Green Buildings And Ergonomics In Increasing Work Performance

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Abstract

The ergonomic term together with the progressive advances of the industry, have been one of the pillars of change when designing or evaluating a job, although with the new virtual era, jobs or functions are increasingly alien to the rigid conditions pre-established in past years by companies, which has made it possible to demonstrate the lack of updating the ergonomic concept and the real usefulness it has in Colombian companies. The objective of this article was to identify the main factors of change in the concept of ergonomics, together with the variations generated by teleworking, for this a descriptive methodology was used, which was based on the collection and analysis of first and second sources, line. Highlighting those that address labor and industrial issues in the country and others that allow a global vision of the term. With this it was possible to demonstrate that the ergonomic term has undergone a great internal change by which companies are in the process of adaptation.

Keywords: Techniques, methods, ergonomics, technologies.

Introduction

"Currently organizations need to have accurate information about their human resources and the needs present in it" [1]. Ergonomics from its beginnings has been linked as that "discipline in charge of the design of workplaces, tools and tasks, adapting these factors with the bodily, mental and behavioral characteristics of the human being" [2]; Guillen, M (2002) states that "this science is a body of knowledge about human abilities, their limitations and relevant characteristics when designing workplaces [3]. The design of workplaces has always been associated with the engineer industry, since many of the optimization techniques are based on it, which is why "since the beginnings of the industrial revolution some of the great exponents of it, such as F. Taylor (Father of scientific management) and the husbands Gilbreth undertook tasks of analysis of the ways of working, with the objective that in one way or another the times and movements of the operators would be optimized” [4].

Based on these studies and other contributions, ergonomics was taking a fundamental role in strategic administration and process improvement, although it is true that in the country's companies, its use is not so frequent due to the large investments of time and capital, despite
this reality it is important to understand the importance of a good workplace and the improvement in organizational performance that these factors can offer to the company. Meneses, J; (2019) emphasize that "human resources must be seen as the main engine of missionary and financial growth, knowing in advance the need for constant monitoring that involves the creation of a pleasant work environment and that in turn allows the full development of their capabilities” [5]

The foregoing aroused the attention of large players in the Colombian industry, such is the case that the Ministry of Labor and ANDI have set some regulations that companies must comply with, in such a way that the physical and mental health of workers is always ensured. workers, providing the necessary tools and equipment for this purpose [6]. In Colombia, the industrial sector is classified into micro, small, medium and large companies, this classification is regulated by Law 590 of 2000 known as the My SMEs Law and its modifications (Law 905 of 2004) [7].

In a study carried out by Bancóldex, (2019), it was determined that in Colombia there are around 1,620,000 companies, 6,793 large, 109,000 SMEs and 1.5 million micro-enterprises [8]. Taking into account this information, it is appropriate to infer the reason for the non-application of the ergonomic concept in the country, and this is due to the fact that more than 92% of the national industry is microenterprise, that is, they are companies that, for the most part, do not have the financial power to be able to implement time and movement optimization projects. “Globally, the use of more comfortable workplaces has been a constant in large companies, research already carried out has shown that location and infrastructure conditions are key allies in job performance [9]”. A global situation that exemplifies this argument is the one observed in the Brass Industry in Sri Lanka, in "mid-2016 a group of researchers from the University of Peradeniya Sri Lanka, concerned about the economic and industrial backwardness that the country was facing, investigated what were the causes of such a negative situation, using the exploratory method of collecting information, which had the purpose of identifying the root problem of these companies” [10], the results of this work showed that the main problem of this industry was the lack of knowledge on the part of the operators and managers of the correct use of the existing productive tools. This demonstrates how most companies have the same methodological and procedural problems, regardless of their location or investment capacity, and linked to these factors is the lack of ergonomic methods in their operations.

