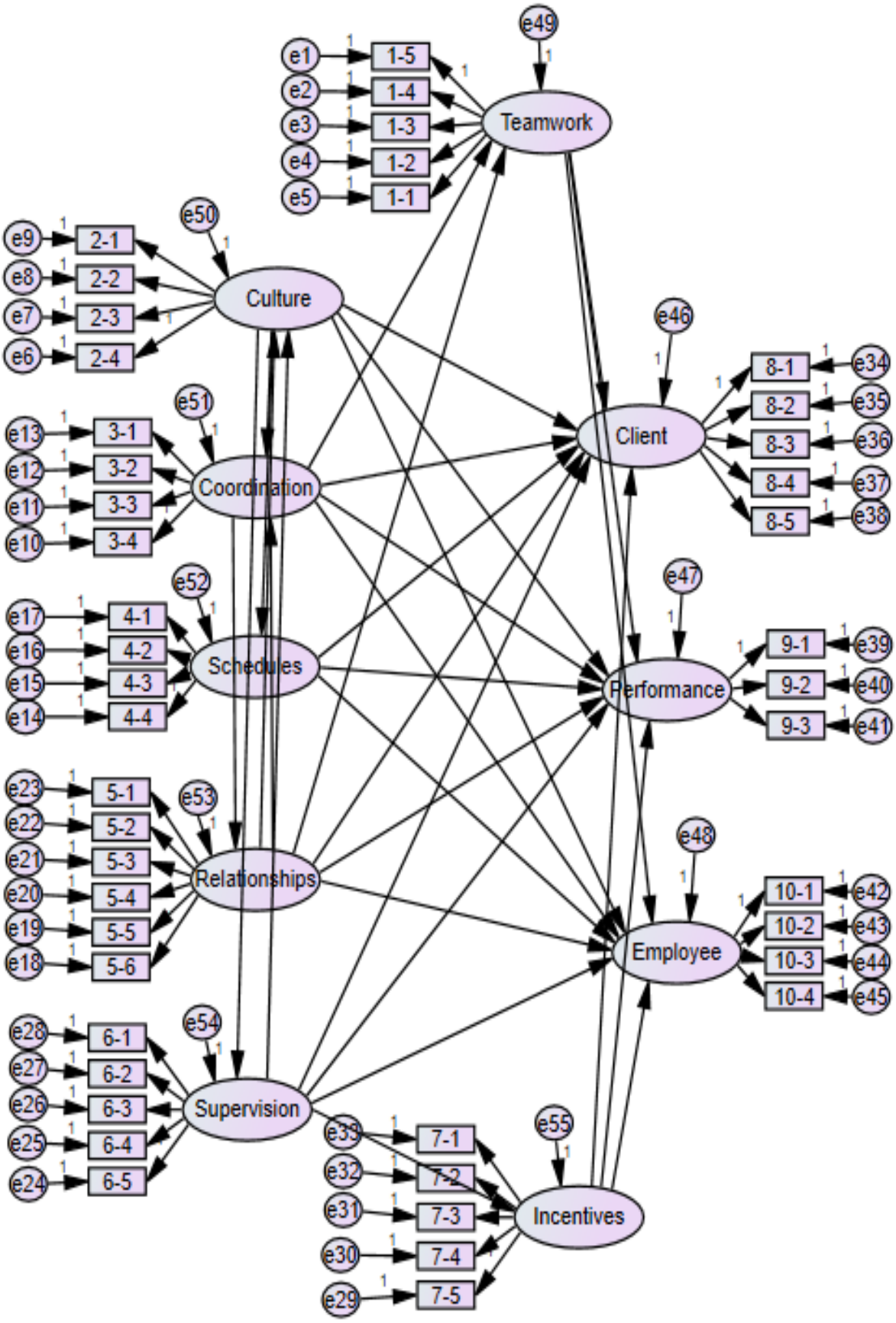

Figure 5.3. The initial SEM.

In terms of convergent validity, the initial model factors' have all the above 0.7 standardized regression weights except the fourth factor of the Coordination element (0.682), the fifth factor of Teamwork element (0.611), and the sixth factor of Social Relationships element (0.511). Thus, in order to ensure convergent validity, these three factors are excluded from the model. Also, discriminant validity is ensured since the correlations between factors are less than 0.8. However, when the model fit parameters are looked at, it can be seen that the model can be developed with better model fit parameters. So, modification indices should be looked at. Modification indices (MIs) were used to guide the addition of paths between error terms to enhance the fit of the SEM to these data. When MIs are looked at, there is a general rule of thumb that MI values over 20 should be looked at. In the initial model, some error terms that are related to factors are found MI value over 20. These error terms should be correlated with the double arrow in order to increase the fit of the model. In this analysis, the error terms which has the highest MI value covariated first and the analysis rerun. However, in order to do that, the error terms should be next to each other. This covariance represents that the similarly worded questions or the questions that understood similarly. This method continued until the model fit parameters have to represent the approximately high quality of the model. After this method, the convergent validity and discriminant validity of the corrected model is looked, and none significant changes have been seen after the modifications have been applied. This measurement model needs to be re-specified because the value of Fitness Indexes does not achieve the required level.

The final SEM structure is represented in Figure 5.4. In the final SEM structure, the arrows between latent variables represent the standardized regression coefficients and the arrows between factors and each representative latent variable shows the factor load value. In the final SEM, there are no standardized regression weights under 0.7, all correlations between factors are less than 0.8, and MI indices are lower than 20. Therefore, the model has better goodness of fit indices than the initial model. The difference between the initial model and final model is that the redundant three factors are excluded from the initial model and four double arrows representing the correlation between error terms are added to increase the initial model's fit.

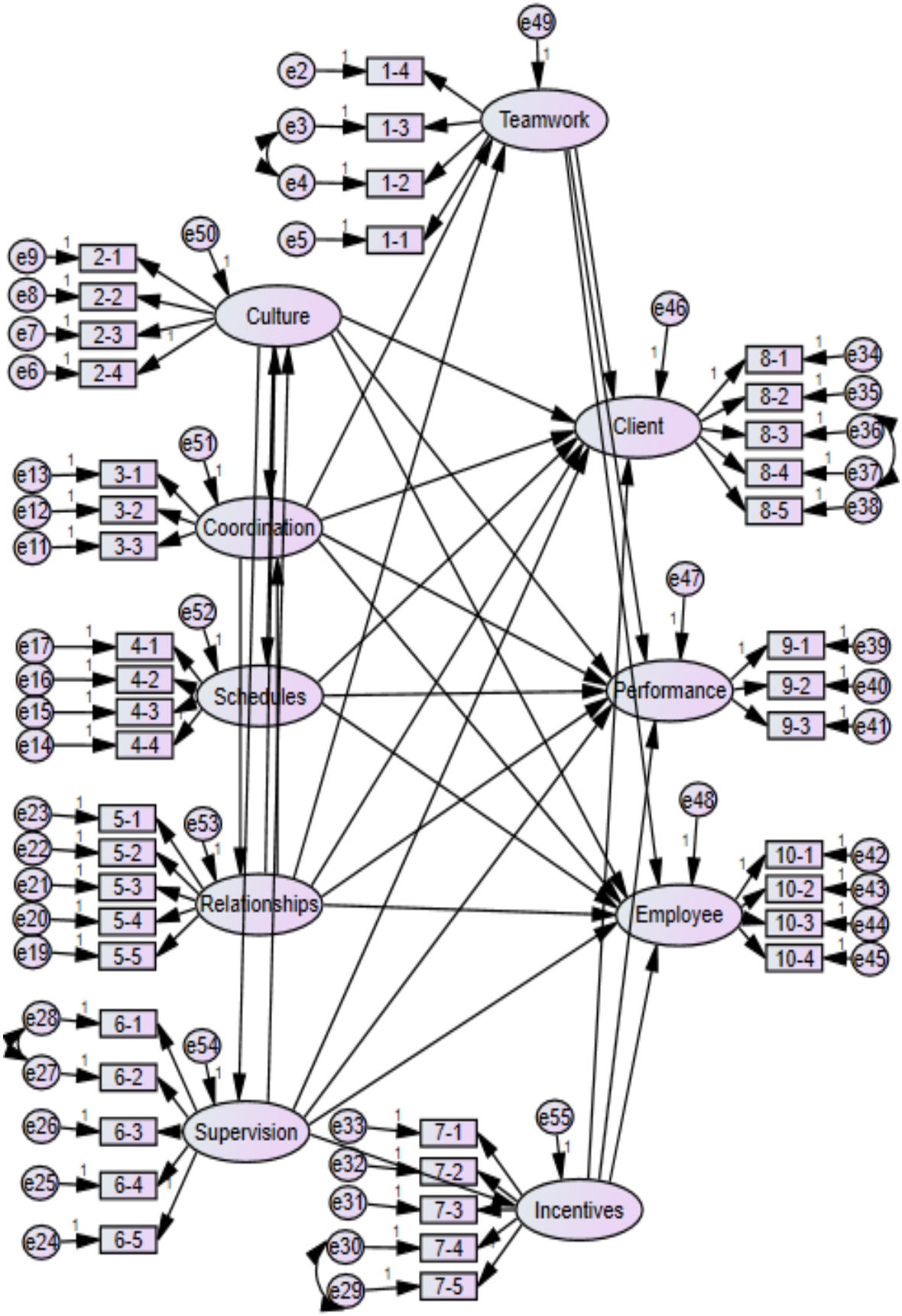

Figure 5.4. The final SEM.

5.5.2.3. Model Fit and Quality Indices. Several fitness indices are representing how the model fits the data at hand. The acceptance rate has been attained by all the fitness index values for the model. The fitness indices summary for the model is presented in Table 5.25.

Table 5.25. The fitness indices of the proposed SEM.

Category Name	Index Name	Index value	Result
Absolute Fit	Chisq	P = 0.132	A necessary acceptance level is reached.
	RMSEA	0.069	A necessary acceptance level is reached.
	GFI	0.911	A necessary acceptance level is reached.
Incremental Fit	AGFI	0.906	A necessary acceptance level is reached.
	CFI	0.913	A necessary acceptance level is reached.
	TLI	0.925	A necessary acceptance level is reached.
	NFI	0.921	A necessary acceptance level is reached.
Parsimonious Fit	Chisq/df	2.96	A necessary acceptance level is reached.

As far as the fitness indices are concerned, it can be said that the CFA analysis has confirmed the factor structure obtained from EFA.

As previously commented, this study first analyzes the direct effects between latent variables. Direct effects are represented in SEM as arrows that directly connect one latent factor to another and help to test hypotheses of the study. Direct effects that measure a dependent latent variable's sensitivity to changes in an independent latent variable while all other variables remain fixed in the study.

Figure 5.5 displays all the direct effect values. Each effect includes a beta (β) value as a dependency measure (standardized beta coefficient), while p-values determined the statistical significance of hypotheses. The strength of each independent variable effect on a dependent variable is compared by a standardized beta coefficient — the more the absolute beta coefficient is, the stronger the effect. For example, the relationship between Teamwork and Client (β = 0.298) is stronger than the relationship between Teamwork and Firm Performance (β = 0.262) since the first relationship's beta value is higher than the second. Standardized beta coefficients have their units as standard deviations. This makes it easy to compare the variables with each other. Various units and various scales are often used in regression analyses. Another factor may use dollars, for example, and another may use percentages. Standardizing coefficients implies that the relative importance of each variable

can be measured in a regression model. By subtracting the mean and dividing it into standard deviations from the variable, betas are calculated. This leads to standardized variables with a zero mean and a standard deviation of one (Freedman, 2009). In Figure 5.5, the dotted line shows the only rejected hypothesis, and the straight lines show the hypotheses that are accepted.

$$\beta = \frac{X - Mean}{sd} \tag{5.4}$$

Where X is the raw score, Mean is the sample mean, and sd is the standard deviation. For example, to explain the direct relationship between Teamwork (E_1) and Client, we can state the linear regression equation as follows:

$$Client = 0.298 \times E_1 + error_{client} \tag{5.5}$$

According to the above formula, it can be stated that one standard deviation increase in Teamwork organizational macroergonomic element leads to a 0.298 standard deviation increase in the Client performance category.

