PROPOSAL OF AN INTERNET OF THINGS-BASED SOLUTION TO MONITOR PHYSICAL FACTORS IN THE WORKPLACE

https://doi.org/10.56238/sevened2025.001-039

Humberto Xavier de Araújo[1], José Carlos Lucio Maia[2] and Katiusse Kelle de Melo Soares[3].

ABSTRACT

This article investigates the use of the Internet of Things (IoT) in the monitoring of physical factors such as temperature, humidity, luminosity and noise, in indoor work environments, with the objective of preventing damage to the physical and mental health of employees of the Regional Electoral Court of Goiás – TRE/GO and other organizations. In addition, it addresses the relationship that these physical agents have with the quality of life in the work environment, with organizational productivity and performance, as well as with the effective management of people. The results indicate that the implementation of IoT-based solutions can facilitate the management of environmental factors, positively interfering in the quality of life at work and in the physical and mental health of employees. It was also demonstrated that data collection, through IoT, can favor evidence-based decision-making by managers, and consequently, increase the productivity and performance of employees, as well as improve people management.

Keywords: Internet of Things. Physical factors. Quality of life at work. Physical and mental health. Organizational productivity and performance. People management.

[1] Doctor
Federal University of Tocantins
E-mail: hxaraujo@uft.edu.br
ORCID: https://orcid.org/0000-0002-3321-4166
LATTES: http://lattes.cnpq.br/1914224370310328
[2] Master's student in Governance and Digital Transformation
Federal University of Tocantins
E-mail: lucio.maia@uft.edu.br
ORCID: https://orcid.org/0009-0008-7254-7634
LATTES: http://lattes.cnpq.br/8168117657468219
[3] Master's student in Governance and Digital Transformation
Federal University of Tocantins
Email: katiusse.soares@mail.uft.edu.br
ORCID: https://orcid.org/0009-0005-4493-159X
LATTES: http://lattes.cnpq.br/4667623775653713

INTRODUCTION

The present study addresses the possibility of using the Internet of Things (IoT) to identify, map and monitor physical factors in internal work environments. With this, managers can adopt measures to control, reduce or even eliminate environmental and occupational risks in organizations, aiming to preserve the physical and mental integrity of employees.

From interconnected devices and sensors, which collect and share data, IoT enables communication and the exchange of information between objects. Thus, it can optimize and automate processes, reduce costs, promote agility, and contribute to more accurate decision-making by organizations, including with regard to the health of their employees.

The work focuses on the professional performance of people who work in the Judiciary, more specifically in the Electoral Justice of Goiás. However, the analyses and conclusions can be useful for almost any type of organization in which there are internal environments in which activities that require intellectual effort and concentration are carried out, in accordance with item No. 17.8.4 of Regulatory Standard No. 17 (NR-17) of the Ministry of Labor.

Despite the enormous variety of elements that can interfere in people's lives and health in the work environment, such as chemical, biological and ergonomic agents, this study is restricted to some physical agents that can be monitored objectively and accurately, through techniques and measurement scales that are already consolidated, with the use of IoT.

Thus, noise, humidity, temperature and luminosity will be analyzed, as well as the relationship they have with the quality of life at work and, consequently, with the health of employees of the Regional Electoral Court of Goiás - TRE/GO and other institutions. In addition, it will be analyzed how IoT can be used to provide information for managers to establish priorities and guide decision-making regarding the quality of the work environment, mitigating harm caused by these environmental risks, positively influencing the productivity and performance of organizations.

Diseases and accidents related to the work environment constitute a global problem that affects society, organizations and individuals. Thus, it is highly recommended that public and private managers take preventive action to reduce occurrences of this nature, which compromise the health and well-being of employees and affect the productivity of organizations.

Thus, the study aims to find an answer to the following question: how can IoT, used in internal environments, to monitor physical agents capable of interfering with the physical

and mental health of employees, contribute to modern and effective people management in organizations?

The general objective of the study is to analyze the feasibility and health benefits of employees as a result of the application of IoT for the monitoring of physical agents in internal environments.

As a result of the general objective, the following specific objectives were established:

a) Map the measurable physical factors that can interfere with the physical and mental health of employees in internal environments;
b) Expose how physical factors can interfere with the physical and mental health of employees, and verify their correlation with people management;
c) Identify how the regulatory standards of the National Council of Justice - CNJ and the TRE/GO deal with aspects related to the monitoring of circumstances that may interfere with the physical and mental health of employees;
d) Detect whether the Permanent Commission of the Quality of Life at Work Program – CPQVT of the TRE/GO has already developed, or plans to develop, actions related to the monitoring of physical agents, with the purpose of preventing and reducing the risks of accidents and damage to health in the workplace;
e) Verify if there is, in the Brazilian market, equipment that is capable of measuring and monitoring physical agents, in internal organizational environments, and if its use is feasible in terms of cost-benefit;
f) Suggest the development of a technology that makes use of the Internet of Things, capable of measuring and monitoring physical agents, in internal environments, with operational and economic feasibility, if the lack of equipment with these functionalities and requirements is verified.