It is clear that industrial delays are not only related to knowing how to handle a team correctly or incorrectly, they also include the lack of support for staff, both morally and physically, for which all parts of the organization must be responsible for improving continuous and the design of modern workplaces, from the executive to the operational area, this lack of coordination and understanding of the companies was evidenced at the beginning of 2020 with the arrival of the Covid-19 in daily life, this pandemic situation caused a very deep economic damage in the country, according to data provided by the Bogotá Chamber of Commerce (CCB), between January and August 2020, 37,000 companies were liquidated, which represented an increase of 63% compared to the same period of the previous year (2019). Of this figure, 99% were my SMEs, 0.5% natural persons and 0.5% legal persons [11], faced with this difficult situation, many national entrepreneurs had to look inward and see the tools they had at their disposal. to continue with its operational activities. “The design of production and control strategies; It played a crucial role in the life of Colombian companies, in large institutions this process was only an implementation of their contingency plans, while in SMEs it was a goodbye to so many years of efforts and operations with purely routine and empirical techniques. in the vast
majority” [12], the negative indicators that were observed in this difficult health situation, served as an awakening for the companies, since in these prevailed the realization of an analysis of the new current work mechanisms and those in accordance with global and national health guidelines.

Consequently, this questioning resulted in the natural daily use of technological tools, which were the methodological evolution of the companies surviving the post-pandemic social and economic context. To date, maintaining the connection between the parts of the organization has been the concern of companies, leaving the initial problem situation in the background, since, with these changes, the concept of workplace was updated, what was previously known as office, desk and others; Now the worker manages it from home, thus forgetting the face-to-face use of the company’s facilities and equipment. With this new notion of work, many of the meetings, talks or presentations of reports were limited to the use of video calls or conference rooms. online exhibition. "Specialists in human talent exposed a decade ago that this situation would be the future of workers and companies, referring to the modification of organizational structures, while also exposing certain positions that in the future would not require being within a company, office or similar context, such as administrative and financial positions” [13].

As it was well explained at the beginning, the concept of Ergonomics changed and this is partly due to the appearance of new labor technologies, since the inclusion of other external factors makes the evaluation of workplaces more rooted in the proper use of the technological tools and equipment, so that the individual's work is carried out more efficiently, avoiding fatigue or any other labor problem. As a synthesis of all the aforementioned information, it could easily be inferred that the reaction capacity of the companies before any eventuality is low, despite the fact that in the world order there are successful cases of management and promotion of good labor techniques, these are increasingly separated from a stable, rigid and independent place (physical production center), for which is interesting to think about how the industry evolved in giant steps forced by a global eventuality; although today this continues to be a national problem for SMEs [13]. With all these arguments it is propitious to want to demonstrate how companies have adapted to the new concept of Ergonomics, favored by current trends and forced by sudden problems. Consulting in true information sources, which contain any type of current or conceptual information of the problem in interest.

Method

The methodology used in the development of this project is descriptive "the descriptive technique is decisive. Since it collects quantifiable data that can be examined for statistical purposes in a target population. This study prototype has the purpose of describing the characteristics of the study problem” [14].

In this same order of ideas, information sources such as. Subscription bases (Scielo, Science Direct, Scopus); National and international economic and scientific magazines; likewise with books or other sources of written information (Projects, reports and articles ). In the process of drafting the document, it was specified, the way in which the main objective was going to be developed and its respective problem, which is why they were used research initiation questions, proposed by FCE, (2019) [15]. Which are described below: What do I want to achieve with this text? How do I want readers to react? What do I want them to do with my text?; What image of myself do I want to project? What impact (or effect) do I want to cause?

To give answers to these, it is necessary to make an abstract diagram of the problem, its
respective analysis factors and the limitations present in it, these were linked according to the words of Martha Helena Saravia Pinilla, president of the SCE (Colombian Society of Ergonomics), which affirms that ergonomics in the country presents “a deficit in relation to its scope and relevance, and continues to be linked to the diagnosis of musculoskeletal disorders. Although these aspects are relevant in ergonomic science, their particular use in the country makes intervention strategies focus on the individual, when prevention must be given from the organization, its activities and processes [16].

**Discussion of the observations found.**

**Colombian ergonomics: Definition, history and present.** Despite the fact that ergonomics arrived in Colombia at the same time as in the rest of the Latin American countries, it has not evolved in comparison to these, since at this moment it is observed how these nations have achieved an effective strengthening of science, both in both in the academic and industrial spheres, since they are recognized worldwide, where they hold events of an international nature, implementing postgraduate programs at the master's and doctoral levels in their educational models, which is evidence of their scientific progress. In Colombia, on the contrary, no studies have yet been carried out that account for the development of ergonomics at the local level [18]. "Ergonomics began to be implemented in the 20th century with Taylor's work on work rationalization, developing as a science at the end of the Second World War" [19]. This science has been immersed in the continuous improvement of business results. Industrially the term has been used to increase productivity or effectiveness in operations; Based on this, we see how in some sectors of the industry the concern for having a more pleasant and sophisticated workplace grows, in such a way that the capacity of the entity's human capital increases. Ergonomics itself, despite being a young discipline, is not the one that must evolve: organizations are the ones that must make the leap, to move from adjustments and adaptations to the integral design of organizational processes [16].