Table 5.26 represents a summary of the direct effects of organizational macroergonomic elements. From the Table, it can be seen that some of the p-values were lower than 0.01; in other words, relationships were statistically significant at a 99% confidence level. However, some of the relationships are varying at different p-values and statistically significance levels. For example, if the p-value is 0.04, then it can be stated as the relationship is statistically significant at a 96% confidence level. In order to generalize the relationship's significance, two levels of confidence are selected. They are 99% and 95% confidence levels. The relationship between Work schedules and Firm Performance showed p=0.1, which is why the corresponding hypothesis was rejected.

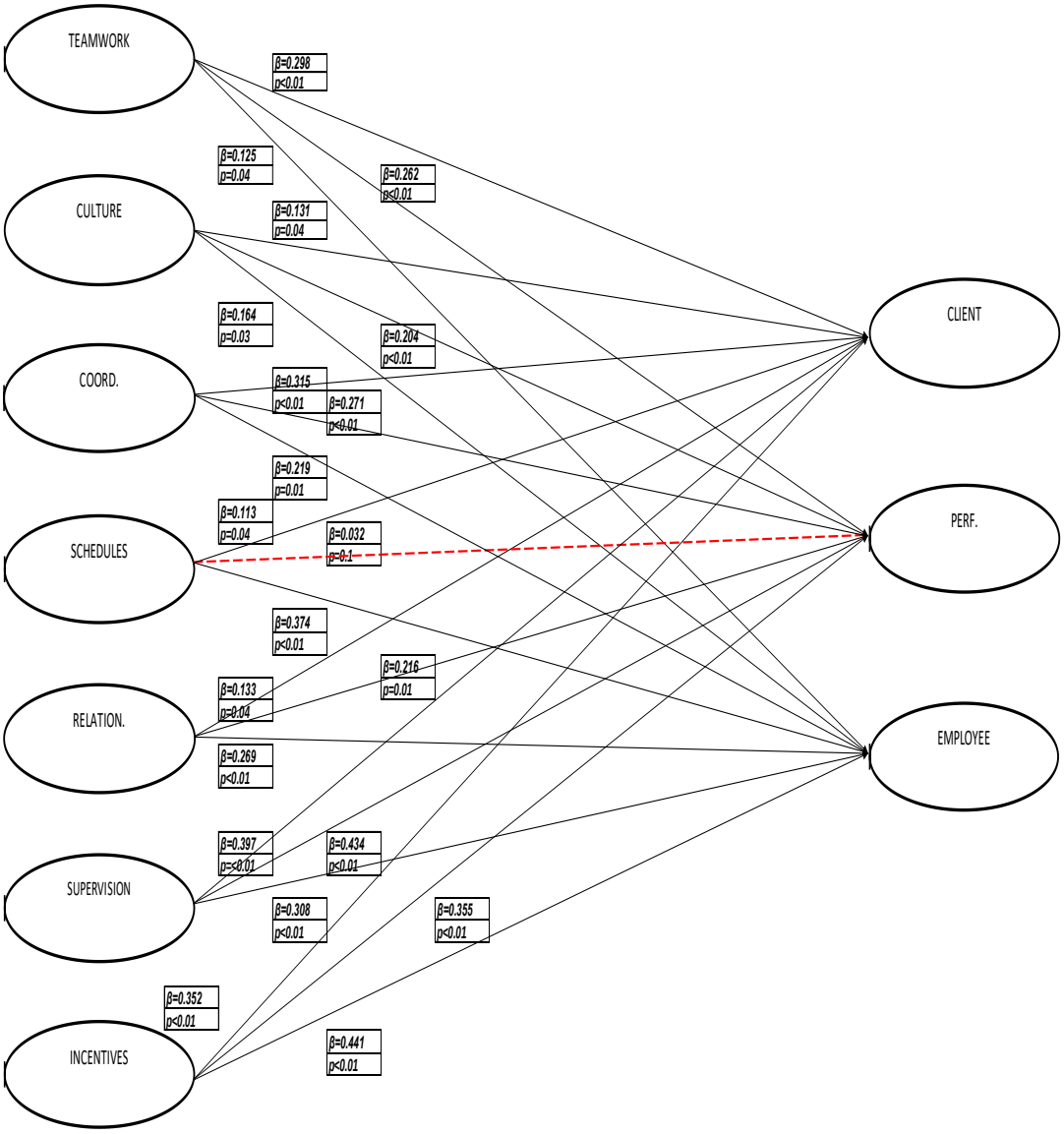

Figure 5.5. Beta value and p-value of each direct relationship.

Table 5.26. Summary of direct effects of organizational macroergonomic elements.

TO	**FROM**													
	Teamwork		**Organizational culture and safety culture**		**Coordination, collaboration, and communication**		**Work schedules**		**Social relationships**		**Supervision and management styles**		**Performance evaluation, rewards, and incentives**	
	Direct Effect	p-value	Direct Effect	p-value	Direct Effect	p-value	Direct Effect	p-value	Direct Effect	p-value	Direct Effect	p-value	Direct Effect	p-value
Client	0.298	0.01**	0.131	0.04**	0.315	<0.01*	0.113	0.04**	0.133	0.04**	0.397	<0.01*	0.352	<0.01*
Firm Performance	0.262	0.01**	0.204	0.02**	0.271	<0.01*	***0.032***	***0.1***	0.216	0.01**	0.434	<0.01*	0.355	<0.01*
Employee	0.125	0.04**	0.164	0.03**	0.219	0.01**	0.374	<0.01*	0.269	<0.01*	0.308	<0.01*	0.441	<0.01*

* The relationship is statistically significant at a 99% confidence level.
**The relationship is statistically significant at a 95% confidence level.

In Table 5.27, the results for the tested hypotheses (in other words, acceptance or rejection) depicted in Figure 5.6 are summarized. Hypotheses are shown in Table as independent variables that are affecting the dependent variables. The one in bold represents the only hypothesis that is rejected due to its p-value.

Summary of direct effects of organizational macroergonomic elements is represented in Table 5.28. It can be seen from the table that all direct relationships are statistically significant at the 95% confidence level, while some of them are statistically significant at a 99% confidence level. The direct relationships and corresponding hypotheses are shown in Figure 5.6. The black lines are representing the accepted hypotheses between elements.

Table 5.27. Summary of the hypotheses testing.

Hypothesis	**Independent Variable**	**Dependent Variable**	**Decision**
$H_{1.1}$	Teamwork	Client	Accepted
$H_{1.2}$	Teamwork	Firm Performance	Accepted
$H_{1.3}$	Teamwork	Employee	Accepted
$H_{2.1}$	Organizational culture and safety culture	Client	Accepted
$H_{2.2}$	Organizational culture and safety culture	Firm Performance	Accepted
$H_{2.3}$	Organizational culture and safety culture	Employee	Accepted
$H_{3.1}$	Coordination, collaboration, and communication	Client	Accepted
$H_{3.2}$	Coordination, collaboration, and communication	Firm Performance	Accepted
$H_{3.3}$	Coordination, collaboration, and communication	Employee	Accepted
$H_{4.1}$	Work schedules	Client	Accepted
$H_{4.2}$	**Work schedules**	**Firm Performance**	**Declined**
$H_{4.3}$	Work schedules	Employee	Accepted
$H_{5.1}$	Social relationships	Client	Accepted
$H_{5.2}$	Social relationships	Firm Performance	Accepted
$H_{5.3}$	Social relationships	Employee	Accepted
$H_{6.1}$	Supervision and management styles	Client	Accepted
$H_{6.2}$	Supervision and management styles	Firm Performance	Accepted
$H_{6.3}$	Supervision and management styles	Employee	Accepted
$H_{7.1}$	Performance evaluation, rewards, and incentives	Client	Accepted
$H_{7.2}$	Performance evaluation, rewards, and incentives	Firm Performance	Accepted
$H_{7.3}$	Performance evaluation, rewards, and incentives	Employee	Accepted

Table 5.28. Summary of direct effects among organizational macroergonomic elements.

On / *Has effect*	Teamwork	Organizational culture and safety culture	Coordination, collaboration, and communication	Work schedules	Social relationships	Supervision and management styles	Performance evaluation, rewards, and incentives
Teamwork	0	0	0	0	0	0	0
Organizational culture and safety culture	0	0	β=0.251 p<0.01*	β=0.214 p=0.01**	0	β=0.133 p=0.04**	0
Coordination, collaboration, and communication	β=0.249 p<0.01*	0	0	0	β=0.177 p=0.03**	0	0
Work schedules	0	0	0	0	0	0	0
Social relationships	β=0.256 p<0.01*	β=0.198 p=0.02**	β=0.243 p<0.01*	0	0	0	0
Supervision and management styles	0	β=0.201 p=0.02**	0	0	0	0	β=0.261 p<0.01*
Performance evaluation, rewards, and incentives	0	0	0	0	0	0	0

* The relationship is statistically significant at a 99% confidence level.

**The relationship is statistically significant at a 95% confidence level.

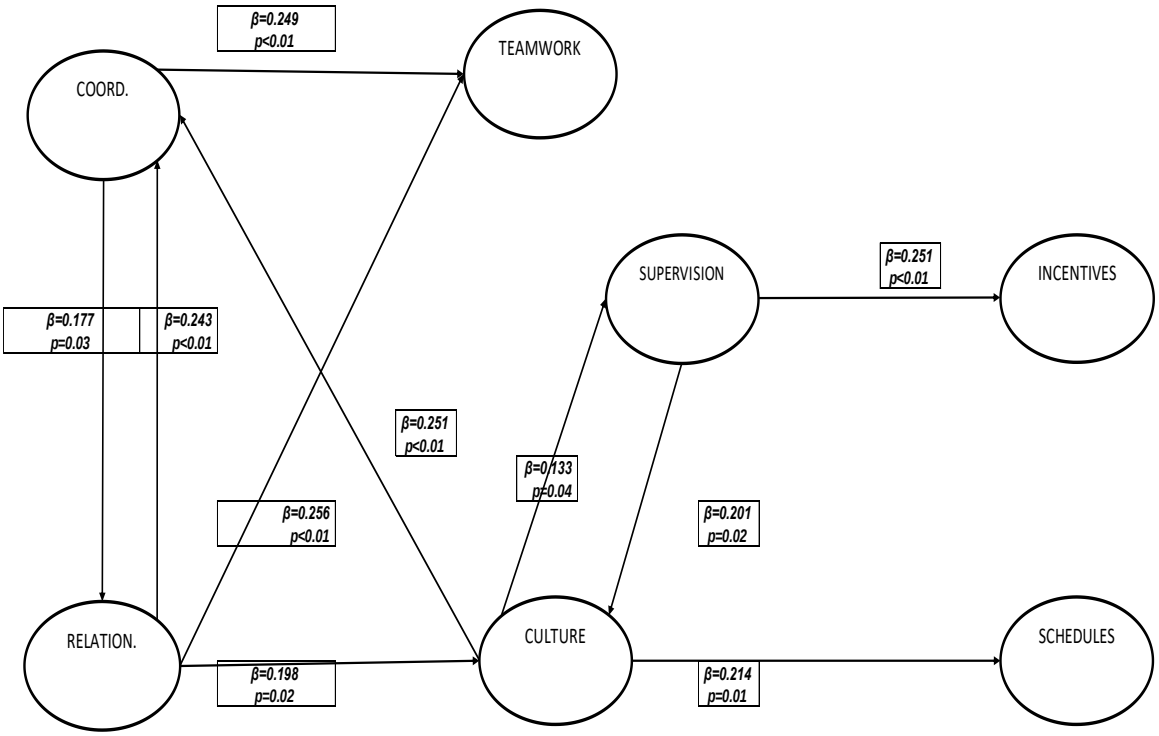

Figure 5.6. Beta value and p-value of each direct relationship.

