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RESEARCH ARTICLE **Open Access**

Designing a Model for the Maturity of Decent Work in the Sustainable Pharmaceutical Supply Chain Using Thematic Analysis

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Abstract
Considering the goals of sustainable development, numerous studies and research have been conducted in the field of supply chain sustainability. While some articles have addressed the social sustainability dimensions of the supply chain, there is a lack of integrated and comprehensive models to assess the performance of these chains in social sustainability dimensions, especially concerning decent work criteria. The present research aims to design a model for the maturity of decent work in the sustainable pharmaceutical supply chain. This research is an applied study from the perspective of objectives and descriptive research methodologically. The research population in the qualitative section consisted of experienced experts in the field of supply chain and decent work, and for this purpose, 15 individuals were selected and interviewed. After designing the initial model, in the qualitative section and initial screening of dimensions and components, 84 concepts remained in the model.

Keywords: *Maturity Model, Decent Work, Supply Chain, Sustainability, Pharmaceutical Industry*

Introduction

Sustainable development is one of the subjects that has increasingly drawn the attention of organizations internationally(Ardehi, Javanmard, & Pilevari, 2023; Shafiei et al., 2023). The significance of this matter on the global stage can be observed in the annual publication of the United Nations' Sustainable Development Report across various domains. With the process of globalization, the scope of supply chain management has extended beyond economic and environmental issues, encompassing specialized subjects such as achieving fair working conditions, uprooting discrimination in employment, supporting productive employment, fair conduct in work, and workplace safety and health (Sánchez-Flores et al., 2020), rooted in the dimensions of decent work.

Decent work is a concept seeking to establish a fairer space concurrent with job security, freedom of expression, self-esteem, and social justice (Fernández-Berrocal et al., 2016). Decent work implies productive labor that supports the rights of all individuals regardless of their abilities and includes aspects such as equal employment opportunities, consideration of fundamental labor rights, conflict resolution, and social support (Cooke, Xu, & Bian, 2019). It has been highlighted since its inception due to its foundational principles included in the global development agenda, aiming to measure the welfare of the workforce (Brill, 2021).

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Due to the importance of supply chain sustainability, there still exists a lack of studies evaluating the sustainability capabilities within supply chains and their implementation methods. The absence of a specific maturity model for sustainability indicators within supply chains, one that can also fulfill the goals of sustainable development, represents a research gap. A model capable of serving as a roadmap toward excellence in a sustainable supply chain, reliant on social aspects and aligned with the objectives of decent work, is more crucial than ever. This would enable companies to undertake long-term strategies to enhance maturity levels and demonstrate the achievement of sustainable development goals.

Although maturity models in studies of supply chain sustainability are diverse, a clear understanding of their developmental capabilities within specialized subsets and with greater detail remains a research challenge. Furthermore, the concepts and relationships used in these models have not been adequately explained concerning the objectives of sustainable development and decent work. Therefore, for the sustainability of the country's pharmaceutical supply chain, the necessity of considering decent work components while balancing the dimensions of sustainability (economic, social, and environmental) is undeniable. Based on this premise, the main issue of the current research is: How is the maturity model of decent work in the sustainable pharmaceutical supply chain of the country? What are the indicators and criteria of sustainability based on decent work?

This research aims to design a maturity model of decent work in the sustainable pharmaceutical supply chain, intending to measure and evaluate indicators of decent work systematically. Although maturity models in studies of supply chain sustainability are diverse, a focused understanding of developmental capabilities centered on decent work remains a research challenge. Therefore, for the sustainability of the country's pharmaceutical supply chain, the necessity of attention to decent work components and balancing the dimensions of sustainability (economic, social, and environmental) is indispensable.

To gather theoretical foundations, library studies were utilized, providing secondary data that were reviewed by the researcher prior to commencing the study. Books, articles, theses, and internet sites were used to collect literature and theoretical discussions relevant to the subject.

Field studies were employed to collect data related to this research. Semi-structured interviews were conducted in the qualitative section, following a designed interview protocol. The statistical population of this research comprises experts in the pharmaceutical sector.

This research adopts a qualitative approach; hence, the data analysis varies according to each stage. In the qualitative section, the analysis of interviews was conducted using thematic analysis.

Literature Review

Supply chain management is among the issues that have attracted the attention of numerous researchers (Stock, Boyer, & Harmon, 2010; Tavakkol, Nahavandi, & Homayounfar, 2023). According to the Supply Chain Management Professionals Association, the supply chain encompasses planning and managing all activities related to sourcing, procurement, transformation, and logistics (Kleab, 2017; Shukla, 2011). It's viewed as a network of interconnected businesses collaborating in the final provisioning of goods and services required by end customers (Dubey, Chavas, & Veeramani, 2018; easyJet & Freighter, 2019).

Supply chain management, a comprehensive framework encompassing the orchestration of resource procurement, material sourcing, and numerous procurement activities, operates in tandem with various stakeholders. This includes suppliers, intermediaries, third-party service providers, and customers (Biswas & Sen, 2017). In contemporary discourse, the

significance of (Nikounam Nezami, Toloie Ashlaghi, & Iranban, 2023)has gained prominence (Ansari & Qureshi, 2015; Galal & Moneim, 2016).

Today, the discourse on sustainability and its vital role in curbing environmental degradation, such as global warming and ozone layer depletion, along with the protection of human rights, has become increasingly imperative (Hawkins, 2019; Nikounam Nezami, Toloie Ashlaghi, & Iranban, 2023). The traditional supply chain needs to evolve towards sustainable supply chain management in terms of economic, social, and environmental benefits (Chuang & Huang, 2018).