"In Latin America (LA) an early deindustrialization stage has become notorious since the eighties, which has impacted the indicators of informality and unemployment in Latin American countries, in addition to the fact that 15% of the employed are independent workers, which gives a different connotation to the problem of job insecurity that could derive from the new forms of employment associated with the digital economy" [20], These economic and social conditions have led to “the increase in self-employed (independent) workers and dependents with temporary, part-time employment or others in which their dependent nature is concealed, this being the result of variables such as technological change, the new digital economy and the global reorganization of supply chains, among other phenomena” [21].

This independence phenomenon has caused the vast majority of companies to develop personnel retention strategies in a more complete way, attracting the best talent from training centers and complementing them with the already old characters of the organization. "With all this, the necessary generational changes in organizations have created a new concept of offices or workplaces" [22]. Adams and Deakin, (2014); contradict the fact that independent workers are the trend in the future, since they consider that "there is not enough evidence to suggest that in the future the typical or standard job will disappear or that it will be replaced by independent work" [23]. The conceptual basis of these lies in the principle that companies must promote a balance in work, family and leisure activities of human capital; these same authors point out the need to establish health and safety programs, training and development, motivation programs ”,
the above in order to motivate the permanence in the work sites. "The training in the way you do the job raises the future productivity of workers, by stimulating the learning of new skills and perfecting old ones" [24].

However, the number of independent or dependent employees is not the issue that most alters the ergonomic needs of a company, in these the priority of being more productive every day dominates; The foregoing is a constant requirement of the current globalized market [25]. However, global trends expose a number of challenges in Colombian companies, compared to the perception they have of the workplace and the way in which the worker appropriates it. this [26] , that is, 13 years ago the use of laptops, smartphones was not so frequent, much less the interaction by email or virtual means of communication, at present it seems that without this there is no future in the activities of the company, as a result of this, the reduction of spaces and times in the adequacy of some workplace became noticeable, at the same time that the interaction between individuals in a physical environment was eliminated.

Initially it was estimated that ergonomics only mediates movements, loads and design workplaces, as if this were only a deterministic science that had no further fields of action; limiting it in itself to a very short margin of action to what it actually is in companies. The application of the concept at the national level seems to go against global trends, which are focused on increasing productivity and preserving work motivation. Experts on the subject “have detailed the importance of carrying out an ergonomic intervention project; which can give three types of benefits” [25].

A. Economic benefits, related to personnel
B. Economic benefits related to equipment and materials.
C. Economic benefits related to increased sales.

Performance evaluation is a term that is linked more to human resource management than to ergonomics itself. In this case, ergonomic science becomes the technical model for optimizing activities, since, following a good workplace together with excellent personal training, you can get to get the best corporate conditions. Usually "training has been considered as an effective tool to improve the performance of employees, par excellence, it can help to have a systematized process in which it could facilitate the necessary change so that the company's personnel have a better vision of the advantages and benefits of the same" [27].

At the moment of being able to determine and demonstrate the incidence of the ergonomic term in all areas of the company, this affirmation is of vital importance, but it also leaves the door open to the debate of a little-treated topic, which is the assertive classification of performance, since that bad practices or erroneous approaches in the design of corporate strategies are linked to this. “The concept of personnel classification is based on the idea that organizations create unnecessary costs when they invest the same amount of resources in all employees, a The central question concerns, in whom best invest limited resources to maximize the contribution of employees within the organization, since allocating talents in a uniform way does not necessarily translate into higher levels of performance [28].

Differentiation focused on the job, aims to reduce disproportionate investment in certain equipment, tools or production materials, taking into account for this the organizational structure and the prior hierarchy of the work sites [29], “the capacity The labor force of the human being
is made up of intangibles originating from their own knowledge, values, abilities and attitudes, which makes it difficult to interpret the person's needs to perform their duties" [30].