The summary of direct relationships and decisions for corresponding hypotheses are represented in Table 5.29.

Table 5.29. Summary of the hypotheses testing among the elements.

Hypothesis	Independent Variable	Dependent Variable	Decision
$H_{9.1}$	Organizational culture and safety culture	Coordination, collaboration, and communication	Accepted
$H_{9.2}$	Organizational culture and safety culture	Work schedules	Accepted
$H_{9.3}$	Organizational culture and safety culture	Supervision and management styles	Accepted
$H_{10.1}$	Coordination, collaboration, and communication	Teamwork	Accepted
$H_{10.2}$	Coordination, collaboration, and communication	Social relationships	Accepted
$H_{11.1}$	Social relationships	Teamwork	Accepted
$H_{11.2}$	Social relationships	Organizational culture and safety culture	Accepted
$H_{11.3}$	Social relationships	Coordination, collaboration, and communication	Accepted
$H_{12.1}$	Supervision and management styles	Organizational culture and safety culture	Accepted
$H_{12.2}$	Supervision and management styles	Performance evaluation, rewards, and incentives	Accepted

Direct relationships between elements are determining the indirect relationships between one element and the performance indicators. Without indirect relationships, the presented SEM model will lack in necessary relationships.

In order to calculate indirect effects, both the relationships between elements and performance categories and the relationships among elements are merged into one model. The number of indirect effects between latent variables analyzed is shown in Table 5.30. The values in the table represent the β values. For example, it can be referred to as the indirect effect of organizational culture and safety culture element on the client performance category is 0.156. All indirect effects are statistically significant at a 95% confidence level according to their p-values as they were all $p < 0.05$. It can be noticed that all latent variables had a major indirect effect, while the most significant ones were from social relationships to the client and organizational culture and safety culture to employees.

Table 5.30. Indirect relationships between organizational macroergonomic elements and performance indicators.

	Teamwork	**Organizational culture and safety culture**	**Coordination, collaboration, and communication**	**Work schedules**	**Social relationships**	**Supervision and management styles**	**Performance evaluation, rewards, and incentives**
Client	0.000	β = 0.156	β = 0.094	0.000	β = 0.179	β = 0.118	0.000
Firm Performance	0.000	β = 0.133	β = 0.103	0.000	β = 0.170	β = 0.134	0.000
Employee	0.000	β = 0.176	β = 0.079	0.000	β = 0.118	β = 0.148	0.000

5.5.2.4. Total Effects. The total effects of a relationship correspond to the sum of its direct and indirect effects (Maldonado *et al.*, 2015). Table 5.31 shows the total effects found in this model. The formula can be represented as follows:

$$\beta_{direct} + \beta_{indirect} = \beta_{total} \tag{5.6}$$

$$\beta_{indirect} = \beta_{c\prime} = \beta_a \times \beta_b \tag{5.7}$$

Where the $\beta_{indirect}$ can be expressed as c' in below Figure 5.7. Also, β_a and β_b are respective standard coefficients of the path a and b.

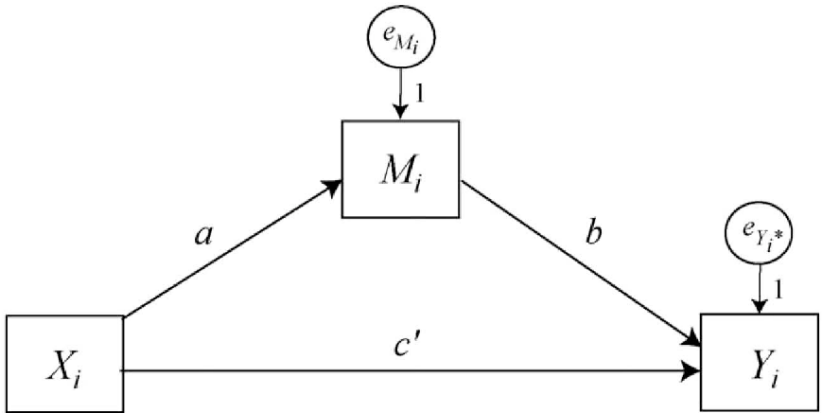

Figure 5.7. The exemplary model of indirect effect mediating by M_i.

Table 5.31. Total effects of organizational macroergonomic elements.

	Teamwork (E_1)	**Organizational culture and safety culture (E_2)**	**Coordination, collaboration, and communication (E_3)**	**Work schedules (E_4)**	**Social relationships (E_5)**	**Supervision and management styles (E_6)**	**Performance evaluation, rewards, and incentives (E_7)**
Client	0.298	0.287	0.409	0.113	0.312	0.515	0.352
Firm Performance	0.262	0.337	0.374	0.032	0.386	0.568	0.355
Employee	0.125	0.340	0.298	0.374	0.387	0.456	0.441

When the total effects on each element are ordered from large to small, the summarized Table 5.32 can be seen below.

Table 5.32. Total effects in descending order.

Client		**Firm Performance**		**Employee**	
Macroergonomic Element	**Total Effect**	**Macroergonomic Element**	**Total Effect**	**Macroergonomic Element**	**Total Effect**
Supervision and management styles	0.515	Supervision and management styles	0.568	Supervision and management styles	0.456
Coordination, collaboration, and communication	0.409	Social relationships	0.386	Performance evaluation, rewards, and incentives	0.441
Performance evaluation, rewards, and incentives	0.352	Coordination, collaboration, and communication	0.374	Social relationships	0.387
Social relationships	0.312	Performance evaluation, rewards, and incentives	0.355	Work schedules	0.374
Teamwork	0.298	Organizational culture and safety culture	0.337	Organizational culture and safety culture	0.340
Organizational culture and safety culture	0.287	Teamwork	0.262	Coordination, collaboration, and communication	0.298
Work schedules	0.113	Work schedules	0.032	Teamwork	0.125

Using the standardized variables, we estimate the model:

$$Y = \sum_{i=1}^{n} (\beta_i E_i) + error \tag{5.8}$$

Where, $\beta_1, \beta_2, \beta_3, \ldots \beta_n$ are the standardized regression coefficients and E_i represents organization macroergonomic elements. The estimated equations and R-squared values of each performance category represented in Table 5.32. Considering total effect values, the structural equations for the dependent latent variables can be stated as in Table 5.33.

Table 5.33. Estimated structural equations of each performance category and R-squared values.

Dependent Variable	Equation	R-Sq.	Adj. R-Sq.
Client	$(0.515 \times E_6) + (0.409 \times E_3) + (0.352 \times E_7) + (0.312 \times E_5) + (0.298 \times E_1) + (0.287 \times E_2) + (0.113 \times E_4) + \varepsilon_{Client}$	0.72	0.70
Firm Performance	$(0.568 \times E_6) + (0.386 \times E_5) + (0.374 \times E_3) + (0.355 \times E_7) + (0.337 \times E_2) + (0.262 \times E_1) + (0.032 \times E_4) + \varepsilon_{Firm\ Performance}$	0.77	0.76
Employee	$(0.456 \times E_6) + (0.441 \times E_7) + (0.387 \times E_5) + (0.374 \times E_4) + (0.340 \times E_2) + (0.298 \times E_3) + (0.125 \times E_1) + \varepsilon_{Employee}$	0.81	0.80

R-squared values reflect the contribution of independent (exogenous) variables to dependent (endogenous) variables. For each of these latent variables, they also represent the percentage of explained variance. Represented R-squared values are called the Coefficient of determination (R^2). The R^2 is a measure of the predictive accuracy of the model. Another way of viewing R^2 is that it reflects the combined effect on the endogenous variable(s) of the exogenous variable. This effect varies from 0 to 1, with a maximum predictive accuracy of 1. Since a variety of disciplines implement R^2, researchers rely on a standard "soft" thumb rule that defines significant, moderate, or low levels of predictive accuracy with 0.75, 0.50, 0.25, respectively (Hair *et al*., 2010).

Finally, as regards explained the variance, this research showed R^2 values above 0.7. As for the dependent variable Client, $R^2 = 0.72$ means that the dependent variable was 72% explained by independent variables. As for the other dependent variable Firm Performance, $R^2 = 0.77$ indicates the variable was 77% explained by independent variables. As for the last dependent variable Employee, R^2=0.81 means that the dependent variable was 81% explained by independent variables. According to this rule of thumb described, it can be said that the R^2 values are considered as adequately high. Moreover, in general, adjusted R^2 should be looked at rather than R^2. R^2_{adj} is an unbiased estimate of the fraction of variance explained, taking into account the sample size and number of variables. As for the dependent variable Client, R^2_{adj}= 0.72, for the other dependent variable Firm Performance, R^2_{adj}= 0.77, and for the last dependent variable Employee, R^2_{adj}=0.81. These Adj. R^2 values state that the equation has good explanatory power over dependent variables.

5.6. Findings of Data Analysis

The findings of the data analysis are explained below:

- The direct effects were found significant at all relationships except the relationship between Work Schedules and Firm Performance since its p-value is higher than 0.05 at the confidence level 95%.
- The result gathered from the relationship between Work Schedules and Firm Performance mainly supports the general idea that consultants are eager to work hard, and although it has some effect, Firm Performance measurements are not affected by high Work Schedule scores from consulting companies.
- As for the company performance indicators regarding the Client, results revealed that Supervision and Management Styles has the highest total effect ($\beta = 0.515$) on this performance category, thereby demonstrating that Supervision and Management Styles are crucial for the competitiveness of consulting work systems. While Supervision and Management Styles represent the highest effect on the Clients, the analysis showed that the organizational element Work Schedules has the least effect ($\beta = 0.113$) on the Clients; however, it stays statistically significant.
- As for the second company performance indicators regarding the Firm Performance, results revealed that Supervision and Management Styles also has the highest total effect ($\beta = 0.568$) on this performance category, thereby demonstrating that Supervision and Management Styles are crucial for the competitiveness of consulting work systems. While Supervision and Management Styles represent the highest effect on the Firm Performance, the analysis showed that the organizational element Work Schedules ($\beta = 0.032$) has the least effect on the Firm Performance, which also let this relationship to be statistically insignificant.
- As for the last company performance indicators regarding the Employee, results revealed that Supervision and Management Styles also has the highest total effect ($\beta = 0.436$) on this performance category, thereby demonstrating that Supervision and Management Styles are crucial for the competitiveness of consulting work systems. While Supervision and Management Styles represent the highest effect on the Firm

Performance, the analysis showed that the organizational element Teamwork has the least effect ($\beta = 0.125$) on the Employee; however, it stays statistically significant.

- Represented 30 hypotheses have accepted, meaning; all organizational elements positively affect the performance categories except Work Schedules.

6. DISCUSSION

The primary lesson for an organization in an ever-changing business environment that wants to develop its strategic capability is that planning and focusing solely on the technical side of the work system results in a dramatic technological and operational change. Managers must consider the broader requirements and be aware of potential falls in the incompatibility of the work system (Koyuncu *et al.,* 2011). Previous experience demonstrates that the design of the work system should fulfill the essential requirements for STSs in order to succeed.