It is expected to demonstrate that the use of IoT in the monitoring of environmental factors can identify risks related to the quality of life in the workplace and, consequently, contribute to improve the management of people in organizations.

The theoretical framework used to support the study included data from the Observatory of Safety and Health at Work and from other sources, discussing the need to prevent environmental and occupational risks in institutions. It also dealt with the management of the quality of the work environment and the importance of Quality of Life at Work - QWL.

The methodology used consisted of a survey of scientific articles, dissertations, theses and books, as well as legal documents (conventions, resolutions, ordinances, regulatory norms, etc.) and administrative documents, statistical data, in addition to consultations in news from websites and non-written sources (courses and lectures, etc.). From these elements, the authors elaborated a table with the consolidated bibliographic reference. In addition, an investigation was also carried out in the Brazilian market to identify the existence of measuring equipment capable of meeting the requirements identified by the authors.

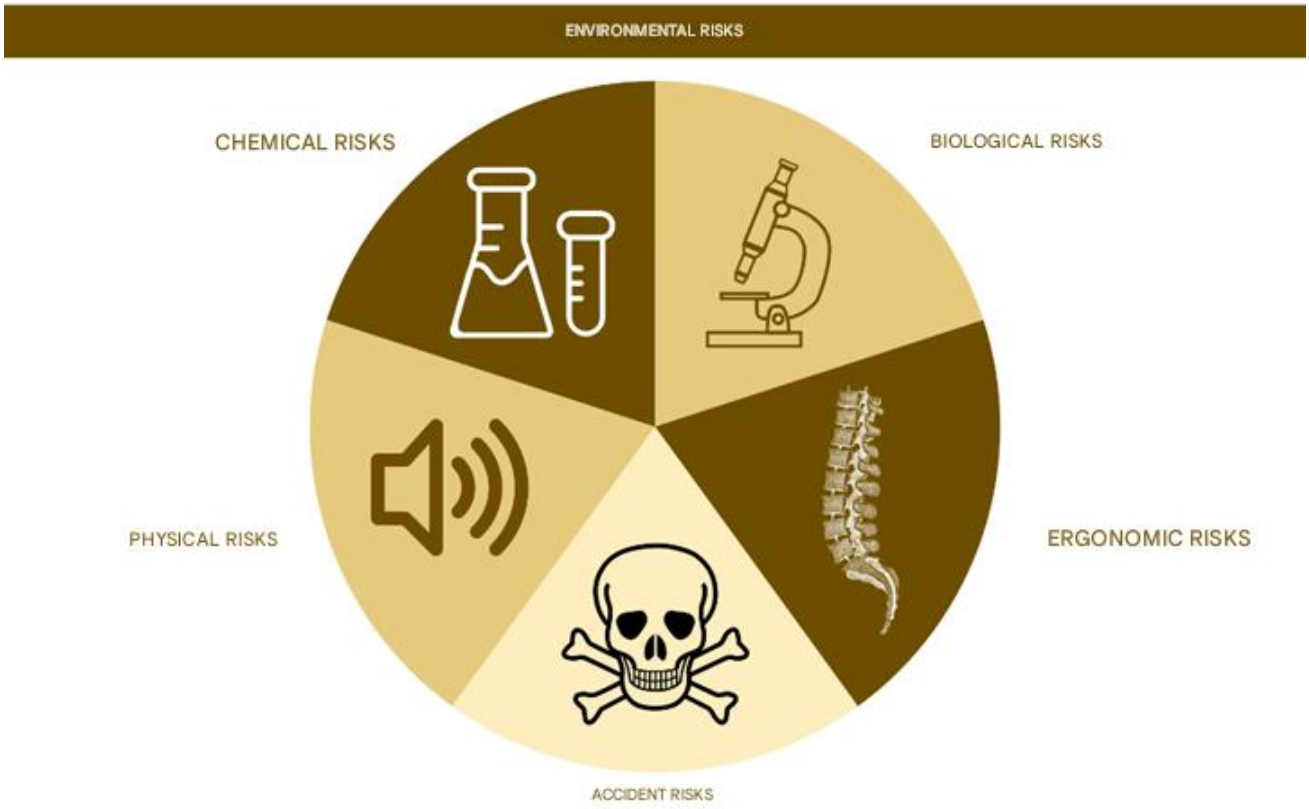
From the data analysis, it was observed that the monitoring of physical factors in indoor environments can contribute to the improvement of QWL, promoting a positive impact on health and productivity. Based on this finding, the use of a multiparameter measurement equipment was proposed, using IoT to monitor the physical factors of the work environment.