Based on conducted studies, sustainable supply chain has three primary dimensions: social, economic, and environmental practices. Supply Chain Sustainability Management (SSCM) requires a combination of economic, environmental, and social perspectives in business operations (Panigrahi, Bahinipati, & Jain, 2019).

Supply chains, crucial to global business operations, play a vital role in sustainable development due to their far-reaching impact and potential unforeseen consequences. These chains are subject to influences from competitors, regulations, globalization, stakeholder demands, and customer expectations, necessitating their alignment with sustainability principles (Ahmadpour, Gholipour Kanaani, & Movahhedi, 2023; Amini & Jahanbakhsh Javid, 2023; Zavala-Alcívar, Verdecho, & Alfaro-Saiz, 2020).

Decent work, a relatively recent focus in labor market discussions, forms a crucial aspect of sustainable development (Ioannides, Gyimóthy, & James, 2021). It aims to create fair economic spaces where workers experience job security, freedom, dignity, and social justice throughout their professional lives. Decent work is multifaceted, encompassing job creation, labor rights protection, social welfare expansion, and improved social dialogue (Bob, 2020). This concept, often synonymous with employment quality and job satisfaction, prioritizes worker well-being and extends from pre-employment to post-retirement phases. Despite its distinct focus, decent work aligns with the broader goals of sustainability, emphasizing the ethical treatment and fulfillment of workers within the larger framework of sustainable development.

Chen et al (Chen et al., 2017). in a study titled "Decent Work in China's Garment Industry: A Comparative Analysis of Blue-Collar and White-Collar Garment Workers" highlighted the significance of addressing labor issues in the garment industry due to increased customer awareness of inappropriate work conditions and rising labor crises in the global garment production industry.

Korea et al. (Correia et al., 2017) systematically reviewed the maturity model of supply chain sustainability. The literature review was conducted from articles between 2000 and 2015. From a sustainability perspective, the scope of analyzed maturity models is largely centered around the Triple Bottom Line (TBL) framework and often lacks an extensive environmental dimension, focusing mostly on a specific process (environmental design and new product development).

Katiyar et al (Katiyar et al., 2018) presented a framework for calculating the social sustainability index based on tools, dimensions, and features of social sustainability in the transportation sector. Their considerations encompassed employment contracts, training and development, safety and health activities, employee service compensation, cultural participation, stakeholder empowerment, equal employment opportunities, among other indicators of social sustainability.

Ray et al. (Rai, Brown, & Ruwanpura, 2019), in a study titled "SDG8: Decent Work and Economic Growth - A Gender Analysis," highlighted that among the 17 Sustainable Development Goals (SDGs), Goal 8 (SDG8) emphasizes the promotion of "sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all." Despite the significant

presence of women in formal and informal sectors, there hasn't been a gender-specific study on decent work and economic growth. Employment and decent work for both women and men by 2030 should account for social values and costs. The research argued that gender serves as a crucial lens for understanding, strategizing, and implementing sustainable development goals. SDG 8 objectives are occasionally contradictory to each other.

Decent work is a concept aimed at creating an equitable economic space, emphasizing job security, freedom, dignity, and social justice. It has four overarching goals: support for fundamental labor rights, promoting productive employment, expanding social protection, and advocating for social dialogue (Askaripoor Geluyake et al., 2019; Bob, 2020).In this research, decent work encompasses four dimensions referenced by the International Labour Organization (ILO). On the other hand, in 2008, Carter and Rogers (Carter & Rogers, 2008) presented a comprehensive conceptual framework for sustainable supply chain management. In addition to the three primary dimensions of sustainability (economic, environmental, and social) that they extensively elaborated on, they added four other aspects that support the three main concepts in this framework: strategy, vision and culture, transparency, and risk management. Table 1 could be presented as an example or sample for the maturity model of decent work in the supply chain.

Table 1.
Proposed initial research model

Level of maturity	Description and delineation for assessing maturity status
1 Lack (weak)	It appears that there is no social sustainability in the supply chain; the company shows no inclination toward implementing social sustainability in its supply chain
2 Aware (sufficient)	The importance of the supply chain is recognized, but no specific actions or plans have been implemented.
3 Moderate (good)	Some efforts to promote sustainable supply chain (such as educational programs or awareness campaigns) have been made, but they have not been consistently implemented throughout the supply chain.
4 Advanced (very good)	There is a good alignment between sustainable supply chain management and the goals of decent work; the processes and procedures of sustainable supply chain management based on decent work goals within the company are planned and the process control is continuously monitored.
5 Sustained (excellent)	The processes of sustainability based on ethical work practices are implemented with the assurance of continuous improvement within the company; shortcomings and issues related to ethical work-based sustainability in the company are identified.

Among the social objectives of decent work, the workforce's "health and well-being," "quality education," and "gender equality" are also important in a sustainable supply chain. However, there are very few quantitative criteria for goals such as "poverty alleviation," "hunger and food security," "fair working hours," "fair workplace treatment," and "peace, justice, and freedom." Therefore, focusing on the human dimensions of the supply chain and humanizing supply chain research could have a significant scientific impact on sustainability and sustainable development. It could also facilitate the realization of decent work objectives within supply chains. Yet, there is no unified approach to assess the real performance of the supply chain in terms of social sustainability, particularly regarding decent work. There is a need to develop measurement tools and a set of social sustainability criteria. Hence, examining the dimensions and components of decent work based on sustainable development objectives and aligning them with the aspects of sustainable supply chains elucidates the role of sustainable supply chains in achieving decent work objectives and sustainable

development through presenting a structured model and a real-world case study. This proposed research model concurrently considers economic, environmental, and social criteria, achieving a well-balanced trio of criteria consistent with sustainable development goals, particularly the realization of decent work within the supply chain. Although maturity models in supply chain sustainability studies are diverse, a clear understanding of their developmental capabilities in specialized subsets and detailed aspects remains a research challenge. Moreover, the concepts and relationships used in these models have not been adequately elucidated concerning sustainable development and decent work objectives. Therefore, to ensure the sustainability of the country's pharmaceutical supply chain, considering the components of decent work while balancing economic, social, and environmental dimensions is an undeniable necessity. Based on this premise, this research focuses on designing a maturity model for decent work within the sustainable pharmaceutical supply chain industry.