Work System performance management is considered one of the critical factors for long-term success. Moreover, the question is, "How should a work system be designed and managed in such a way that the system irritation is minimized, and harmonization or compatibility is maximized?" (Hendrick and Kleiner, 2001). As companies pursue more aggressive ways to increase their competitiveness, it is becoming progressively essential to establish and maintain high levels of harmonization between elements of the work system. (Hendrick, 2000). In other terms, solutions that match all the work system elements to produce the anticipated business results in the business world are required to be identified. It is argued that this would ensure that system elements are optimally ergonomically compatible with the overall structure of the system (Kleiner, 2006). A lack of compatibility may have a direct negative effect not only on the productivity and efficiency of the work system but also on employee morale, dedication, and intrinsic job satisfaction. Macroergonomics removes the just stated pitfalls and fulfills the human-centered design of the work systems and incorporates its methods and tools to establish a wholly harmonized macro and microergonomic work systems

Modern ergonomics has focused on improving indicators such as efficiency, health, safety, and work life quality. While such local improvements are significant, the stress on work systems to achieve a global improvement is growing. Although work system designers typically concentrate on the human-machine interface level, the interface level of human-organization is usually overlooked. Macroergonomics often focuses on the level of

the organization and fills the gap by concentrating its activities on both levels uniquely and presents a greater emphasis on work system designers achieving large-scale organizational improvement. Particular attention is given to the different elements of the organizational factor in the external environment and the need to incorporate a macroergonomic approach to the design of the work system at all levels. The large-scale organizational change, generating positive organizational change, and performance improvement can be accomplished with the unique commitment to the organization factor and its elements. In this regard, it is crucial to understand comprehensively what the effects of organizational factor elements over work system performance are. It is, therefore, necessary to analyze the respective effects of elements over the selected performance measurements and to identify which elements have higher effects and will give the best performance results in a short period if an adequate commitment has been given. Within the scope of this study, one of the most popular service sectors in the world, the management consulting service's work system is selected for the analysis.

This research examines the effects of organizational macroergonomic compatibility elements over consulting work systems performance. In order to reach the main objectives of this research, firstly the MCQ which was acquired from the studies of Realyvásquez *et al.* (e.g., Realyvásquez *et al.*, 2015; Realyvásquez *et al.*, 2018) and modified through the aspects of consulting work system applied for initial data collection from the participants. After data collection, demographics such as gender, age, position in the company, the highest level of formal education, and total experience duration are analyzed to acquire a better understanding of the survey participant's characteristics. Then, EFA was applied to obtain a small number of specific factors that include questions and explains the maximum variance and based on the relationships between observed variables. After the explanatory model was gained, CFA was applied to test the suitability of the factors determined by EFA to the factor structures determined by the hypothesis. At the CFA phase, the assigned hypotheses were tested, and the direct, indirect, and total effects of organizational factor elements are determined by using the most used CFA methodology structural equation modeling according to the research's objective. Finally, the exact solution is acquired by using the AMOS program.

The present study has found enough evidence to determine supervision and management styles organizational macroergonomic element as the most significant element since its effect on all three performance categories is the highest. Moreover, work schedules has found the least contributor to the client and firm performance categories. This result may be due to the fact that the survey participants were middle and senior managers. Besides, coordination, collaboration, and communication; social relationships; performance evaluation, rewards, and incentives elements have a very significant effect on the performance categories. As for client performance category, coordination, collaboration, and communication has the second whereas performance evaluation, rewards, and incentives has the third-highest effect. Regarding the firm performance category, social relationships has the second whereas coordination, collaboration, and communication has the third-highest effect. Lastly, for the employee performance category, performance evaluation, rewards, and incentives has the second whereas social relationships factor has the third-highest effect. These results may differ depending on the hierarchical level of the participants in the company. It can be clearly stated that the perceptions of employees and managers can vary significantly.

According to the literature, all organization macroergonomic elements have a certain effect on both manufacturing and service work system performance. The main findings of this study support the early literature since almost all organizational macroergonomic elements affect the determined performance categories. However, it is found differently compared to the early studies that the work schedules have an insignificant effect on firm performance measures.

This study has several strengths in certain aspects compared to previous studies. Firstly, in terms of the target group and the scope of the study is unique since there was no study that investigated the effects of organization macroergonomic elements on consulting work system performance. Secondly, the new MCQ for management consulting companies was developed to collect data. The developed MCQ can also be applied to other service companies by slightly modifying the questionnaire. Thirdly, the reliability of the MCQ has been tested both internal consistency and stability. Fourthly, the study includes middle and senior management to collect more reliable data about both MP and performance assessment.

Fifthly, the validity and reliability of constructed factor structure have been checked from different aspects. Moreover, the methodology to apply CFA after EFA presents great potential to improve the process of extracting essential factors from questions and confirm the developed model with SEM for this particular topic. Lastly, the SEM includes all of the organizational macroergonomic elements and both their relations among them and between performance categories.

The sub-discipline and viewpoint of macroergonomics need to be recognized in the field of professional services, especially in developing countries. Interestingly, macroergonomics provides the desperately needed efficient use of resources by harmonizing elements of the work system in economically developing countries such as Turkey. Consulting companies with an ergonomics or macroergonomics perspective would greatly benefit the business - and thus, its clients and stakeholders - from this perspective. The competitiveness of consulting work systems should be driven in such an increasingly competitive marketplace by analyzing the organizational macroergonomic factor and its elements.

Organizations seek to improve the performance of their work systems in many situations. Macroergonomics aims to shift the focus from just one element of the work system (for example, the individual worker and the tools used) to a more comprehensive analysis of what leads to the key metrics of performance. Macroergonomic compatibility refers to the ability of organizational requirements, activities, and environment to integrate and operate effectively, agreeably, and organized within a work system with the person factor. To maximize the well-being and efficiency of the employee and the work system, the compatibility of the human-work system must be evaluated on all elements of the organization macroergonomic factor. Besides, these are the very elements that can dramatically increase the productivity of the work system and the people and organization harmony. The method of joint optimization of the macro-ergonomic organizational elements throughout the organization is suggested to ensure that system components have optimal macroergonomic compatibility with the overall system structure and sustainable system functionality. This can result in an increased chance of optimum process functioning and efficiency, including performance, health, comfort, employee morale, and work life quality.

The model based on the SEM solution can be used to prioritize which organizational elements are crucial for the consulting work system to achieve the best performance results for the categories of Client, Firm Performance and Employee. Herein, the represented model provides some valuable and new insights to build macroergonomic techniques for consulting work systems and a better understanding of which organizational macroergonomic elements to focus on for the consulting companies to be more competitive while increasing the service quality to the customers, to be more agile with sustainable and harmonized work systems, and to be seen as the favorable company to work by improving the quality of life at work. Therefore, knowledge of direct and indirect results derived from organizational elements on consulting job systems facilitates the development and enhancement of these systems significantly.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

Macroergonomics provides a narrow and broader view of the design of the process; explores the goals of organizational environments culture and the work system goals (Hendrick and Kleiner, 2001). It aims to have a truly harmonized work system at both microergonomic and macroergonomic levels by creating stronger relationships between these two fields (Hendrick, 2000). Work system design problems disturb the service sector, and there are significant needs for human-organization interaction. Practically, every organization in this era is challenged, and those challenges reach beyond the human-machine interface solution level. These and other instances show the need for a broad perspective to the system as proposed by macroergonomics. Macroergonomics appears to be able to deal with the new issues that arise from the rapidly changing world while still coping with internal problems. Good macroergonomic design determines the number of aspects of the work system's microergonomic design and thus guarantees that work system elements remain ergonomically consistent with the overall structure of the work system. When work systems have compatible macroergonomic design, then the synergistic work of organizational macroergonomic elements affects productivity, safety, employee satisfaction, perceived quality of work life, and worker well-being positively.

This study represents an important step toward a better understanding of why the consulting companies should implement organizational macroergonomic practices into their work system. Specifically, this research has three significant advantages for the literature in the context of examining and comprehending organizational macroergonomic elements in consulting companies.

(i) Firstly, enhanced knowledge has been gained thanks to the study examined all the organizational macroergonomic elements and put forward a more holistic approach, and all effects on the predetermined performance factors were examined and compared in a comprehensive model.

(ii) The second important contribution of the study is that even though researches are examining the effects of several macroergonomic factors on the manufacturing work systems, so far, no such work has been done on service work systems. Therefore, this study represents a unique position in this research area by investigating such factor's elements in one of the essential industries grow their businesses worldwide; namely, management consulting.

(iii) Finally, the use of MCQ and the following methods used after the data collection makes this study inventive since both applied questionnaire validation methods, and factor analyses helped to gain more reliable data and, accordingly, the results. To the author's knowledge and as can be seen from the literature review, there are no previous data analysis and profound research on this precise topic that validates the applied questionnaire in many points of view and includes all organizational macroergonomic elements in a single model.

The findings of this study demonstrate that organizational macroergonomic elements are key to the competitiveness of management consulting work systems since almost all the analyzed latent variables had significant total effects on the performance categories. Supervision and management styles have direct, indirect, and total effects on almost all the remaining latent variables. Therefore, this organizational macroergonomic element is found as the most significant contributor to the competitiveness of management consulting companies. Similarly; supervision and management styles cause the largest effect on organizational culture and safety culture and performance evaluation, rewards and incentives. Also, social relationships cause the largest effect on teamwork. Results also stated that organizational culture and safety culture cause the largest effect on communication, collaboration and communication; work schedules; and supervision and management styles. Finally, coordination, collaboration and communication cause the largest effect on social relationships.

In addition, social relationships have the largest indirect effects on client and firm performance whereas the second-largest total effects on firm performance, and the third-largest total effect on employee performance category. Likewise, it is found that organizational culture and safety culture have the largest indirect effects on employee

performance category. Although it has the largest indirect effect on the employee, it has a moderately low total effect on both three performance categories as stated in Table 5.32. Such results imply that management consulting work systems must pay close attention to organization-related variables, such as management and supervision styles; coordination, collaboration, and communication; social relationships; and performance evaluation, rewards, and incentives if they wish to increase their competitiveness.

Considering Figure 5.5 and Figure 5.6, and Table 5.27 and Table 5.29, the following conclusions can be proposed:

- In consulting work systems, the macroergonomic compatibility of *Teamwork* is necessary for *Client Satisfaction*, effective *Firm Performance* measures, and *Employee Well-Being* ($H_{1.1,}$ $H_{1.2,}$ $H_{1.3}$).
- In consulting work systems, the macroergonomic compatibility of *Organizational Culture and Safety Culture* is necessary for *Client Satisfaction*, *Effective Firm Performance* measures, and *Employee Well-Being* ($H_{2.1,}$ $H_{2.2,}$ $H_{2.3}$).
- In consulting work systems, the macroergonomic compatibility of *Coordination, Collaboration, and Communication* is necessary for *Client Satisfaction*, *Effective Firm Performance* measures, and *Employee Well-Being* ($H_{3.1,}$ $H_{3.2,}$ $H_{3.3}$).
- In consulting work systems, the macroergonomic compatibility of *Work Schedules* is necessary for *Client Satisfaction* and *Employee Well-Being* ($H_{4.1,}$ $H_{4.3}$).
- This study found enough statistical evidence to reject the hypothesized relationship $H_{4.2}$, the relationship between *Work Schedules* and *Firm Performance*. Therefore, although it is beneficial to some degree to have the work schedules macroergonomic compatibility, in consulting work systems, it is not really necessary for achieving effective firm performance measures.
- In consulting work systems, the macroergonomic compatibility of *Social Relationships* is necessary for *Client Satisfaction*, effective *Firm Performance* measures, and *Employee Well-Being* ($H_{5.1,}$ $H_{5.2,}$ $H_{5.3}$).
- In consulting work systems, the macroergonomic compatibility of *Supervision And Management Styles* is necessary for *Client Satisfaction*, effective *Firm Performance* measures, and *Employee Well-Being* ($H_{6.1,}$ $H_{6.2,}$ $H_{6.3}$).