It is expected that the development of the proposed practices will contribute to the improvement of indicators related to the organizational dimension of quality of life at work. It is believed that, with the adoption of these techniques, there may be an improvement in people management, which is one of the macro challenges of the National Strategy of the Judiciary, provided for in CNJ Resolution No. 325/2020. This is because managers will be able to adopt measures, based on data, to control, reduce or even eliminate environmental factors that negatively interfere with organizations (Brasil, 2020).

THEORETICAL FRAMEWORK

Environmental risks (Figure 1), composed of physical, chemical, biological, ergonomic and accident agents, have a direct impact on people's physical, mental and social health.

Figure 1 - Types of environmental risks



Source: School of Government of the Federal District. Adapted by the authors (2024).

Harmful agents present in the environment are capable of causing damage to the health of workers due to their nature, concentration, intensity, exposure time, individual sensitivity, etc. These factors can be physical, such as air quality, luminosity, noise level, humidity, among others. They may also involve more subjective issues, which are not the object of this study, such as emotional state, focus, attention, repetitive effort and ergonomics.

Data from the Observatory of Safety and Health at Work, developed by the *SmartLab* Decent Work initiative, reveal that, in the period from 2012 to 2024, there were 7,711,613 work accidents and 29,018 deaths with people with a formal contract, 525,249,658 work days lost due to accident-related leaves and 155,655,539.23 expenses with accident-related leaves. It should be noted that this information was collected on July 11, 2024.

In the Public Administration in general, in the period from 2012 to 2024, 168,674 notifications for work accidents were registered, according to records collected on July 11, 2024 (SmartLab, 2022).

In Goiás, 165,747 notifications of work accidents and 651,160 accident-related absences were recorded between 2012 and 2022, whose numbers were obtained on July 11, 2024 (SmartLab, 2022).

Although a preventive stance is highly recommended regarding the factors capable of putting the life and health of workers at risk, the information collected in the database mentioned in the previous paragraph demonstrates the need to improve the policies adopted by companies and public institutions regarding the management of environmental and occupational risks at work.

Therefore, there is a need to adopt a more precise prophylactic planning, according to the guidelines set forth in Regulatory Standard No. 01 (NR-1), of the Ministry of Labor and Employment – MTE, which deals with general provisions and the management of occupational risks and should serve as a guide for organizations that do not fall within its mandatory field of application (Brazil, 1978).

Given the importance of the subject, the World Health Organization (WHO) and the International Labor Organization (ILO) have published guidelines on mental health at work, addressing, among other issues, the need for managers to commit to avoiding environmental and occupational hazards or risk factors (United Nations Brazil, 2024). In addition, organizations must comply with ILO Convention No. 155, which provides for the safety and health of workers and the working environment.

Thus, the quality management of the work environment is an effective procedure with regard to identifying, in advance, factors that harm the health of workers. This attitude can reduce accidents and occupational diseases and increase productivity (Chiavenato, 2014).

In addition, considering that the management of environmental risks can contribute to increasing productivity and performance at work, organizations should be concerned with the quality of life at work - QWL, whose elements include not only the comfort, but also the health of employees. For them to develop their potential, it is essential that they are inserted in healthy environments, both from a physical, social and emotional point of view.

Still with regard to QWL, it is verified that in addition to the lack of consensus on its concept, there is also the finding that it involves dynamic aspects that are always changing and evolving. In addition, it has a total connection with the context and the historical moment in which it is inserted. Quirino and Xavier, for example, in 1987, stated that QWL comprised motivational, performance and satisfaction elements. On the other hand, in 1997, Limongi-França said that it covered the managerial and technological aspects, with a focus on innovation, to improve the environment and provide better working conditions (Orsiolli *et al*., 2025).

In the Judiciary, the National Policy for People Management emphasizes that the continuous and integrated improvement of the work environment must encompass the

organizational dimension, which promotes the adoption of healthy habits, the improvement of the quality of services and the improvement of performance (Brasil, 2016).

On the other hand, the Health Care Policy for Magistrates and Employees of the Judiciary, in line with a broader approach, establishes as one of its principles the biopsychosocial approach to the health and disease process, whose understanding must encompass a comprehensive view of the human being and illness, which encompasses the physical, psychological and social dimensions (Brasil, 2015).

In an identical line of argument, Regulatory Standard No. 17 (NR-17), of the MTE, which deals with issues related to ergonomics, prescribes that working conditions must respect the psychophysiological state of employees, so that the work environment can provide health, safety, comfort, as well as provide opportunities for the efficient performance of activities (Brasil, 1978a).

In addition, NR-17 of the MTE states that internal environments in workplaces require thermal and acoustic comfort, as the activities developed in these environments require constant attention and intellectual solicitation (Brasil, 1978a).