Methodology

This study aims to design a model for the maturity of decent work in the sustainable pharmaceutical supply chain. The research uses thematic analysis to develop this model. Thematic analysis is a qualitative data analysis method involving the exploration of a set of data to identify, analyze, and report repeated patterns or themes. Themes represent the most important underlying meaning and hidden responses to research questions. A distinctive feature of thematic analysis is its flexibility and applicability across a wide range of theoretical frameworks to address research questions (Clarke & Braun, 2017). The thematic analysis process involves continuous iterative movement between a set of data and generated codes. Themes encapsulate crucial information about the data and research questions, highlighting patterns that are latent within the data. Themes can be identified in an inductive (data-driven) or deductive (theory-based) manner. Understanding themes with an inductive approach somewhat aligns with grounded theory and involves a data-driven coding and analysis process. In this research, an inductive thematic analysis approach was utilized for analyzing semi-structured interviews, and a specific unit of analysis was determined before commencing the data analysis stage.

The unit of analysis can be a word, a topic, individuals, events, or documents capable of coding and constructing concepts. Therefore, "themes" were identified as the unit of analysis for semi-structured interview data. The current research framework involves multiple methodological approaches, including literature review and comparison of existing maturity models, semi-structured interviews with experts, and conceptual design of the model. Figure 1 shows the schematic of the methodology used in the presented research.

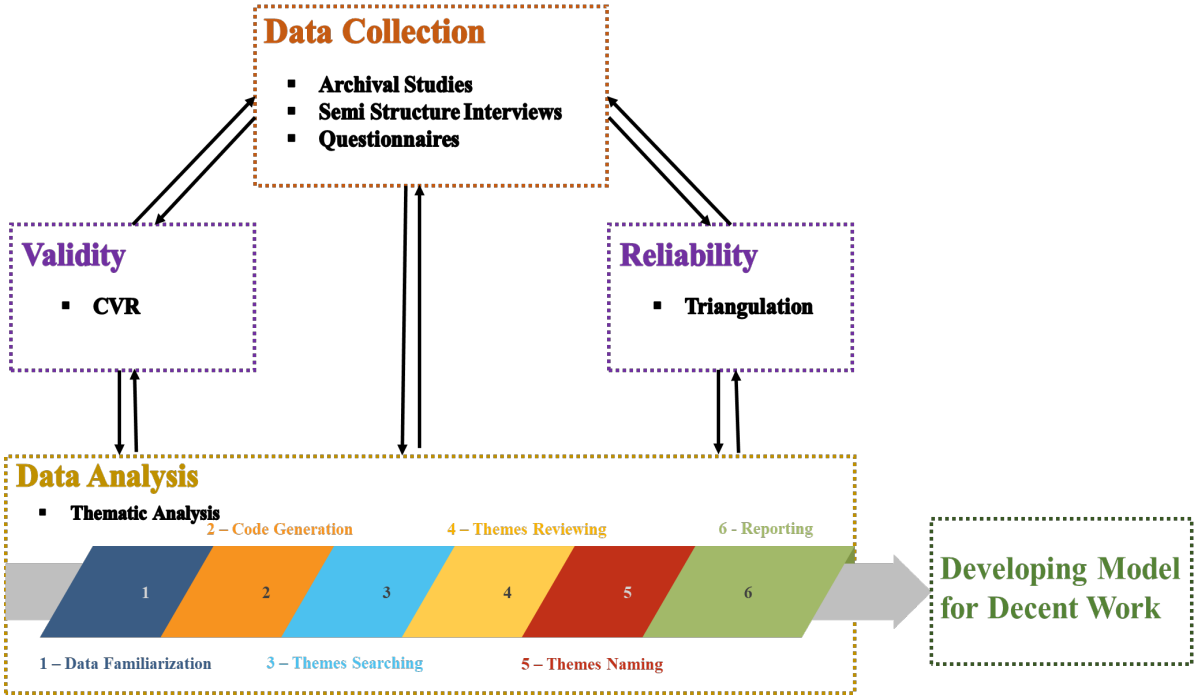

Figure 1. *Research methodology*

Thematic Analysis

The thematic analysis is primarily conducted through three types of coding: open coding, axial coding, and selective coding, using these codes to break down and label observation records and interview text, rewriting word by word, sentence by sentence, and paragraph by paragraph (Lawless & Chen, 2019). In this research, semi-structured interviews were conducted with 15 individuals, and the interview texts were transcribed and immediately analyzed. Through interviews with 15 experts, theoretical saturation was reached, meaning that adding more samples did not add more to the number of themes and processes under study.