- In consulting work systems, the macroergonomic compatibility of *Performance Evaluation, Rewards, and Incentives* is necessary for *Client Satisfaction,* effective *Firm Performance* measures, and *Employee Well-Being* ($H_{7.1,}$ $H_{7.2,}$ $H_{7.3}$).
- In consulting work systems, the macroergonomic compatibility of *Organizational Culture and Safety Culture* is necessary for the macroergonomic compatibility of *Coordination, Collaboration and Communication; Work Schedules;* and *Supervision and Management Styles* ($H_{8.1,}$ $H_{8.2,}$ $H_{8.3}$).
- In consulting work systems, the macroergonomic compatibility of *Coordination, Collaboration, and Communication* is necessary for the macroergonomic compatibility of *Teamwork* and *Social Relationships* ($H_{9.1,}$ $H_{9.2}$).
- In consulting work systems, the macroergonomic compatibility of *Social Relationships* is necessary for the macroergonomic compatibility of t*eamwork; Organizational Culture and Safety Culture;* and *Coordination, Collaboration and Communication* ($H_{10.1,}$ $H_{10.2,}$ $H_{10.3,}$).
- In consulting work systems, the macroergonomic compatibility of *Supervision and Management Styles* is necessary for the macroergonomic compatibility of *Organizational Culture and Safety Culture;* and *Performance Evaluation, Rewards, and Incentives* ($H_{11.1,}$ $H_{11.2}$).

This study, in general, revealed the effects of a fully harmonized work system in terms of organizational elements through the developed model and illustrated how macroergonomics could achieve impressive performance results in a more comprehensive assessment of macroergonomic practices. Through organizational macroergonomic elements, this research has generally demonstrated the effects of a fully harmonized work system and showed that macroergonomics and its elements could achieve impressive results in a comprehensive evaluation of work systems and set priorities in the components of a work system design. The macroergonomic organizational elements of a consulting work system design could be prioritized concerning macroergonomics through the proposed SEM model. The findings of the proposed SEM could be used to evaluate potential compatibility deficiencies in work system design, and necessary actions could be taken to make the work system more macroergonomically compatible. Consequently, decisions on improving the work system could be made based on the priorities determined by the SEM.

7.2. Recommendations for Practitioners

As regards results introduced earlier, the following conclusions for macroergonomic compatibility in consulting work systems can be proposed:

(i) Supervision and Management Styles is the most influential element for all three performance indicators, which does the inevitable practice for a consulting company in order to be more competitive and successful compared to the rivals.

(ii) The consulting companies should pay their attention to the organizational macroergonomic practices since almost all the elements have a significant effect on the performance measures and understand that without compatibility for one element, the company will start to be left behind in today's highly competitive business world.

(iii) Consulting work systems must be open to change and improve in order to gain competitive advantage by implementing ergonomic practices at all levels (microergonomic and macroergonomic) and enhancing those already applied.

(iv) To increase long-term business benefits, organizations working in the consulting industry, as well as any other type of company, should design their work systems without neglecting macroergonomic factors.

(v) It is crucial that management consulting firms should create an ongoing process responsible for ensuring that the initiatives and practices that move work system compatibility one step forward not only in theory but in practice take place.

Such findings provide some new and relevant information for developing macroergonomic strategies for consulting work systems in order to increase their competitiveness in terms of business results coming from good client-consulting company relationships and projects and increase their overall well-being and happiness in work. Moreover, knowledge about direct and indirect effects derived from organizational elements over consulting work systems supports designing and improving these work systems by applying macroergonomic practices.

For overall organizational harmonization, the macroergonomic elements should be identified, weighted, prioritized, and used in consulting work system designs. In this sense,

the developed model may help the consulting company decision-makers to prioritize their action plans through the road of being macroergonomically compatible and invest their resources intelligently. Meaning, the model based on SEM solution can be used to prioritize which elements are essential while creating high performing work system in the consulting sector. By using the suggested approach, convincing decision-makers through setting priorities (because it is realized that consulting companies are often reluctant to follow all the recommendations of the represented study due to time, cost, expertise, and motivation constraints) would enhance the solution implementation. If the genuine dedication and attention are paid to the prioritization of the organization macroergonomic elements, the performance results emerging from the work system will be useful in reaching higher tiers of the consulting industry. This thesis will represent a guideline to the consulting companies, which are both wanting to increase the performance indicators separately and increase the overall performance of their work system.

The employees and senior managers must collectively refine the characteristics of the work system in macroergonomic requirements in order to achieve organizationally compatible consulting work systems. This research is believed to demonstrate how numerous performance measures can be enhanced simultaneously by organizational macroergonomics elements included in a consulting work system. From a strategic perspective, understanding harmonization and compatibility between elements of the work system can help identify and focus on the appropriate elements that fit into the organizational environment. Knowledge of the specific organizational macroergonomic elements of a given work system will guide employees from all hierarchical levels to improve these critical dimensions in a macroergonomic context.

7.3. Recommendations for Future Research

The results of this study helped pave the way for further studies in the macroergonomic compatibility research topic in service work systems. In addition to the implications suggested before, in this study, it is pointed out that only effectively managed system compatibility should be seen as a competitive advantage. Through the proposed SEM, managers will make better choices on the design and management approaches for their

consulting work systems used in their organizations. Compared to previous studies on improving organizational performance, this study allowed us to streamline the structure of strategic decision-making to be more consistent with the characteristics of the company's socio-technical work environment, considering all macroergonomic organizational elements.

That said, methodology and target group for this study are an original, brand new approach to the analytics of macroergonomics since they combine macroergonomic compatibility with the overall performance of the consulting work system (assessed by clients, company performance, and employees) across a number of macroergonomic elements. Ultimately, concerning MCQ for consulting firms, it is assumed to be a new and useful method for collecting information on macroergonomic activities in the service sector. The MCQ efficiently works with the aid of statistical methods and mathematical models to assess the macroergonomic compatibility of the work system. In order to shed light on future studies, although the MCQ designed in this study applied in the particular work system, it can be modified and applied to the other companies which are operating in the service sector, such as banks, insurance, and so on.

However, these results are only valid to the consulting companies having participated in the research. To obtain better results and recommendations, similar research has to be extended to other countries, cultures, and industrial sectors, as this would increase the external validity of the proposed model.

In further research, this method could be used with expanded evaluation indicators, different or additional macroergonomic factors for new or existing work system design processes. Moreover, the investigated direct relationships between organizational macroergonomic elements determined by the 20 selected participants from consulting companies. This does not mean that all direct relationships among elements are limited to investigated relationships. Future studies can include other not investigated direct relationships among elements by determining them with some other methodology. This will undoubtedly increase the extent of this research area.

I firmly believe that this master thesis, including the methods and models used, provides guidance to professionals and researchers on the analysis of processes of work system design across various macroergonomic organizational elements. Proposed SEM can be adapted to any work system, provided the criteria are correctly identified, and there are some dependencies among them. This research subject constitutes a promising future research line in the field of macroergonomics. This thesis reflects a unique situation in the sense that macroergonomic compatibility for service work systems is a different approach for work system evaluation.

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APPENDIX A: MACROERGONOMIC COMPATIBILITY QUESTIONNAIRE

The appendix section includes the macroergonomic compatibility questionnaire that was used in this study. Also, this section includes forms such as invitation, necessary information, and privacy policy.

A.1: The invitation form that was used to draw potential participant's attention and give information about the author and the context of the study.

A.2: Personal consent form is prepared and a detailed description of the aim and procedures of the study are included in this form. In order to participate in this study, all of the participants voluntarily checked, "Yes, I agree."

A.3, A.4, and A.5: Detailed information about what to measure in each section was given to the participants in this form.

A.6: Privacy policy declaration was given in order to aware participants about their privacy protection. Also, this form is including some questions as a reward for the completion of the questionnaire to encourage the participant to complete the questionnaire and keep their attention.

A.7: A full version of the macroergonomic compatibility questionnaire in English was presented in this form.

A.8: A full version of the macroergonomic compatibility questionnaire in Turkish was presented in this form.

A.1. Invitation Mail to the Questionnaire

Merhaba …. Hanım/Bey,

İsmim Deniz Kaya. Boğaziçi Üniversitesi Endüstri Mühendisliği Yüksek Lisans öğrencisiyim. Derslerimi başarı ile tamamlamış olup şu an tez yılıma girmiş bulunmaktayım. Yüksek lisans tezim kapsamında sizi, hedef kitlesi yönetim ve strateji danışmanlığı firmalarında çalışanlar olan ankete davet etmek istiyorum.

Bu yüksek lisans tezi, hem kapsam hem de araştırdığı faktörler açısından Türkiye'de özgün bir değer taşımaktadır. Siz de bu çalışmaya, ankete katılımınız ile destek olursanız gerçekten mutlu olacağım. Anket ile ilgili tüm detay bilgi anketin içinde mevcuttur. Anket yaklaşık olarak 20 dakikanızı alacak olup soruların dili ise İngilizce'dir.

Bu anketi, kendisini ilgilendiren ve hedef kitlesine dahil olarak gördüğünüz iş arkadaşlarınıza ve tanıdıklarınıza iletebilirsiniz. Şimdiden ilginiz ve emekleriniz için teşekkür ederim.

Saygılarımla,

Deniz.

A.2. An Informative Form About the Questionnaire and the Study in General

Macroergonomic Compatibility Questionnaire

Name of the master thesis: Effects of macroergonomic organization factor on consulting work system performance.

Dear participant,

I am doing my master's degree at Bogazici University. I also have experience in management consultancy. I am conducting research for my master thesis on the effects of macroergonomic organization factors on consulting work system performance. The main aim of this thesis is to determine the effects of organizational macroergonomic compatibility elements on management consulting service performance. The results of this study will determine the direct and indirect effects of macroergonomic practices on the performance of management consulting services located in Turkey while assessing the extent which macroergonomic practices (MPs) of organizational culture, teamwork, organizational communication, performance evaluation, supervision and management styles, work schedules and social relationships, were implemented in these companies.

Macroergonomics has the potential to improve organizations by ensuring that their work system designs harmonize with their critical sociotechnical characteristics. I believe that the output of this thesis is not only for the benefit of academia but also for the benefit of the consulting sector. Despite the need for the professionals searching for a career in consulting, existing consultants, academic institutions and consulting firms, no research has been conducted so far in the Turkish consulting industry and to what extent they apply macroergonomics practices. This study will create a roadmap for future studies in macroergonomics and macroergonomic applications. Based on the results that will be generated by this thesis, companies can adopt the macroergonomic practices that best meet their presence objectives. With this vision in mind, I am asking for a few minutes of your time to help me conduct this research with this questionnaire below.

Please consider participating in this research. If you have any questions or concerns about this research, please feel free to contact me or my advisor. Also, please note that, if requested, I can share my updated CV for your reference.

Thank you for participating!

Sincerely,

Deniz KAYA
Graduate Student
Master of Science – Industrial Engineering
Bogazici University, Istanbul, TURKEY
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Advisor:
Prof. Dr. Mahmut EKŞİOĞLU
Industrial Engineering Department
Bogazici University, Istanbul, TURKEY
Email: mahmut.eksioglu@boun.edu.tr

I have read the above statement, and I agree to participate in research in this context.

Yes, I agree. ☐
No, I do not agree. ☐

A.3. An Informative Form About Section One

Macroergonomic Compatibility Questionnaire (Section One)

General directions: Please read each item carefully and answer all items except optional ones on this form. Please answer this questionnaire anonymously. Judge how well each statement fits the company you are working in. The survey rating scale and its descriptors can be read as follows: (1) totally disagree, (2) disagree, (3) neutral, (4) agree, and (5) totally agree.

If you are unable to complete the survey at a computer, you may complete it on your personal or company phone (IOS or Android).