Although this rule is aimed at workers governed by the Consolidation of Labor Laws – CLT, it is important to note that its parameters can and should be observed in the public service, when there is no specific regulation that deals with the quality of life at work or when there is no provision for how environmental factors capable of interfering with the physical and mental health of employees of institutions should be managed.

It is emphasized that in order to understand how these various dimensions of QWL influence the environment and what are the possible consequences for institutions, the ideal is to carry out an evaluation with employees, seeking to understand their needs. This evaluation should be done using robust and already consolidated models, such as Walton's, which was a pioneer in this subject, in addition to practical evaluation instruments, such as the Biopsychosocial and Organizational Analysis (BPSO-96) of Limongi-France. These techniques can transform theoretical concepts into metrics and, in this way, allow data monitoring and analysis. In addition, they enable the elaboration of diagnoses capable of positively assisting in decision-making and in the design of more effective public policies (Orsiolli *et al*., 2025).

Regarding the possibility of improving people management through the monitoring of physical agents and the improvement of quality of life, it is considered that some fundamentals are required (Figure 2):

Figure 2 - Fundamentals of People Management

Source: Chiavenato, 2014. Adapted by the authors (2024).

Due to the technological advances that have occurred in society in recent decades, corporate environments are increasingly dynamic and challenging. In this context, the digital transformation of institutions becomes necessary to promote innovation and meet the needs of the recipients of the products and services provided by the organizations (Oliveira, 2024).

Although digital transformation provides significant advances and benefits in the organizational context, it also presents challenges, such as equipment and *software* costs, the need for training and qualification of technology users, resistance to change on the part of employees, and concerns about data storage and security (Oliveira, 2024).

The Internet of Things (IoT) deals with the connection of devices, sensors, and systems through the world wide web, providing real-time data sending and receiving (Oliveira, 2024). The decree that instituted the national plan for IoT defined this technology as:

> The infrastructure that integrates the provision of value-added services with physical or virtual connection capabilities of things with devices based on information and communication technologies existing in their evolutions, with interoperability (Brasil, 2019, nonpaginated source).

As IoT encompasses more than one dimension, the one that will be analyzed in this article is the one related to health, whose objective is to improve the quality of life of individuals and increase the effectiveness of the services provided (Brasil, 2019).

Due to technological development and the advancement of IoT, it is currently perfectly feasible to use measurement equipment, connected in a network, in order to obtain data on environmental factors, in the spaces of internal work spaces. The information obtained through this technology can provide managers with more effective decision-making regarding the management of quality of life at work.

Although environmental factors have been the subject of concern in labor regulations for almost five decades, until recently it would not have been possible to even imagine that managers could have a set of relevant data on the physical conditions of the internal environments of the organizations' units. The difficulties faced in frequently reading environmental factors, storing and organizing data, made this type of initiative impractical.

However, at the current stage of technological advancement, IoT reveals itself as a technology capable of contributing to the realization of standards that deal with health prevention in the workplace, through the use of equipment that identifies and monitors the factors that constitute environmental and occupational risks.

MATERIAL AND METHODS

For the elaboration of this study, a survey was made in scientific articles, dissertations, theses and books, as well as in legal documents (conventions, resolutions, ordinances, regulatory norms, etc.) and administrative documents, statistical data, in addition to consultations in news from websites and non-written sources (courses and lectures, etc.).

Figure 3 shows an infographic with the main normative acts of the CNJ, the TSE and the TRE/GO, as well as some administrative documents and statistical data that address issues related to environmental risks, health and safety at work and quality of life in the workplace, from various agencies.