Open coding is used to process and organize collected materials from interviews, news reports, books, and other sources based on the existing analysis at the sentence or paragraph level. Conceptualization refers to selecting or creating a concept that best reflects the essence of the sentence. Categorization refers to a more abstract concept higher in the hierarchy than the general concept (Williams & Moser, 2019). In the process of open coding, data is segmented to identify similarities and differences under scrutiny. The process of open coding can be seen as part of the analysis process, engaging in conceptualization and categorization of phenomena through careful examination and scrutiny of data (Corbin & Strauss, 1990). The steps involved in open coding are:

Analysis and coding: In this approach, sampling is done to allow the researcher to discover concepts within the texts. As data is sequentially reviewed, numerous codes will be extracted from within the text of each interview, and ultimately final codes will be determined.

Discovery of categories: In this step, concepts need to be categorized based on their relation to similar subjects. The titles by which we name the categories are much more abstract than the concepts that make up the desired set of categories. The chosen titles must be highly compatible with the data that represents them, being common phrases used by most interviewees.

Description of categories: This step involves describing the characteristics of the categories for further clarification.

Open coding matrix: This matrix comprises two sections. The first section

delineates free codes, and the second section determines concepts or open codes.

Central coding is used for clustering and categorizing open codes, finding internal relationships between different categories. The reason for naming this type of coding is that coding revolves around a central concept; in other words, one of the selected open-coding concepts is chosen, and then other concepts will be related to that central or core concept (Corbin & Strauss, 1990)

Data Collection Method and Tools
Archival Studies

Collecting information in research is one of the most crucial stages in conducting a study. In the exploratory phase of this research, tools such as document review, studying the theoretical literature of the research, and background studies have been used to gather information from sources such as examining documents, theses, books, domestic and international articles, websites in the field of investigating the dimensions and components of decent work in the supply chain

Semi-Structured Interviews with Experts

A thorough and deep assessment of perceptions, viewpoints, and aspirations is possible through the method of interviews (DeJonckheere & Vaughn, 2019). In the current research, the studies conducted in the area of decent work as well as the examination of the dimensions and components of decent work in the supply chain have led to the formation of interview focal points with experts. In the qualitative section of this research, semi-structured interviews, which offer high flexibility, are employed. Approximately 60 minutes were allocated for each interview session. The interviews continued until theoretical saturation was achieved.

Questionnaire

Following the integration of expert opinions with literature, to understand the dimensions of decent work in the supply chain, a Content Validity Ratio (CVR) questionnaire was employed. The items were adjusted based on findings derived from interviews and literature, structured as a three-option Likert scale. The questionnaire items were categorized as essential, necessary, and unnecessary, assigned numbers from 3 to 1, respectively.

Research Strategy

Strategies in qualitative research encompass foundational data theory, narrative analysis, participatory observation, case studies, and thematic analysis (Creswell et al., 2007). In this current research, a thematic analysis strategy was employed to determine the dimensions and components of the model. Thematic analysis is a systematic approach for examining qualitative data (such as conducted interviews and observation protocols) (Nowell et al., 2017). In this study, data derived from articles, theses, and expert opinions will evidence theoretical development. Neundorf (Neuendorf, 2017) define thematic analysis as 'a systematic and objective analysis of message features' through the interaction of various social actors. Thematic analysis is a method for identifying, analyzing, and expressing patterns existing within data. It organizes data and describes them in detail, allowing for the interpretation of various aspects of the research topic. Thematic analysis involves iterative movement between the mentioned stages, constituting a recursive process over time and comprises six general stages: 1. Familiarization with data, 2. Generating initial codes, 3. Searching for themes, 4. Reviewing themes, 5. Defining and naming themes, and 6. Producing the final report (Clarke & Braun, 2017).

Population and Sampling Methodology in Research

No research endeavor can progress without defining its population. The statistical population comprises a complete set of individuals, objects, or elements sharing at least one common characteristic, typically represented as 'N' (Nanjundeswaraswamy & Divakar, 2021). The statistical population is

an abstract idea of a large group of cases from which a researcher selects a sample and generalizes the findings of that sample to the entire population (Nanjundeswaraswamy & Divakar, 2021). The population refers to all possible measurements or recorded information regarding a qualitative attribute, concerning the complete set of units from which we aim to make inferences.

For the interview-based research, the population and the sample consisted of specialized individuals, experts, opinion leaders possessing research experience and expertise in the fields of supply chain and ethical work, specifically in the pharmaceutical industry of the country. They were selected based on the criteria outlined in Table 2.

Table 2.
Characteristics and Number of Interviewees

Statistical population	Specifications	Population size	Sampling method	Sample size
Academic and pharmaceutical industry experts	Holder of a master's or doctoral degree, with 5 years of continuous work experience	20	Snowball	15

The qualitative sampling section comprises small samples in an in-depth study. In qualitative research, a non-probability method should be employed, such as the snowball or purposive sampling method, continuing until theoretical saturation is reached. In the current qualitative research section to identify experts, the snowball sampling method (also known as chain referral) was used. In this sampling approach, interviews began with a key informant on the subject under study, who was then asked to introduce other suitable individuals for interviews. Essentially, each sample unit not only provides information about themselves but also expresses opinions about other units in the community and subsequently recommends other relevant individuals. This method is effective for identifying a population that is otherwise concealed. Fifteen experts with experience and knowledge in the realm of ethical work and supply chains were interviewed, following the principle of theoretical saturation.

Research Validity

In order to test the validity in qualitative research, the method of triangulation is used. In triangulation, several research methods are employed to study a phenomenon. The reliability in qualitative research is the consequence of validity in a study (Patton, 1999). Based on the above content, it can be acknowledged that the validity and reliability of qualitative research rely on the researcher. Considering that in this qualitative research section, interviews were used, and the researcher has conducted extensive studies regarding the recognition of the professional competencies of knowledgeable staff. Additionally, in the interview sessions with experts, the findings were set aside, respecting the confidentiality of an interview, ensuring the interviewees that their information, opinions, and ideas will remain entirely confidential and only be used in data analysis. Moreover, the researcher utilized the opinions of the advisor and consultant to interpret the research results. Hence, it can be concluded that the research possesses validity. In other words, the researcher in this study aims to enhance the validity and reliability of their qualitative research by employing the opinions of professors.