A red asterisk indicates a required response. You will get an error message if you do not enter a response to a question with an *.

This form consists of three sections. At the end of the form, there is a privacy policy for your information. The total estimated response time of the form is approximately 20 mins. The first section collects demographic and general employment information, such as gender, age, job position, seniority, and the company name. The section includes ten questions that were used in this research to conduct a descriptive analysis of the sample.

A.4. An Informative Form About Section Two

Macroergonomic Compatibility Questionnaire (Section Two)

The second section collects data regarding the implementation degree of macroergonomic practices (MPs). Namely, you will be rating the extent to which your company implements macroergonomic practices and how often macroergonomic elements are taken into account. These elements are respectively: Teamwork, Organizational Culture, and Safety Culture, Coordination, Collaboration, and Communication, Work Schedules, Social Relationships, Supervision and Management Styles, and Performance Evaluation, Rewards, and Incentives.

A.5. An Informative Form About Section Three

Macroergonomic Compatibility Questionnaire (Section Three)

The third section collects data on the company benefits obtained from macroergonomic practices implementation. In this part of the questionnaire, you will be asked to rate how often, in your general opinion, your company obtains the listed benefits items of clients, firm performance, and employees. If you do not know the exact answers to give, you can select the closest rating based on your experiences acquired over time.

A.6. Privacy Policy Declaration Form

Your privacy is important to us. The identity of all survey participants is kept strictly confidential. All information collected in this survey will be held in strict confidence. All information you provide by completing this survey will be kept private, including the company where you work. No information will be given to your supervisor or company. This research is conducted with one and only for academic purposes.

No one at your company will receive a copy of your survey. Nor will the responses to any of your questions be disclosed to anyone at your company. At no time will any of your responses be linked to your name or to any other information that could be used to identify you. None of your answers will be reported in any way that identifies you personally. The survey results will only be released in summary tables and reports. No information collected in this survey may be used for any other purpose than the purpose for which it was collected.

Your responses will be grouped with others' responses for reporting purposes. Reports will include results for all employees combined. After reports are finished, you may ask for a soft copy of this research including the results. At the end of the questionnaire, there is an optional question asking for personal e-mail and report soft copy requests.

E-mail address

I request a soft copy of this research report with results.

Yes. ☐

No. ☐

I request your updated CV.

Yes. ☐

No. ☐

In accordance with our principle of continuous improvement and development, is there anything you would suggest for the development of the survey?

A.7. Questions of the Macroergonomic Compatibility Questionnaire (English)

Table A.1. Questions of the macroergonomic compatibility questionnaire.

ID	SECTION	QUESTION
BEGIN1	Demographic	What is the highest level of formal qualification you have completed?
BEGIN2	Demographic	How long have you been employed in your current company?
BEGIN3	Demographic	How long have you been in your current position?
BEGIN4	Demographic	In your current position, do you manage other managers?
BEGIN5	Demographic	How many years have you been working in your life?
BEGIN6	Demographic	Which company do you currently work in?
BEGIN7	Demographic	Which of the following options better represents your position in the company?
BEGIN8	Demographic	Gender
BEGIN9	Demographic	Age
TEA1	Teamwork	Employees perform the tasks in the team.
TEA2	Teamwork	Training practices with task efficiency and teamwork improvement are given in company-wide.
TEA3	Teamwork	The company encourages the culture of teamwork success.
TEA4	Teamwork	Managers and employees are highly aware of the concept of teamwork.
TEA5	Teamwork	The company gives enough attention to improving its employee's collaboration and teamwork skills
TEA6	Teamwork	Managers have the vision to introduce teamwork activities within the company.
TEA7	Teamwork	Managers permit teams to play an important part in decision making.
TEA8	Teamwork	Teamwork has been used by the company to implement the strategic decisions that are taken in response to a range of business challenges and pressures.
TEA9	Teamwork	The company creates a conducive and trustable environment for synergetic teamwork.
TEA10	Teamwork	Teams embrace and are constituted effectively by a diversity of cultures, talents, and personalities.
TEA11	Teamwork	Teams are selected while considering individuals capable of doing the job for which they have been selected, specific expertise, knowledge, experience and the skills were necessary to operate within the team.
TEA12	Teamwork	Employees perform the tasks on the team.
TEA13	Teamwork	Teamwork practices such as problem-solving groups, quality circles, and others are used.
TEA14	Teamwork	Specific team building activities are placed in order to construct strong intra-team relationships.

Table A.2 Questions of the macroergonomic compatibility questionnaire (cont.).

TEA15	Teamwork	Managers communicate the clear expectation that teamwork and collaboration are expected.
TEA16	Teamwork	The performance management system places emphasis and value on teamwork.
ORG1	Organizational Culture and Safety Culture	The company's principles and values are clearly transmitted to the employees from the beginning.
ORG2	Organizational Culture and Safety Culture	Employees know the vision and mission of the company.
ORG3	Organizational Culture and Safety Culture	Employees strive to keep the company's principles and values.
ORG4	Organizational Culture and Safety Culture	Safety culture is promoted among the employees.
ORG5	Organizational Culture and Safety Culture	Service systems are defined and maintained proper Organizational Culture.
ORG6	Organizational Culture and Safety Culture	The determining of strategy, politics, and human resource practices are done in accordance with organizational culture.
ORG7	Organizational Culture and Safety Culture	Employees follow the values and beliefs that provide norms of expected behaviors.
ORG8	Organizational Culture and Safety Culture	Through individual involvement and participation as part of organizational culture and context is developed.
ORG9	Organizational Culture and Safety Culture	The glue that holds the organization together is loyalty and mutual trust, and commitment to this organization runs high.
ORG10	Organizational Culture and Safety Culture	Formal rules and policies are applied.
ORG11	Organizational Culture and Safety Culture	High trust, openness, and participation persist.
ORG12	Organizational Culture and Safety Culture	The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.
ORG13	Organizational Culture and Safety Culture	The safety programs in my company are good.
ORG14	Organizational Culture and Safety Culture	The company's efforts encouraged employees to work more safely.
ORG15	Organizational Culture and Safety Culture	Off-the-job safety a part of the company's safety program.
COO1	Coordination, Collaboration, and Communication	Employees strive to maintain good coordination, collaboration and communication.
COO2	Coordination, Collaboration, and Communication	Any employee can communicate with another employee regardless of the hierarchical level.

Table A.3. Questions of the macroergonomic compatibility questionnaire (cont.).

COO3	Coordination, Collaboration, and Communication	The company uses different forms of communication (visual, oral, auditory, written).
COO4	Coordination, Collaboration, and Communication	Our employees communicate widely, not just with their own departments and functions.
COO5	Coordination, Collaboration, and Communication	In the company, subtasks are integrated by coordination mechanisms such as plans, procedures, or schedules.
COO6	Coordination, Collaboration, and Communication	Inter-organizational collaborations are managed through a combination of mechanisms that support coordination and cooperation.
COO7	Coordination, Collaboration, and Communication	Managers develop strategies to build professional respect for employees, facilitate effective consultant-client communication and improve employees' willingness to collaborate.
COO8	Coordination, Collaboration, and Communication	Effective communication, perceived respect and willingness to collaborate were all significant independent predictors.
COO9	Coordination, Collaboration, and Communication	Strategies such as team training, designed for further understanding teamwork and collaboration.
COO10	Coordination, Collaboration, and Communication	The company staying up to date with trends and new developments in the corporate communication arena.
COO11	Coordination, Collaboration, and Communication	Management supports their subordinates in terms of sending them on courses, workshops, etc. in order to enhance their networking, listening, verbal communication, and strategic communication skills.
COO12	Coordination, Collaboration, and Communication	Collaborations with other teams are productive, worthwhile, and yield good results.
COO13	Coordination, Collaboration, and Communication	Employees are able to work through differences of opinion without damaging relationships.
COO14	Coordination, Collaboration, and Communication	Employees are satisfied with the communication and collaboration tools provided to me by the company.
WOR1	Work Schedules	In the company, work schedules are comfortable and stable.
WOR2	Work Schedules	Employees are early informed about works that are going to demand extra time.

Table A.4. Questions of the macroergonomic compatibility questionnaire (cont.).

WOR3	Work Schedules	Employees make their own decision-making the program of their tasks.
WOR4	Work Schedules	Employees are able to give inputs to their managers about the hours they begin and end work.
WOR5	Work Schedules	Employees know their work schedule and upcoming projects well.
WOR6	Work Schedules	The company does not have schedules involving unpredictable working hours (short notice).
WOR7	Work Schedules	Work schedules do not demand higher emotional exhaustion.
WOR8	Work Schedules	Management offers a wide array of communication tools to improve the possibilities for knowledge sharing within the company and with clients while the employees telecommute.
WOR9	Work Schedules	The job does not require job schedules with long working hours.
WOR10	Work Schedules	The company establishes protective measures for people working overtime.
WOR11	Work Schedules	The company organizes employer-sponsored health promotion programs, for example, counseling and education about the risks of long work schedules, periodic medical surveillance examinations, and ergonomic redesign to decrease job demands.
WOR12	Work Schedules	Flexitime is allowed to determine (or be involved in determining) the start and end times of the working day; without changing the total number of hours worked of a standard workday.
WOR13	Work Schedules	The company allows working at home or at an alternative work location away from the standard work location.
SOC1	Social Relationships	Employees can maintain social relationships inside the company.
SOC2	Social Relationships	Employees can interact with people outside the organization (clients, providers, etc.) in an effective way.
SOC3	Social Relationships	Employees can keep cordial, professional relationships.
SOC4	Social Relationships	Employees can gather to talk about any topic.
SOC5	Social Relationships	Managers are concerned about the welfare of the people who work for them.
SOC6	Social Relationships	The exchange of information in the relationship takes place frequently in the company.
SOC7	Social Relationships	Managers build relationships within the workplace.

Table A.5. Questions of the macroergonomic compatibility questionnaire (cont.).

SOC8	Social Relationships	Managers take time out to get to know employees personally.
SOC9	Social Relationships	Managers are able to play the role of a counselor towards employees.
SOC10	Social Relationships	The company encourages employees including friends, as well as partners, to take place in work social events.
SOC11	Social Relationships	Manager's awareness of how work practices impact on relationships is high.
SOC12	Social Relationships	Managers promote work practices that would minimize work-related problems affecting personal relationships.
SOC13	Social Relationships	Employees form good relationships with their colleagues.
SUP1	Supervision and Management Styles	Tasks are supervised and monitored in order to improve the employees' performance.
SUP2	Supervision and Management Styles	Managers enjoy setting goals for the future.
SUP3	Supervision and Management Styles	Managers welcome suggestions given by employees.
SUP4	Supervision and Management Styles	Managers check-in with the employees often, to see how the project is coming along.
SUP5	Supervision and Management Styles	Managers spend time teaching and coaching their subordinates frequently.
SUP6	Supervision and Management Styles	Employees are considered as having different needs, abilities, and aspirations from others.
SUP7	Supervision and Management Styles	Managers effectively lead the project teams.
SUP8	Supervision and Management Styles	Managers are effective in meeting organizational requirements.
SUP9	Supervision and Management Styles	Managers are effective in meeting their subordinate's job-related needs.
SUP10	Supervision and Management Styles	Managers consider the moral and ethical consequences of decisions.
SUP11	Supervision and Management Styles	Managers create a comfortable environment where their subordinates could discuss concerns.
SUP12	Supervision and Management Styles	Managers continuously provide professional and career development support, guidance, and motivation.
SUP13	Supervision and Management Styles	Managers discuss expectations and conflicts openly and honestly and adjust to their subordinate's needs over time.
SUP14	Supervision and Management Styles	Managers motivate their subordinates with professional development opportunities, like a promotion or more responsibility.