Figure 3 - Consolidated Bibliographic Reference

REFERENCIAL BIBLIOGRÁFICO CONSOLIDADO				
CARACTERIZAÇÃO DO MATERIAL	**ORIGEM**	**CARACTERIZAÇÃO DO ASSUNTO**	**CARACTERIZAÇÃO DO CONTEÚDO**	**OC**
Norma Regulamentadora n. 1 de 1978 (NR-1)	Ministério do Trabalho e Emprego	Disposições Gerais e Gerenciamento de Riscos Ocupacionais.	Diretrizes e requisitos para o gerenciamento de riscos ocupacionais e medidas de prevenção em segurança do trabalho, dentre outras questões.	OE1 OE2
Convenção n. 155, de 1981	OIT	Segurança e Saúde dos Trabalhadores e o Meio Ambiente de Trabalho.	Reduzir as circunstâncias que geram riscos relacionados ao meio ambiente de trabalho, através de políticas que previnam acidentes e danos à saúde, dentre outras questões.	OE1 OE2
Constituição Federal de 1988	Assembleia Nacional Constituinte	Instituição de um Estado Democrático, destinado a assegurar o exercício dos direitos sociais e individuais, a liberdade, a segurança, o bem-estar, o desenvolvimento, a igualdade e a justiça, dentre outros assuntos.	Saúde como um direito social fundamental que está relacionado à dignidade da pessoa humana Meio ambiente ecologicamente equilibrado através do controle de métodos e substâncias que comportem risco para a vida e a qualidade de vida das pessoas.	OE1 OE2
Plataforma de dados criada em 2015	SmartLab de Trabalho Decente e Faculdade de Saúde Pública da USP	Fórum multidisciplinar de fomento da gestão transparente de políticas públicas.	Disponibilização de estatísticas e indicadores que auxiliam na formulação de políticas públicas de prevenção de acidentes e doenças no trabalho.	OE1 OE2
Resolução n. 207 de 2015	CNJ	Instiuiu a Política de Atenção Integral à Saúde de Magistrados e Servidores do Poder Judiciário.	Diretrizes e estratégias para coordenar ações que detectem, analisem e monitorem fatores que interferem na saúde no ambiente de trabalho, com a finalidade de planejar, implantar, monitorar e analisar intervenções que reduzam os riscos e agravos à saúde Produzir e a analisar dados estatísticos para subsidiar a propositura de ações na área de saúde, para prevenir doenças, diminuir o absenteísmo e auxiliar na tomada de decisões.	OE1 OE2
Portaria n. 422 de 2015	TRE/GO	Núcleo Socioambiental - atuar em caráter permanente no planejamento, implementação, monitoramento de metas anuais e avaliação de indicadores de desempenho.	A qualidade de vida no ambiente de trabalho abrange a valorização, a satisfação e a inclusão dos colaboradores das organizações Estímulo ao desenvolvimento pessoal e profissional dessas pessoas, assim como adequação das instalações físicas.	OE1 OE2 OE3
Resolução n. 23.474 de 2016	TSE	Dispõe sobre a implantação do Plano de Logística Sustentável da Justiça Eleitoral, dentre outras providências.	A qualidade de vida no ambiente de trabalho abrange a valorização, a satisfação e a inclusão dos colaboradores das organizações. Estímulo ao desenvolvimento pessoal e profissional dessas pessoas, assim como adequação das instalações físicas.	OE1 OE2 OE3
Resolução n. 240 de 2016	CNJ	Dispõe sobre a Política Nacional de Gestão de Pessoas no âmbito do Poder Judiciário.	Governança de pessoas: direcionamento e monitoramento da gestão de pessoas com a finalidade de reduzir riscos e promover a saúde Princípio: promoção da saúde, a qual refere-se a um estado de completo bem-estar físico, mental e social A qualidade de vida dos magistrados e dos servidores é um dos requisitos essenciais para o alcance dos objetivos da instituição.	OE1 OE2 OE3
Portaria n. 95 de 2020	TRE/GO	Instituiu o Programa de Qualidade de Vida no Trabalho - PQVT - no TRE/GO.	Finalidade: Manter a saúde e melhorar a qualidade de vida dos colaboradores Aperfeiçoar as condições de trabalho e garantir um ambiente organizacional saudável Estimular a iniciativa, a produtividade e o comprometimento com os resultados Reduzir o estresse, os índices de absenteísmo e de acidentes e doenças ocupacionais Atribuições da Comissão: Elaborar diagnóstico sobre as necessidades dos servidores Estabelecer um plano de ação, constando suas prioridades e os recursos necessários para sua execução, dentre outros assuntos Sugerir parcerias, patrocínios e doações para minimizar os custos operacionais do plano de ação.	OE1 OE2 OE3 OE4

CARACTERIZAÇÃO DO MATERIAL	ORIGEM	CARACTERIZAÇÃO DO ASSUNTO	CARACTERIZAÇÃO DO CONTEÚDO	OC
Resolução n. 325 de 2020	CNJ	Dispõe sobre a Estratégia Nacional do Poder Judiciário 2021-2026.	Macrodesafio relativo ao Aprendizado e Crescimento - Aperfeiçoamento da gestão de pessoas – Os órgãos devem adotar políticas, métodos e práticas que promovam a saúde, aprimorem, de forma contínua, as condições de trabalho, propiciem a qualidade de vida no trabalho, dentre outras ações.	OE1 OE2 OE3
Resolução n. 400 de 2021	CNJ	Dispõe sobre a Política de Sustentabilidade no Poder Judiciário.	As ações de sustentabilidade caracterizam-se, dentre outros fatores, por práticas institucionais que melhorem a qualidade de vida dos colaboradores da organização, compreendendo seu desenvolvimento pessoal e profissional, bem como a preocupação com as instalações físicas e com o cuidado preventivo A qualidade de vida no ambiente de trabalho abrange a valorização, a satisfação e a inclusão das pessoas. Trata-se de um dos temas que deve compor os indicadores de desempenho do Plano de Logística Sustentável.	OE1 OE2 OE3
Resolução n. 396 de 2024	TRE/GO	Dispõe sobre a Política de Gestão de Pessoas no âmbito da Justiça Eleitoral de Goiás.	O conceito de gestão de pessoas abrange a melhoria da saúde, da qualidade de vida no trabalho, o bem-estar, dentre outros A qualidade de vida no trabalho abarca o bem-estar biopsicossocial, no qual deve-se atentar para a promoção da saúde, da segurança no trabalho e das relações socioprofissionais saudáveis e humanizadas.	OE1 OE2 OE3 OE4
Pesquisa por meio de correio eletrônico	Fabricantes e fornecedores de equipamentos de medição	Disponibilidade de IoT para monitorar fatores ambientais.	Consulta sobre a disponibilidade ou informação sobre a existência de equipamentos que realizem medição de fatores ambientais e que tenham conexão em rede para transmissão e armazenamento de dados.	OE5 OE6