Data Analysis and Interpretation

For the identification of dimensions and components of the model, an extensive study of articles and theses was conducted. Subsequently, based on the collected texts, a questionnaire was prepared and provided to the experts (interviewees). After obtaining experts' opinions, the coding process took place. Thus, through open, axial, and selective coding, issues and concepts were extracted. The thematic analysis framework according to Brown and Clarke (Braun & Clarke, 2006) comprises six stages:

Stage 1 - Familiarizing with the Data:

The initial step in thematic analysis involves becoming familiar with the dataset. To grasp the content depth, researchers should immerse themselves in the data and consistently engage in recurrent data re-examination.

Stage 2 - Generating Initial Codes:

Following data familiarity, the process of coding and organizing them at a specific level begins. Researchers can make notes on instances and ideas during coding. In this phase, only codes are created, not themes.

Stage 3 - Searching for Themes:

This stage involves examining and reviewing codes to explore potential themes. According to Brown and Clarke (Braun & Clarke, 2012) the overall data analysis is like a house where codes act as individual bricks and tiles, while themes (the essence) function as walls and ceilings.

Stage 4 - Reviewing Themes:

Brown and Clarke (Braun & Clarke, 2006)consider theme reviewing as a two-level analysis. At the first level, the researcher reviews coded data related to each theme to ensure semantic fit. This involves ensuring that the considered data for each subject possess sufficient coherence and internal consistency and that there is enough differentiation between different themes without significant semantic overlap. Themes are adjusted to better reflect the coded data. At the second level, the relationship between themes and the entire dataset is examined to ascertain if the thematic map constitutes a comprehensive and cohesive pattern from the dataset as a whole (Braun & Clarke, 2006).

Stage 5 - Theme Definition and Naming:

Once the thematic map is revised, the fifth stage involves assigning a name to each theme and providing a narrative definition for them. This phase starts when the thematic map is satisfactorily outlined, and the researcher provides a concise and specific analysis for each theme based on the research question.

Stage 6 - Report Writing:

This stage involves the composition of the final analysis and description of findings. Elements of writing are initiated during note-taking, and in this stage, the researcher describes and delineates themes in their final report. Essentially, when the researcher has a fully reviewed set of themes, the final analysis and report are presented in a cohesive, logical, and concise manner.

In this stage, each interview, considering the initial concepts related to each expert, their repetitions, and frequencies, has been reported. In total, among 505 statements based on 15 interviews and 4 documents, 92 open codes (initial concepts) have been extracted.

Axial coding process based on primary concepts

When specific phenomena are identified within the data, it becomes possible to categorize concepts around them. This process reduces the number of units one needs to work with. The process of categorizing concepts that seem to relate to similar phenomena is referred to as thematic analysis. Then, a conceptual name is given to the theme that encompasses a particular phenomenon. It's important to note that this name should be more abstract than the names of the concepts that constitute the theme (Strauss & Corbin, 1990).

The extracted concepts and sub-themes in this research for the sustainable supply chain based on ethical work in the pharmaceutical industry have been reported. At this stage, we have reached 21 sub-issues, resulting in 4

core categories (Table3). The procedure and guidelines for axial coding (sub-thematic creation) were based on a comprehensive review of literature, conducted iteratively to prevent researcher bias.

Table 3.
Categorizing sub-category codes and core category for a sustainable supply chain based on decent work

Core category	Sub-category
Sustainable Infrastructures and Platforms	Sustainability Culture; Sustainable Objectives and Strategies; Sustainable Technological and Information Infrastructures; Supportive Sustainable Governance
Economic Functions of Sustainability	Financial sustainability performance; Resource management and optimization; Pharmaceutical supply chain quality performance; Reporting sustainable achievements; Transparent pharmaceutical production and distribution system
Social Functions of Sustainability	Productive employment; Fair social support system; Creating work-life balance; Workplace safety and health; Opportunity creation and human capital development; Respect for human rights and labor standards; Designing accountability systems in crises
Environmental Functions of Sustainability	Sustainable resource procurement; Green logistics and drug inventory control; Mechanisms for controlling and reducing pollutants; Sustainable production; Management of pharmaceutical waste

In our study, we have identified four core categories that form the basis of sustainability within pharmaceutical supply chains. These categories are:

1. Sustainable Infrastructures and Platforms: This category encompasses the establishment of sustainable cultural norms, objectives, strategies, technological and informational infrastructures, and supportive governance mechanisms.
2. Economic Functions of Sustainability: This category focuses on financial sustainability performance, resource management, pharmaceutical supply chain quality performance, reporting sustainable achievements, and ensuring transparency in pharmaceutical production and distribution systems.
3. Social Functions of Sustainability: This category emphasizes aspects such as productive employment, fair social support systems, work-life balance, workplace safety and health, opportunity creation and human capital development, respect for human rights and labor standards, and designing accountability systems during crises.
4. Environmental Functions of Sustainability: This category involves sustainable resource procurement, green logistics and inventory control, pollution control mechanisms, sustainable production practices, and the management of pharmaceutical waste.

These core categories provide a comprehensive framework for addressing various dimensions of sustainability within pharmaceutical supply chains.

To provide further clarification, as an example example, similar to Table 4can be used for implementation.