Table A.6. Questions of the macroergonomic compatibility questionnaire (cont.).

PER1	Performance Evaluation, Rewards, and Incentives	Managers motivate their subordinates with professional development opportunities, like a promotion or more responsibility.
PER2	Performance Evaluation, Rewards, and Incentives	The company makes periodically salary increments, allowances, bonuses, fringe benefits, and other compensations on regular and specific periods to keep employees morale high and make them more motivated.
PER3	Performance Evaluation, Rewards, and Incentives	Assessments of the employees' performance are made periodically.
PER4	Performance Evaluation, Rewards, and Incentives	Employees who do extraordinary performance stand a fair chance of being promoted (or receiving higher pay increase).
PER5	Performance Evaluation, Rewards, and Incentives	Employees are received appropriate feedback and recognition for their contributions.
PER6	Performance Evaluation, Rewards, and Incentives	Employees are satisfied with the amount and frequency of recognition from supervisors when they have good performance.
PER7	Performance Evaluation, Rewards, and Incentives	The performance evaluation of the employees agrees with what they achieved.
PER8	Performance Evaluation, Rewards, and Incentives	The retirement system makes employees feel safe and ensured.
PER9	Performance Evaluation, Rewards, and Incentives	Health insurance offers suitable services for employees.
PER10	Performance Evaluation, Rewards, and Incentives	Employees have a chance to get a percent of the profits as part of the incentives that the company offers.
PER11	Performance Evaluation, Rewards, and Incentives	In the company, promotion mechanisms are appropriate.
PER12	Performance Evaluation, Rewards, and Incentives	Employees think that the reward regulations in the incentive system are fair in the company.
PER13	Performance Evaluation, Rewards, and Incentives	The company offers appreciation certificates and honor promotions for those who deserve (without increasing the salary).
PER14	Performance Evaluation, Rewards, and Incentives	The company offers participation in training sessions according to performance evaluations in order to improve the employees' performance.

Table A.7. Questions of the macroergonomic compatibility questionnaire (cont.).

PER15	Performance Evaluation, Rewards, and Incentives	The performance is evaluated depending on some scientific and clear variables.
PER16	Performance Evaluation, Rewards, and Incentives	The company pays attention to the quality of the services given to the beneficiaries.
PER17	Performance Evaluation, Rewards, and Incentives	The reward system facilitates the implementation of the strategy by attracting and retaining the right kind of people.
PER18	Performance Evaluation, Rewards, and Incentives	Performance goals are mutually developed and have specific time frames.
CLI1	Client	Clients keep loyal to the company.
CLI2	Client	The number of clients has increased over the time.
CLI3	Client	Client engagement has been increased over the time.
CLI4	Client	Client satisfaction has been increased over the time.
CLI5	Client	The resource requirements associated with the project in terms of time (duration) and costs have reduced over the time.
CLI6	Client	Capacity utilization in client projects has increased over the time.
CLI7	Client	Service and product quality have been increased over the time.
CLI8	Client	Project Profitability has increased over the time.
CLI9	Client	Timeliness of service delivery (on-time project completion) has increased over the time.
CLI10	Client	The success rates of each project have increased over the time.
CLI11	Client	The number of projects has been increased over the time.
CLI12	Client	The average project size has been increased over the time.
CLI13	Client	Repeat business is increased over the time.
CLI14	Client	Service processes have been improved over the time.
CLI15	Client	The size of clients has increased over the time.
FIR1	Firm Performance	The company’s sales growth rate has increased over the time.

Table A.8. Questions of the macroergonomic compatibility questionnaire (cont.).

FIR2	Firm Performance	The company's public image has got stronger over the time.
FIR3	Firm Performance	The company's innovative degree has increased over the time.
FIR4	Firm Performance	The company's market share has increased over the time.
FIR5	Firm Performance	Productivity has increased over the time.
FIR6	Firm Performance	The variety of products and services has increased over the time.
FIR7	Firm Performance	Billable consultant utilization has increased over the time.
FIR8	Firm Performance	Revenue growth has increased over the time.
FIR9	Firm Performance	Revenue has increased over the time.
FIR10	Firm Performance	Net Profit has increased over the time.
FIR11	Firm Performance	The company has more rapid and more effective internal and external coordination for its regional, national and global activities than last year.
EMP1	Employee/Consultant	The company’s attraction to professionals is higher than in the last years.
EMP2	Employee/Consultant	Employee morale is higher than in the last years.
EMP3	Employee/Consultant	Employee Turnover Rate (ETR) has decreased over the time.
EMP4	Employee/Consultant	The percentage of response to open positions has increased over the time.
EMP5	Employee/Consultant	Employee satisfaction has increased over the time.
EMP6	Employee/Consultant	Retaining talent has got easy over the time.
EMP7	Employee/Consultant	Physical and psychological well-being at work has increased over the time.
EMP8	Employee/Consultant	Employee engagement has increased over the time.
EMP9	Employee/Consultant	Employee absenteeism has decreased over the time.
EMP10	Employee/Consultant	Headcount has increased over the time.
EMP11	Employee/Consultant	Investments in employee’s development and training have increased over the time.

A.8. Makroergonomik Uyumluluk Anket Soruları (Türkçe)

Table A.9. Makroergonomik uyumluluk anketi soruları.

1. BÖLÜM	
Demografik	Tamamladığınız en yüksek eğitim düzeyi nedir?
Demografik	Mevcut şirketinizde ne kadar zamandır çalışıyorsunuz?
Demografik	Ne kadar zamandır mevcut pozisyonundasınız?
Demografik	Ne kadar zamandır mevcut pozisyonundasınız?
Demografik	Şu anki pozisyonunuzda diğer yöneticileri yönetiyor musunuz?
Demografik	Toplam kaç yıllık iş tecrübesine sahipsiniz?
Demografik	Aşağıdaki seçeneklerden hangisi şirketteki pozisyonunuzu daha iyi temsil ediyor?
Demografik	Cinsiyet
Demografik	Yaş
2. BÖLÜM	
Takım Çalışması	Çalıştığınız şirkette, görevler takım çalışması ile yerine getirilir.
Takım Çalışması	Çalıştığınız şirkette, görev etkinliği ve ekip çalışması geliştirme ile ilgili eğitim verilmektedir.
Takım Çalışması	Çalıştığınız şirkette, takım çalışması başarısı teşvik edilir.
Takım Çalışması	Çalıştığınız şirkette, yöneticiler ve çalışanlar ekip çalışması kavramının farkındadır.
Takım Çalışması	Çalıştığınız şirkette, çalışanların işbirliği ve takım çalışması becerilerini geliştirmeye yeterince önem vermektedir.
Takım Çalışması	Çalıştığınız şirkette yöneticiler, şirket içinde ekip çalışması faaliyetlerini tanıtmak için yeterli vizyona sahiptir.
Takım Çalışması	Çalıştığınız şirkette yöneticiler, karar vermede ekiplerin önemli bir rol oynamasına izin verir.
Takım Çalışması	Çalıştığınız şirkette ekip çalışması, şirket tarafından çeşitli zorluklara ve baskılara cevap olarak verilen stratejik kararları uygulamak için kullanılır.
Takım Çalışması	Çalıştığınız şirkette, sinerjik ekip çalışması için elverişli ve güvenilir bir ortam yaratılmaktadır.
Takım Çalışması	Çalıştığınız şirkette ekipler, çeşitli kültürler, yetenekler ve kişilikleri biraraya getirilerek etkili bir şekilde oluşturulur.
Takım Çalışması	Çalıştığınız şirkette bireyler, seçtikleri işi yapabilecek kapasiteye, özel uzmanlığa, bilgiye, deneyime ve ekip içinde çalışması için gereken becerilere bakılarak takımlar kurulur.
Takım Çalışması	Çalıştığınız şirkette, çalışanlar görevlerini takım çalışması kullanarak yerine getirir.
Takım Çalışması	Çalıştığınız şirkette, problem çözme grupları, kalite çemberleri ve diğerleri gibi takım çalışması uygulamaları kullanılır.
Takım Çalışması	Çalıştığınız şirkette, takım içi güçlü ilişkiler kurmak için özel takım faaliyetleri düzenlenir.
Takım Çalışması	Çalıştığınız şirkette yöneticiler, ekip çalışmasının ve işbirliğinin beklendiği konusundaki beklentiyi açıkça bildirir.
Takım Çalışması	Çalıştığınız şirkette, performans değerlendirme sistemi ekip çalışmasına ağırlık verir.

Table A.10. Makroergonomik uyumluluk anketi soruları (devam).

Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, şirket ilkeleri ve değerleri, çalışanlara en baştan açıkça aktarılmaktadır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, çalışanlar şirketin vizyonunu ve misyonunu bilir.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, çalışanlar, şirketin ilkelerini ve değerlerini korumaya ve sürdürmeye çalışır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, çalışanlar arasında güvenlik kültürü desteklenir.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirketteki hizmet sistemleri, kurum kültürünü korumakta ve desteklemektedir.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, strateji, politika ve insan kaynakları uygulamalarının belirlenmesi organizasyon kültürüne uygun olarak yapılır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, çalışanlar, beklenen davranış normlarını sağlayan değerleri ve inançları izler.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, yapılacak işlere olan bireysel katılım kurum kültürünün bir parçası olarak gelişir.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, kurumu bir arada tutan etken sadakat ve karşılıklı güven ve kuruma olan bağlılıktır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, resmi kurallar ve politikalar uygulanır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, yüksek güven, açıklık ve kollektif katılım sağlanmaktadır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, başarıyı insan kaynağının gelişimi, ekip çalışması ve çalışan bağlılığı temelinde tanımlamaktadır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, iyi bir iş güvenliği kültürü vardır.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirket, personelini daha güvenli çalışmaya teşvik etmektedir.
Kurum Kültürü ve Güvenlik Kültürü	Çalıştığınız şirkette, iş dışı güvenlil, şirketin güvenlik politikasının bir parçasıdır.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette, çalışanlar iyi koordinasyon, işbirliği ve iletişimi sürdürmek için çaba gösterir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette, herhangi bir çalışan, hiyerarşik seviyesinden bağımsız olarak başka bir çalışanla iletişim kurabilir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette, farklı iletişim biçimleri kullanır (görsel, sözlü, işitsel, yazılı).
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette, çalışanlar yalnızca kendi departmanları ile değil, departmanlar arası rahatça iletişim kurarlar.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette görevler, planlar, prosedürler veya programlar gibi koordinasyon mekanizmalarıyla bütünleştirilir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirket, kurumlararası işbirlikleri ve koordinasyonu destekleyen mekanizmaların bir kombinasyonu ile yönetilmektedir.

Table A.11. Makroergonomik uyumluluk anketi soruları (devam).

Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette yöneticiler, çalışanlara profesyonel saygı göstermek, etkin danışman-müşteri iletişimi sağlamak ve çalışanların işbirliği yapma istekliliğini geliştirmek için stratejiler geliştirmektedir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette, etkili iletişime ve saygı ve işbirliğine istekli olmaya oldukça önem verilmektedir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette ekip çalışması ve işbirliğini daha iyi anlamak için tasarlanmış eğitimler verilmektedir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirket kurumsal iletişim alanındaki trendler, ve yeni gelişmeleri yakından takip etmektedir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette yönetim, iletişim ağı kurma, dinleme, sözlü iletişim ve stratejik iletişim becerilerini geliştirmek için kurslara, çalıştaylara vb. Gönderme konusunda astlarını destekler.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette diğer ekiplerle yapılan işbirlikleri verimli, faydalıdır ve iyi sonuçlar verir.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette, çalışanlar ilişkilere zarar vermeden fikir farklılıklarıyla çalışabilirler.
Koordinasyon, İşbirliği ve İletişim	Çalıştığınız şirkette çalışanlar, şirket tarafından sağlanan iletişim ve işbirliği araçlarından memnundur.
Çalışma Takvimi	Çalıştığınız şirkette, çalışma programları rahat ve istikrarlıdır.
Çalışma Takvimi	Çalıştığınız şirkette ekstra zaman talep edecek işler hakkında çalışanlara erken bilgi verilir.
Çalışma Takvimi	Çalıştığınız şirkette, çalışanlar görevlerini yerine hetirmek için kendi alışma programlarını kendileri oluşturur.
Çalışma Takvimi	Çalıştığınız şirkette, çalışanlar başladıkları ve çalışmalarını bitirdikleri saatler hakkında yöneticilerine geri bildirim verebilmektedir.
Çalışma Takvimi	Çalıştığınız şirkette, çalışma programları ve gelecek projeler iyi bilinmektedir.
Çalışma Takvimi	Çalıştığınız şirkette, öngörülemeyen çalışma saatleri (kısa bildirim) içeren çalışma programları yoktur.
Çalışma Takvimi	Çalıştığınız şirkette, çalışma programları fazla duygusal tükenme gerektirmez.
Çalışma Takvimi	Çalıştığınız şirkette yönetim, çalışanlar uzaktan çalışırken müşterileri ile bilgi paylaşımı olanaklarını geliştirmek için çok çeşitli iletişim araçları sunar.
Çalışma Takvimi	Çalıştığınız şirkette projeler, uzun çalışma saatleri olan çalışma programları gerektirmez.
Çalışma Takvimi	Çalıştığınız şirket, fazla mesai yapan insanlar için koruyucu önlemler almaktadır.
Çalışma Takvimi	Çalıştığınız şirket, uzun çalışma programlarının riskleri, periyodik tıbbi gözetim muayeneleri ve ergonomik yeniden tasarım gibi danışmanlık ve eğitim gibi işveren tarafından desteklenen sağlığı geliştirme programları düzenlemektedir.

Table A.12. Makroergonomik uyumluluk anketi soruları (devam).

Çalışma Takvimi	Çalıştığınız şirkette, esnek bir çalışma gününün başlangıç ve bitiş zamanlarını belirleme (veya belirlemede yer alma) imkanı vardır.
Çalışma Takvimi	Çalıştığınız şirket, standart çalışma yerinden uzakta evde veya alternatif bir iş yerinde çalışmaya izin verir.
Sosyal İlişkiler	Çalıştığınız şirkette çalışanlar, şirket içindeki sosyal ilişkileri korumakta ve geliştirmektedir.
Sosyal İlişkiler	Çalıştığınız şirkette çalışanlar, kuruluş dışındaki kişilerle (müşteriler, sağlayıcılar vb.) Etkili bir şekilde iletişime girmektedir.
Sosyal İlişkiler	Çalıştığınız şirkette, çalışanlar samimi ve güvenilir profesyonel ilişkiler kurabilir.
Sosyal İlişkiler	Çalıştığınız şirkette, çalışanlar herhangi bir konu hakkında konuşmak için toplanabilir.
Sosyal İlişkiler	Çalıştığınız şirkette yöneticiler, kendileri için çalışan kişilerin refahı hakkında ilgi duymaktadır.
Sosyal İlişkiler	Çalıştığınız şirkette, çalışanlar ile iletişim kurarken bilgi alışverişi sık sık gerçekleşir.
Sosyal İlişkiler	Çalıştığınız şirkette yöneticiler astları ile iyi ilişkiler kurar.
Sosyal İlişkiler	Çalıştığınız şirkette yöneticiler, çalışanları kişisel olarak tanımak için zaman ayırırlar.
Sosyal İlişkiler	Çalıştığınız şirkette yöneticiler, çalışanlara yönelik danışman rolünü oynayabilir.
Sosyal İlişkiler	Çalıştığınız şirket, iş arkadaşlarının yanı sıra şirket ortaklarını da içeren sosyal etkinliklerde yer almaya teşvik eder.
Sosyal İlişkiler	Çalıştığınız şirkette yöneticinin, projelerin ilişkiler üzerinde nasıl bir etkisi olduğuna dair farkındalığı yüksektir.
Sosyal İlişkiler	Çalıştığınız şirkette yöneticiler, kişisel ilişkiyi etkileyen işle ilgili sorunları en aza indirecek iş uygulamalarını teşvik eder.
Sosyal İlişkiler	Çalıştığınız şirkette çalışanlar, meslektaşları ile iyi ilişkiler kurar.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette çalışanların performansını artırmak için verilen görevler denetlenir ve izlenir.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler gelecek için hedef belirlemekten zevk alırlar.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler çalışanlar tarafından verilen önerileri memnuniyetle karşılamaktadır.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler, projenin nasıl ilerlediğini görmek için sık sık astlarıyla kontrol etmektedir.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler, astlarına sık sık eğitim vermek ve koçluk yapmak için zaman harcarlar.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette çalışanlar, diğerlerinden farklı ihtiyaçlara, yeteneklere ve hırslara sahip olarak kabul edilir.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler, çalışanlarını kariyer olanaklarını geliştirererek, iş tanımlarını ya da sorumluluk alanlarını arttırarak motive ederler.

Table A.13. Makroergonomik uyumluluk anketi soruları (devam).

Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler, proje ekiplerini etkin bir şekilde yönetir.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler kurum gereksinimlerin karşılanmasında etkilidir.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler, astlarının işle ilgili ihtiyaçlarını karşılamada etkilidir.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler kararların ahlaki ve etik sonuçlarını göz önünde bulundururlar.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler, astlarının endişelerini tartışabilecekleri rahat bir ortam yaratır.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler sürekli olarak mesleki ve kariyer gelişim desteği, rehberlik ve motivasyon sağlar.
Denetim ve Yönetim Stilleri	Çalıştığınız şirkette yöneticiler beklentileri ve geri bildirimleri açık ve dürüst bir şekilde tartışır ve zaman zaman yönetim tarzlarını astlarının ihtiyaçlarına göre ayarlar.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette yöneticiler astlarını bir terfi veya daha fazla sorumluluk gibi profesyonel gelişim fırsatları ile motive ederler.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirket, çalışanlarının moralini yüksek tutmak ve motive etmelerini sağlamak için periyodik olarak maaş artışları, ödenekler, primler, yan haklar ve düzenli ve belirli dönemlerde diğer tazminatlar yapmaktadır.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette çalışanların performanslarına ilişkin değerlendirmeler periyodik olarak yapılmaktadır.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette olağanüstü performans gösteren çalışanlar terfi etme (veya daha yüksek ücret artışı alma) konusunda diğerlerine göre daha büyük bir şansa sahiptir.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette çalışanlara katkıları için uygun geri bildirim ve ödüller verilir.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette çalışanlar, iyi performans gösterdiklerinde verilen ödül miktarından ve sıklığından memnundurlar.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette çalışanların performans değerlendirmesi, gerçekte neyi başardıklarını yansıtmaktadır.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette emeklilik sistemi çalışanların kendilerini güvende hissetmelerini sağlar.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette sağlık sigortası çalışanlara uygun hizmetler sunmaktadır.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette çalışanlar, şirketin sunduğu teşviklerin bir parçası olarak kârın bir yüzdesini alma şansına sahipler.

Table A.14. Makroergonomik uyumluluk anketi soruları (devam).

Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette ödül mekanizmaları sağlıklı bir şekilde çalışmaktadır.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette çalışanlar, teşvik sistemindeki ödül düzenlemelerinin şirkette adil olduğunu düşünmektedir.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirket, (maaşını artırmadan) hak edenlere takdir belgeleri ve onur ödülleri sunar.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirket, çalışanlarının performansını artırmak için performans değerlendirmelerine göre, eğitim oturumlarına katılım sunmaktadır.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette performans, bazı bilimsel ve açık değişkenlere bağlı olarak değerlendirilir.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirket, çalışanlarına verilen hizmetlerin kalitesine dikkat eder.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette ödül sistemi, çalışanların şirket bünyesinde kalmasını kolaylaştırır.
Performans Değerlendirme, Ödüller ve Teşvikler	Çalıştığınız şirkette performans hedefleri karşılıklı olarak geliştirilir ve belirli zaman dilimlerine sahiptir.
3. BÖLÜM	
Müşteri	Müşteriler şirkete sadık kalmaktadır.
Müşteri	Zamanla müşteri sayısı artmıştır.
Müşteri	Müşteri katılımı zaman içinde arttırılmıştır.
Müşteri	Müşteri memnuniyeti zaman içerisinde artmıştır.
Müşteri	Projeyle ilgili zaman ve maliyet açısından kaynak gereksinimleri zaman içinde azalmıştır.
Müşteri	Müşteri projelerinde kapasite kullanımı zaman içerisinde artmıştır.
Müşteri	Hizmet ve ürün kalitesi zaman içerisinde arttırılmıştır.
Müşteri	Proje Karlılığı zaman içinde artmıştır.
Müşteri	Hizmet sunumunun zamanındalığı (zamanında proje tamamlama) zaman içinde artmıştır.
Müşteri	Her projenin başarı oranı zamanla artmıştır.
Müşteri	Zamanla proje sayısı artmıştır.
Müşteri	Ortalama proje büyüklüğü zaman içerisinde artmıştır.
Müşteri	Sabit bir müşteriyle tekrar iş yapma olasılığı zamanla artmıştır.
Müşteri	Hizmet süreçleri zaman içinde geliştirilmiştir.

Table A.15. Makroergonomik uyumluluk anketi soruları (devam).

Müşteri	Müşterilerin şirket büyüklüğü zamanla artmıştır.
Şirket Performansı	Şirketin satış artış hızı zaman içinde artmıştır.
Şirket Performansı	Şirketin halka açık imajı zaman içinde daha da güçlenmiştir.
Şirket Performansı	Şirketin inovatiflik düzeyi zaman içinde artmıştır.
Şirket Performansı	Şirketin pazar payı zamanla artmıştır.
Şirket Performansı	Verimlilik zamanla artmıştır.
Şirket Performansı	Ürün ve hizmet çeşitliliği zaman içinde artmıştır.
Şirket Performansı	Projelerde aktif olarak çalışan danışman kullanımı zaman içinde artmıştır.
Şirket Performansı	Gelir artışı zaman içinde artmıştır.
Şirket Performansı	Gelir zaman içinde artmıştır.
Şirket Performansı	Net Kâr zaman içinde artmıştır.
Şirket Performansı	Şirket bölgesel, ulusal ve küresel faaliyetleri için geçen yıllara göre daha hızlı ve daha etkili bir iç ve dış koordinasyona sahiptir.
Şirket Çalışanı	Şirkette çalışmayan profesyonellerin şirkete olan ilgisi son yıllarda olduğundan daha yüksektir.
Şirket Çalışanı	Çalışanların morali son yıllarda olduğundan daha yüksektir.
Şirket Çalışanı	Çalışan Devir Hızı zaman içerisinde azalmıştır.
Şirket Çalışanı	Açık pozisyonlara cevap yüzdesi zaman içinde artmıştır.
Şirket Çalışanı	Çalışan memnuniyeti zaman içinde artmıştır.
Şirket Çalışanı	Yeteneği korumak zamanla kolaylaşmıştır.
Şirket Çalışanı	İşyerinde fiziksel ve psikolojik refah zamanla artmıştır.
Şirket Çalışanı	Çalışan bağlılığı zaman içinde artmıştır.
Şirket Çalışanı	Çalışan devamsızlığı zaman içinde azalmıştır.
Şirket Çalışanı	Çalışan sayısı zamanla artmıştır.
Şirket Çalışanı	Çalışanın gelişimine ve eğitimine yapılan yatırımlar zaman içinde artmıştır.