LEGENDA
OC = Outras características

ESPÉCIE DE DOCUMENTO: JURÍDICO, ADMINISTRATIVO, FONTE ESTATÍSTICA

OBJETIVO ESPECÍFICO: OE1

Source: Prepared by the authors (2024).

In addition, an investigation was carried out in the national market to identify the existence of equipment that met the necessary requirements to constantly monitor the internal work environments of organizations.

ANALYSIS AND DISCUSSIONS

As predicted, it has been shown that temperature, noise, humidity and luminosity can interfere with the physical and mental health of people in the workplace. Therefore, the monitoring of these physical factors can effectively contribute to improving the quality of life at work and, consequently, positively impact the physical and mental health of employees, as well as increase productivity and performance, in addition to improving people management.

Given the importance of the issues that were correlated in this study, it was found that the institution of quality of life programs in the Judiciary, as required by goal 9 of the CNJ, in the sense of integrating the UN 2030 Agenda, aims to bring the TRE/GO and other Justice bodies closer to the fulfillment of some of the Sustainable Development Goals (Figure 4) and, In this way, provide health and well-being, decent work and sustainable development.

Figure 4 - SDGs related to the study theme

Source: United Nations - Brazil (https://brasil.un.org/pt-br/sdgs). Adapted by the authors (2024).

From the studies carried out, it was observed that the concern with the reduction of circumstances related to the work environment, which generate risks to the physical and mental health of the employees of organizations, as well as those that affect the quality of life at work, is present in at least three institutional policies, namely, health, sustainability and people management.

In the TRE/GO, two strategic objectives provided for in the 2024-2026 Management Plan are directly related to the prevention of environmental risks and quality of life at work, namely, to promote sustainability and improve people management.

Regarding ergonomics and environmental risks, it was found that there was a project in the TRE/GO, called Ergonomic Assessment and Occupational Risks, which contemplates this dimension of quality of life at work, whose assessment actions were expected to start in 2024.

With regard to people management, it was found that its improvement is not only linked to the promotion of the physical and mental health of the employees of organizations, but also to the humanization of professional relationships, the continuous improvement of working conditions, the development of behavioral skills and the adequate distribution of the workforce.

In this line, it was confirmed that organizations should implement and develop programs in which people management is more participatory. Thus, employees need to be seen and placed as partners of institutions, which reflects positively on the identity of organizations, which comprises the mission, vision, and values, especially in the unit responsible for people management, which must have human capital as the center of its actions.

It is also worth mentioning that, although they are not analyzed in this study, issues such as financial planning, religious tolerance and harassment in labor relations are themes that should also be part of the agenda of quality of life at work programs in organizations.

In addition, it was found that risk prevention, through monitoring with tools that use IoT, has the potential described in Figure 5.

Figure 5 - Possibilities of risk monitoring through IoT

Source: Prepared by the authors (2024).

Industrial environments have their own characteristics with regard to dangers to people's health and occupational safety, such as repetitiveness of tasks and exposure to unhealthy agents. These conditions increase the risks of repetitive strain injuries (RSI/WMSD) and pathologies such as contact dermatitis (Da Cruz *et al*, 2025).

For these reasons, it is observed that there are several devices that allow monitoring factors such as air quality, humidity, noise and luminosity for use in industrial environments. In these spaces, especially in risky or unhealthy activities, this type of measurement and monitoring already occurs, which are carried out due to the nature of the work or as a result of legal imposition.

However, for indoor environments, in which activities that require constant attention and more focused on the intellect are carried out, as defined in NR-17 of the MTE, it is verified that the measurement and monitoring of environmental factors are not part of a consolidated reality in most organizations.

At this point, it is important to note that monitoring is among the duties of the committee responsible for the quality of life at work program, as provided for in Ordinance TRE/GO No. 95/2020.