The initial model derived from qualitative coding

Wittstruck & Teuteberg (Wittstruck & Teuteberg, 2010) have proposed the supply chain model. They pointed out that companies are facing new challenges and must quickly address these challenges (such as financial crises, industrial pollution, product demand downturns, and prices). Consequently, interest in topics such as green logistics, green innovation, environmental sustainability, and energy efficiency has increased due to the growing demand of consumers. They define sustainable supply chain management as a "network management of interconnected businesses that play a role in delivering the final packages of products and services needed by customers." In the second stage, they expanded the concept of supply chain

management by adding sustainability aspects and considered sustainability as the integration of social, environmental, and economic issues, representing a rational balance between economic development, environmental monitoring, and social equality. Following this macro perspective on the supply chain, they defined sustainable supply chain management as a strategic achievement and organizational integration according to the research of Carter and Rogers (Carter & Rogers, 2008). This approach focuses on improving long-term economic performance through coordinated systemic key business processes between organizations. They introduced the model of sustainable supply chain management with three main dimensions of sustainability as the pillars of the supply chain home. Risk management and adaptability also formed the foundation of this structureIn the current study, after three-stage coding and identifying 21 core concepts, an attempt was made to integrate these concepts into the model derived from the literature to further validate the research model. Accordingly, based on the aforementioned, Figure 2 is presented as a qualitative research model in which the functions of social, economic, and environmental aspects of a decent work-based supply chain are strengthened and balanced through the establishment of a sustainable culture and alignment with sustainable goals and strategies. However, the presence of technological and informational infrastructures and supportive governance of sustainable goals by top managers is essential.

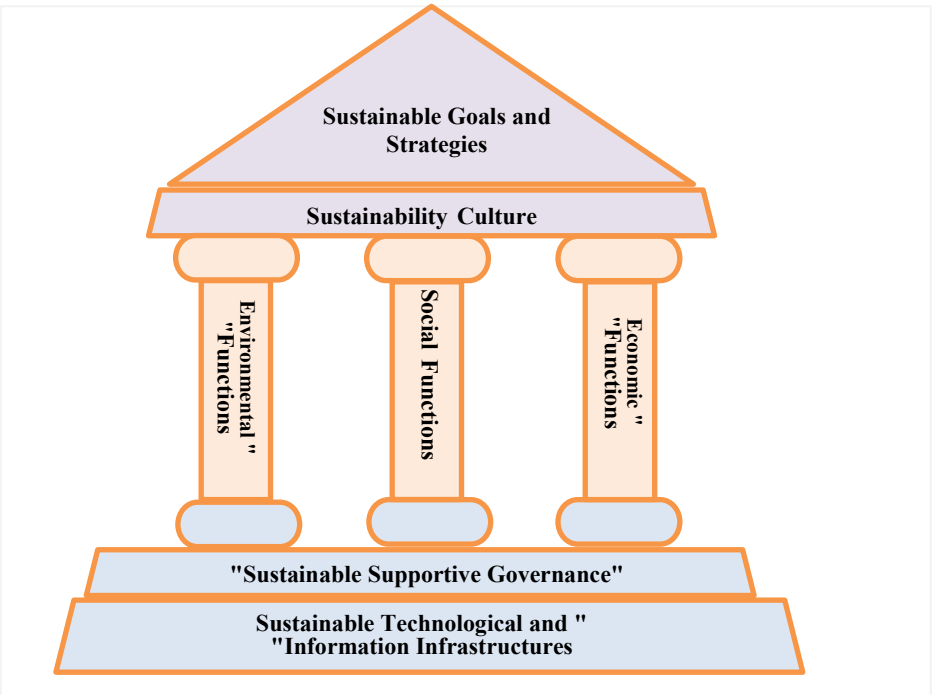

Figure 2. *Qualitative Framework for a Sustainable Supply Chain Model based on Decent Work*

According to the referenced model, Figure 3 represents the qualitative section of the study, illustrating the interactive relationships between economic, social, and environmental functions. It emphasizes how the infrastructures and frameworks act as facilitators and enhancers, impacting various aspects of sustainable supply chain based on decent work in the pharmaceutical industry.