It should be noted that human capital can be grouped into three categories: knowing, doing and being. Based on them, human capital is understood as the set of knowledge, shared values, labor competencies, and demographic characteristics of the personnel who work for the company and who add, or may in the future, add value [31].

With all this clarification, the dilemmas present in employers' decisions are not only linked to having good staff or not, but rather, on the contrary, adapting to the environment and the large number of social and economic problems that are seen. exposed to the worker, these problems range from the lack of opportunity, insecurity or in some cases the lack of quality education. With the appearance of these new technologies, other questions have arisen, linked above all to age and the level of productivity, that is, what role do young people play in this job change and how can older, experienced personnel be used? but may not have the right computer skills. Boeri, T.; Caiumi, A. and M. Paccagnella (2020) state that “we have a mismatch problem here: we would like the elderly to have jobs that can be carried out from home, instead of the young” [32]. The fact that these authors reaffirm their thinking leads to a more realistic conceptual notion of what is expected, that is, the new labor trends as they are seen, and that implies the inclusion of new technologies in the routines of companies, in the processes of selection, training and ultimately in the design of workplaces. Thus understanding the progressive increase in productivity and cost reduction [33].

B. Business Sustainability and Ergonomics: Offices and Green Spaces (World Example)

"In terms of sustainability, it is necessary to understand, design and manage urban green properly from an ecological, aesthetic and recreational perspective" [34], which is why currently the appearance of green spaces in replacement of the already known white and gray places of companies, has gained great momentum within large institutions. An example of new ergonomic practices focused on the design of workplaces is Google.

“In these new work spaces, they take care of the design down to the smallest detail and their objective is to become places where the worker feels comfortable, feels cared for. Where the notion that nothing is left to chance is given and combines spaces designed to stimulate or relax the mind. The objective is always to make the most of the space and the worker” [35].

Perhaps investing in job sites such as Google's turns out to be somewhat expensive for small businesses, however we see how there are other work tools or what are known as new trends, which with the adversity of the pandemic stood out exponentially.

News of ergonomics in the country

"Entrepreneurs must also assimilate that their function today, beyond producing good profits or increasing their clients, is to offer workers the opportunity to carry out their functions in another geographical space different from their workplace, granting them the necessary resources to this " [36]. "It is also essential to understand, depending on the economic sector where the company is located, the potential results that can be achieved with the use of a broader ergonomic concept, little limited to evaluation dogmas or others" [37]. It is clear that some other important perceptions cannot be superimposed when making these changes, these are mostly linked to the new reality experienced by the worker, whether perhaps working at home takes away family time or other personal tasks, which can cause a series of motivational difficulties in this that in
the long run can affect their performance and behavior [38].

Some studies have “revealed that the space used to work in the home, the presence of people in the home while teleworking, the number of days of teleworking, the time that a subject has been teleworking and the degree of responsibility that the worker has outside in the workplace, they influence the work-family conflict” [39]. Rather than reversing current and emerging global political and economic trends, the coronavirus would intensify and deepen them [40]. In the context of the containment measures of Covid-19, it is expected that employment in commerce, restaurants and hotels and the manufacturing industry will be among the most affected, while work in the agricultural sector (essential for general subsistence and, generally, with the possibility of maintaining physical distancing at work) is at a medium-low risk of (temporary) loss [41]. “Among the main consequences of digitization, technological substitution of human work has been identified, the transformation of existing occupations and the emergence of new occupations” [42].

Ergonomics and Teleworking generate an impact, regardless of their economic activity, we therefore see the questioning for which companies are investing, and it is caused by ethical and moral thoughts linked to work performance, that is, how how committed the workers can be from the comfort of their homes and how efficiently they are performing their work, it is imperative to obtain a clear answer to such interesting questions since these are linked to the raison d'être and personality of the operator, which for the majority of managers is a difficult problem to measure. In recent years, the work that the Colombian government and business community have been carrying out in order to incorporate a work philosophy strongly linked to the use of ICTs is indisputable, especially (but not exclusively) in the service sector and with collaborators from “white collar” [43].

Research on Telework has devoted a lot of effort to the level of the individual decision to choose Telework as a work option (determinants, facilitators and restrictions), as well as its consequences [44]. In the same way that the drawbacks present in In this regard, it is important to understand that not all industrial activities can be subject to this work method or virtuality. In the case of manufacturing industries, the use of operational personnel is a priority, since they do not have robust investment capital in technology. In this case, it is necessary to look for alternatives to adapt to new trends and offer the people in charge of these activities free, safe and highly motivated work spaces. This may lead to some debate or controversy that age is so necessary in this type of work [45].