Although labor rules provide for the requirement of acoustic and thermal comfort, as well as adequate lighting in indoor environments, the management of environmental factors lacks data to ensure that the parameters for applying the standards are met.

Thus, the researchers' proposal is to use a multiparameter environmental factor measurement equipment (*all in one*), using IoT, to read the physical factors of the environment, as represented in Figure 6.

Figure 6 - Proposal for the use of equipment, using IoT, to monitor physical factors in indoor workspaces

Source: Prepared by the authors (2024).

There are several pieces of equipment capable of measuring environmental factors. According to searches carried out in the national market, it was observed that the manufacturers and suppliers of measuring instruments Akso, Instrubrás, Instrutherm and Minipa have equipment minimally prepared for the intended application, since they bring together in a single device the functions of measuring light intensity, temperature, relative humidity and sound pressure levels.

However, it was noticed that the devices are developed for use by outsourced professionals, linked to the area of health or occupational safety, who perform occasional readings in the environment for the purpose of preparing reports, for example. Some of

these electronic devices even have the ability to store data, but they don't have any form of network connection to instantly transmit the information to a cloud.

The identified devices also do not have automatic activation functionality for reading data at predefined intervals. There is a need for a human operator to activate them, which would make it unfeasible to monitor environmental factors in the internal spaces of organizations.

Thus, for the type of use proposed in this study, it is suggested the improvement of existing technologies, adding functionalities of automatic activation and network connection, to a multiparameter equipment, making it capable of automatically recording data related to the conditions of the environment, with a certain frequency of time and transmitting them to a database connected to the cloud, for consultation at an opportune time. The equipment to be developed must meet the characteristics described in Figure 7.

Figure 7 - Equipment attributes, using IoT, to monitor environmental factors in indoor workspaces

Source: Prepared by the authors (2024).

The use of the equipment, in the proposed form, can provide managers with important information for making more assertive decisions with regard to the management of the work environments of the institutions.

FINAL CONSIDERATIONS

This article addressed the possibility of using the Internet of Things to monitor physical factors in internal workspaces, in order to prevent damage to the physical and

mental health of TRE/GO employees and institutions in general. It has been demonstrated that this practice is capable of improving the quality of life in the workplace, increasing productivity and performance, in addition to improving people management.

This work presented contributions to the understanding and management of environmental factors that can interfere in the quality of life of TRE/GO employees. It also demonstrated that technology can be an ally in promoting a healthier and safer work environment, by enabling the automatic monitoring of variables such as temperature, humidity, luminosity and noise pollution levels.

The study also collaborated to promote synergy between public policies such as people management, sustainability, physical and mental health of workers and technology, proposing a model that can be replicated in different organizational contexts. The research also opened space for future investigations, suggesting that new studies can explore the possibility of using IoT to monitor other dimensions of quality of life in the workplace, such as occupational and psychosocial.

The study also opens up possibilities to add value to the topics covered in this article, with regard to correlation with Data Science. It is not enough to collect, it is important to know how to interpret the information obtained through the IoT, analyzing it critically, monitoring its entire production cycle and transforming it into knowledge. This is a fundamental condition for the effectiveness of public/institutional policies.

The analyses carried out throughout this article have shown that the implementation of IoT systems not only facilitates the collection of data in real time, but also allows managers of the TRE/GO and other institutions to make more effective, evidence-based decisions, minimizing risks to the physical and mental health of workers. In addition, it was found that the ability to continuously monitor environmental conditions enables proactive action, with quick and effective interventions that can prevent problems or, when unavoidable, mitigate their consequences, before they become critical.

Thus, it is believed that the use of the internet of things to monitor and provide data related to environmental factors, which interfere with the physical and mental health of employees, can facilitate and boost the creation of healthy workspaces that favor the improvement of quality of life.

Considering that the health of the people who make up an organization should be a priority, technology can play a crucial role in this process, even helping to improve organizational productivity and performance.

REFERENCES

1. Bardin, L. (1995). Análise de conteúdo (L. A. Reto & A. Pinheiro, Trads.). Edições 70. https://edisciplinas.usp.br/pluginfile.php/7684991/mod_resource/content/1/BARDIN__L._1977._Analise_de_conteudo._Lisboa__edicoes__70__225.20191102-5693-11evk0e-with-cover-page-v2.pdf

2. Brasil. (1988). Constituição da República Federativa do Brasil. Presidência da República. https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm

3. Brasil. (2019). Decreto n. 9.854, de 25 de junho de 2019: Institui o Plano de Internet das Coisas. Presidência da República. https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2019/decreto/d9854.htm

4. Brasil. (2021). Resolução n. 207, de 15 de outubro de 2015: Institui a Política de Atenção Integral à Saúde de Magistrados e Servidores do Poder Judiciário. Conselho Nacional de Justiça. https://atos.cnj.jus.br/atos/detalhar/2189