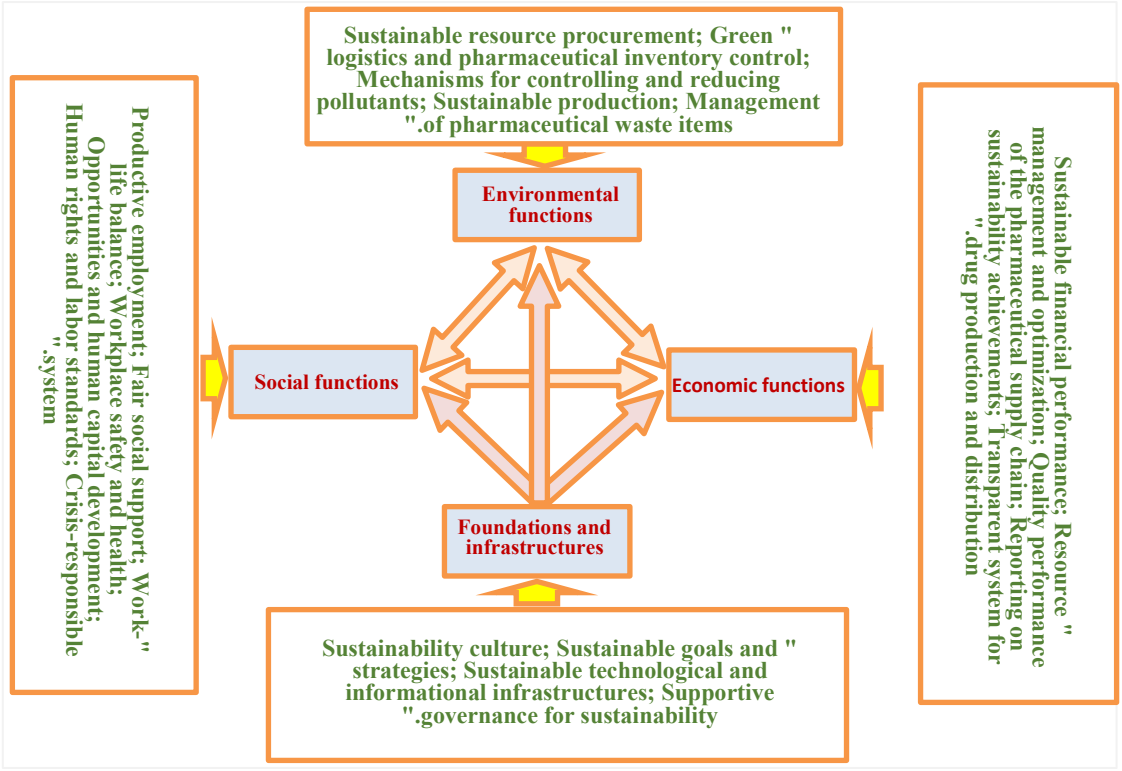

Figure 3. *The initial model of dimensions and components of a sustainable supply chain based on decent work*

Managerial Insights

- Drawing a roadmap for companies:
  - Companies are suggested to develop a clear roadmap that outlines their journey towards integrating sustainability principles into their supply chain management practices.
  - This roadmap outlines specific goals, strategies, and actions to be taken to enhance supply chain sustainability.
- Elevating the level of supply chains:
  - Companies need to focus on upgrading the maturity level of their supply chains to ensure they are capable of meeting sustainability objectives.
  - This involves enhancing transparency, traceability, and accountability throughout the supply chain.
- Designing a fuzzy maturity model:
  - Consider implementing a fuzzy maturity model to assess and measure the sustainability maturity of supply chain management practices.
  - This model account for the inherent uncertainties and complexities associated with sustainability assessments.
- Tailoring improvement programs based on decent work components:
  - Companies can develop improvement programs tailored to enhance decent work practices within their supply chains.
  - These programs address key components of decent work, such as job security, fair wages, safe working conditions, and opportunities for career advancement.
- Establishing closed-loop supply chains:
  - Companies can explore the concept of closed-loop supply chains to minimize waste and maximize resource efficiency.
  - By implementing closed-loop systems, companies can reduce their environmental footprint and promote circular economy principles.
- Selecting business partners committed to decent work:
  - Companies are suggested to prioritize partnering with suppliers and service providers that demonstrate a commitment to decent work practices.
  - This includes conducting due diligence to ensure that business partners adhere to

ethical labor standards and promote fair treatment of workers.

- Advocating for legislative frameworks promoting decent work:
  - Companies can actively engage with policymakers and advocate for the implementation of legislative frameworks that support decent work principles.
  - By collaborating with government agencies and industry associations, companies can influence the development of policies aimed at improving working conditions and promoting social justice.
- Establishing support councils and committees:
  - It is recommended to establish support councils and committees tasked with overseeing the implementation of sustainability principles in the supply chain.
  - These groups can monitor progress, address challenges, and facilitate collaboration among stakeholders to drive sustainable practices.
- Promoting social responsibility and fair working conditions:
  - Companies are suggested to prioritize social responsibility initiatives and strive to create fair and equitable working conditions for all employees.
  - This includes investing in programs that support employee well-being, promote diversity and inclusion, and foster a culture of respect and equality.
- Building trust through fairness and transparency:
  - Companies can build trust among employees and stakeholders by promoting fairness, transparency, and accountability in decision-making processes.
  - By adhering to ethical standards and communicating openly with stakeholders, companies can enhance trust and credibility within the supply chain ecosystem.

Conclusion

In order to answer the main question of the research, which was about the model of maturity in ethical supply chain in the pharmaceutical industry, a qualitative interview method was employed. The results indicated that the model of maturity in ethical supply chain in the pharmaceutical industry comprises four main aspects: infrastructure and foundations, economic functions, social functions, and environmental functions.

1. Infrastructure and foundations: This includes sustainability culture, sustainability goals and strategies, sustainable technological and informational infrastructures, and supportive governance for sustainability.
2. Economic functions: These cover sustainable financial performance, resource management and optimization, quality performance of the pharmaceutical supply chain, reporting of sustainability achievements, and a transparent system for the production and distribution of pharmaceuticals.
3. Social functions: These encompass productive employment, fair social support system, work-life balance, workplace safety and health, opportunities for human capital development, adherence to human rights and labor standards, and designing a responsible system during crises.
4. Environmental functions: These involve ensuring sustainable resource procurement and supplies, green logistics and pharmaceutical inventory control, mechanisms for controlling and reducing pollutants, and sustainable production practices.

One of the crucial parts of scientific research is comparing findings with previous results, which can contribute to the theoretical literature's development. During research, examining literature and understanding prior studies and theories on the subject is crucial as it allows researchers to expand existing knowledge, identify gaps in the literature, and present new insights.

When comparing findings with the research background, researchers evaluate the alignment of their results with previous studies, considering similarities and differences in research methods, sample sizes, data collection techniques, and analytical approaches. Through this,

researchers can determine if their findings support existing theories or not.