Due to the arguments previously exposed, the execution of these tasks mechanically becomes imperative, therefore the incidence of the position and its functions, turn out to be one of the intrinsic variables of the good structuring of the workplace, while the external factors that affect the worker, such as access to the internet or electronic devices; This is activated with frequent training on the proper use of these tools. While some authors believe that these initiatives subject the worker to a higher and disproportionate workload than normal [46].

Results

In addition to the previous information and according to the sources consulted in this article, an answer could be given to a general questioning of society in recent times, and it is: How many jobs can be implemented with relative ease from the physical world to the digital world? It could be easily answered that those linked to the service sector, but the administrative or managerial part of the manufacturing sector would be omitted. Albrieu, R, (2020) answers this question by
using a survey, in which he determined that the percentage of jobs that can be done from home is between 27% and 29% of the total jobs, this in part of it is due to the fact that in Latin American countries there is not a network of connectivity as wide as would be expected [49].

In a more specific way, the Inter-American Development Bank offered a report on which are the activities with the greatest vocation for remote work [50]; Where the following was evidenced (See table 1)

**Table 1. Sectors and percentages of teleworkable activities**

<table>
<thead>
<tr>
<th>Sector economic</th>
<th>% TV workable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector banking</td>
<td>61%</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>58%</td>
</tr>
<tr>
<td>Education</td>
<td>71%</td>
</tr>
<tr>
<td>real estate</td>
<td>33%</td>
</tr>
<tr>
<td>Agriculture, cattle raising, hunt</td>
<td>22%</td>
</tr>
<tr>
<td>Industry manufacturing</td>
<td>17%</td>
</tr>
<tr>
<td>Transportation Y storage</td>
<td>13%</td>
</tr>
</tbody>
</table>

Note. Table developed according to the results obtained by the Inter-American Development Bank.

These values demonstrate the reality of many companies and the difficult situation that they present themselves. On the one hand, we see how the companies with the most capital (services sector) are the most benefited by the use of teleworking; while those companies where the average working hand is housed, the strong human capital of a country does not even reach half the standardization of its activities with the virtual world [50]. The lines of industrial deepening allow administratively addressing other labor fields, including medicine and organizational management within it, "the use of information technologies, both for the diagnosis, prevention and treatment of diseases and for the training of health professionals, for research and evaluation activities, telemedicine is visualized clearly, both for the people and families cared for and for the professionals. In relation to patients, for example, it can improve accessibility, waiting time, geographic equity, avoid travel, work permits or, in exceptional times, it can maintain continuity of care avoiding the risk of contagion

**conclusions**

Understanding each of the sectors in which Ergonomics and virtuality generate an impact, regardless of their economic activity, we consequently see the dilemma for which companies are investing, and it is caused by ethical and moral thoughts linked to labor performance of the job, that is to say, how committed the workers can become in their homes and how efficiently they are performing their tasks, it is imperative to obtain a clear answer to these questions since these are linked to the raison d’être and personality of the worker. operator, analysis variables somewhat intangible for what would be expected

With the above, we do not want to stigmatize older workers, but instead generate constructive criticism of how prepared they are and how much use they have given to the new tools, which is why the analysis or evaluation that is carried out both at employers as employees must be very deep, including all the variables involved in the production cycle, and the way in which tasks are carried out. In conclusion, to all of the above, it can be defined that evidently the term ergonomics in the country lacks a stronger appropriation by the industrial sector, due to many conceptual and
methodological factors, the vast majority of Colombian companies are microenterprises, which do not see the need to apply this science in their work, since this represents the inclusion of new processes and greater investments of time and capital.

On the other hand, training and Colombian production models are going through a learning stage in which the virtual era has taken on crucial importance, thus limiting the productive units capable of undertaking work using virtual tools, to this is added the replacement generational labor, which is the center of discussion in the country, since in virtuality it is not known how capable older workers are with the use of virtual media and their tools, in the same way that the commitment that they can young people to arrive when they carry out their organizational work from home, this being the present bet in such an informative era. With all this, it is expected that the term ergonomics will necessarily have to mutate and adapt together with organizations to the new production and work criteria demanded by the labor and productive market.

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