5. Brasil. (2020). Resolução n. 325, de 29 de junho de 2020: Dispõe sobre a Estratégia Nacional do Poder Judiciário 2021-2026 e dá outras providências. Conselho Nacional de Justiça. https://atos.cnj.jus.br/atos/detalhar/3365

6. Brasil. Ministério do Trabalho e Emprego. (2024). Norma Regulamentadora n. 1 (NR-1). https://www.gov.br/trabalho-e-emprego/pt-br/acesso-a-informacao/participacao-social/conselhos-e-orgaos-colegiados/comissao-tripartite-partitaria-permanente/normas-regulamentadora/normas-regulamentadoras-vigentes/nr-01-atualizada-2024.pdf

7. Brasil. Ministério do Trabalho e Emprego. (2024). Portaria n. 1.419, de 27 de agosto de 2024. https://www.in.gov.br/en/web/dou/-/portaria-mte-n-1.419-de-27-de-agosto-de-2024-58077827

8. Chiavenato, I. (2014). Gestão de pessoas: O novo papel dos recursos humanos nas organizações (4ª ed.). Manole. https://biblioteca.unisced.edu.mz/bitstream/123456789/2347/1/Idalberto-Chiavenato-Gestao-de-Pessoas-o-Novo-Papel.pdf

9. Ferreira, M. C., & Santos, L. A. (Orgs.). (2023). Diagnóstico, política e programa de qualidade de vida no trabalho do Poder Judiciário de Rondônia (PJRO). Editora dos Autores. https://drive.google.com/file/d/1TaCYFChF3D0w9kuln8h8GAZxlEC5VDny/view

10. França, A. C. L. (1996). Indicadores empresariais de qualidade de vida no trabalho [Tese de doutorado, Universidade de São Paulo]. https://www.teses.usp.br/teses/disponiveis/12/12132/tde-14042009-113324/publico/tesedoutoradoLimongi.pdf

11. Gil, A. C., & Reis Neto, A. C. (2020). Survey de experiência como pesquisa qualitativa básica em administração. Revista de Ciências da Administração, 22(56), 125-137. https://periodicos.ufsc.br/index.php/adm/article/view/74026/45678

12. Lemos, D. S. (2019). Curso Básico em Segurança do Trabalho. https://egov.df.gov.br/wp-content/uploads/2019/11/Apresenta%C3%A7%C3%A3o-

%E2%80%93-Introduc%CC%A7a%CC%83o-a-seguranc%CC%A7a-do-trabalho-e-riscos-ambientais.pdf

13. Ministério da Saúde. (2020). O que significa ter saúde?. https://www.gov.br/saude/pt-br/assuntos/saude-brasil/eu-quero-me-exercitar/noticias/2021/o-que-significa-ter-saude

14. Nações Unidas Brasil. (2024). OMS e OIT publicam novas diretrizes sobre saúde mental no trabalho. https://brasil.un.org/pt-br/201450-oms-e-oit-publicam-novas-diretrizes-sobre-sa%C3%BAde-mental-no-trabalho

15. Oliveira, M. F. (2011). Metodologia científica: Um manual para a realização de pesquisas em administração. UFG. https://files.cercomp.ufg.br/weby/up/567/o/Manual_de_metodologia_cientifica_-_Prof_Maxwell.pdf

16. Orsiolli, T. H. E., Souza, C. A., Orsiolli, T. A. E., & Matos, J. L. T. (2025). Qualidade de vida no trabalho: Percepção dos servidores de uma instituição federal. Revista Aracê, 7(1), 1347-1369. https://doi.org/10.56238/arev7n1-082

17. Oliveira, R. M. J. (2024). Transformação digital nas cadeias de suprimentos: Benefícios, desafios e inovações tecnológicas. Revista Aracê, 6(3), 4583–4598. https://doi.org/10.56238/arev6n3-020

18. Prodanov, C. C., & Freitas, E. C. (2013). Metodologia do trabalho científico: Métodos e técnicas da pesquisa e do trabalho acadêmico (2ª ed.). Feevale. https://www.feevale.br/Comum/midias/0163c988-1f5d-496f-b118-a6e009a7a2f9/E-book%20Metodologia%20do%20Trabalho%20Cientifico.pdf

19. SmartLab. (2022). Observatório de segurança e saúde no trabalho: Promoção do meio ambiente do trabalho guiado por dados. https://smartlabbr.org/sst

20. Tribunal de Justiça do Piauí. (2023). Projeto “Se Cuida” visa atuar preventivamente e com foco na saúde mental, diz presidente do TJ-PI. https://www.tjpi.jus.br/portaltjpi/tjpi/noticias-tjpi/projeto-se-cuida-visa-atuar-preventivamente-e-com-foco-na-saude-mental-diz-presidente-do-tj-pi