Therefore, here, a comparison of the results with some domestic and international empirical research backgrounds is presented in Table 5. Based on the comparisons made in the current research with previous backgrounds, it can be stated that the current research has clearly highlighted the role of ethics in the sustainability of the pharmaceutical supply chain and has presented a model for assessing maturity based on 21 criteria and four dimensions.

Table 4.
Levels of Sustainability Integration in the Pharmaceutical Supply Chain

Level	Sustainability Culture	Sustainable Objectives and Strategies	Sustainable Technological and Information Infrastructures	Supportive Sustainable Governance
Weak (1)	There is no specific emphasis on sustainability culture in the pharmaceutical supply chain.	There are no specific sustainable objectives or strategies in the pharmaceutical supply chain.	There is no particular focus on sustainable technological infrastructures in the pharmaceutical supply chain.	There is no specific governance framework to support sustainability in the pharmaceutical supply chain.
Aware (2)	Awareness of the importance of sustainability culture exists, but no specific actions or programs have been implemented.	Awareness of the importance of sustainable objectives and strategies exists, but no specific objectives or strategies have been defined.	Awareness of the importance of sustainable technological infrastructures exists, but no specific actions or investments have been made.	Awareness of the importance of supportive sustainable governance exists, but no specific mechanisms or policies have been implemented.
Moderate (3)	Some efforts to promote sustainability culture (such as educational programs or awareness campaigns) have been made, but they are not consistently implemented throughout the supply chain.	Some efforts to establish sustainable objectives and strategies (such as setting goals to reduce environmental impacts) have been made, but they are not comprehensive or consistently followed throughout the supply chain.	Some efforts to develop sustainable technological infrastructures (such as adopting energy-efficient technologies or implementing digital systems) have been made, but they are not consistently implemented or optimized throughout the supply chain.	Some efforts to create supportive governance structures (such as sustainability committees or policies) have been made, but they are not fully integrated or consistently practiced throughout the supply chain.
Advanced (4)	Sustainability culture is well established throughout the pharmaceutical supply chain, and sustainable practices are deeply rooted in the organizational culture.	Sustainable objectives and strategies are fully defined, clear, and measurable throughout the pharmaceutical supply chain to guide sustainable practices.	Sustainable technological infrastructures, including the adoption of green technologies, digitization of processes, and data-driven decision-making, are well established and consistently applied throughout the pharmaceutical supply chain.	Supportive governance mechanisms, including clear roles and responsibilities, responsive frameworks, and stakeholder engagement, are well established and consistently practiced throughout the pharmaceutical supply chain.
Sustained (5)	The pharmaceutical supply chain actively reinforces	The pharmaceutical supply chain actively pursues and achieves	The pharmaceutical supply chain actively invests in sustainable	The pharmaceutical supply chain actively promotes and

Level	Sustainability Culture	Sustainable Objectives and Strategies	Sustainable Technological and Information Infrastructures	Supportive Sustainable Governance
	values, behaviors, and practices that align with sustainable principles as a strengthened and maintained culture.	sustainable objectives, integrating sustainability into business strategies, decision-making processes, and performance evaluation systems.	technological infrastructures, utilizing advanced technologies and data-driven systems to enhance efficiency, transparency, and sustainable performance.	maintains a governance framework supportive of sustainability, enhancing transparency, responsiveness, and effective management of sustainability initiatives and performance.

Suggestions

In light of the conducted research on designing a model for ethical maturity in the pharmaceutical supply chain and the outcomes obtained, the following policy and management packages are proposed. If implemented as overarching strategies in pharmaceutical supply chain management, they can contribute to improving the economic, social, and environmental performance of this industry.

1. Encouraging Optimal Financial Management: Optimized financial management can reduce financial waste and enhance profitability within the pharmaceutical supply chain. This action leads to the optimization of financial resources, cost reduction, and increased financial efficiency.
2. Promoting Resource and Energy Optimization: Reducing the consumption of natural resources and energy in pharmaceutical production maintains a balance between customer satisfaction, cost reduction, and environmental protection.
3. Ensuring Efficiency and Quality of Drugs: Guaranteeing efficiency and quality at all stages of the pharmaceutical supply chain enhances productivity, reduces quality issues, and boosts customer satisfaction.
4. Commitment to International Standards: Adherence to international standards in drug production ensures compliance with global standards and enhances customer trust.
5. Development of Employee Skills and Competencies by Human Resource Management: Human resource management is committed to developing employee skills and competencies to improve product efficiency and quality.

Research Limitation

1. Generalization: The findings and proposed model in this research are based on the supply chain behavior of pharmaceutical companies in Iran. While this study provides valuable insights for this specific context, it may not directly apply to various other organizations or companies. Further research is needed to discover the applicability of the proposed model in different fields.
2. Confidentiality of Information: Due to the researcher's commitment to not disclose the particulars of experts and maintaining confidentiality, direct use of experts' names and identities is restricted.
3. Studies in Different Areas: Research on cultural development in all companies for the improvement of supply chain aspects, especially the social and human aspects, could continue in the future.
4. Designing Skill Development Programs: Evaluating skill development programs can be effective in improving supply chains.
5. The Role of Technology: Investigating the role of technology in improving supply chain management alongside human resources is essential.

6. Assessing Continuous Learning: Assessing the impact of continuous learning and skill enhancement on the development of decent work is necessary.
7. Effectiveness of Social Sustainability Plans: Studying the effects of social sustainability plans on improving working conditions in global supply chains is needed.
8. Technology and Human Resources Connection: Research on cultural differences and the role of technology in the supply chain could help achieve necessary improvements.
9. Role of Decent Work in Human Rights: Investigating the role of decent work in ensuring human rights and ethical standards is essential.

These limitations indicate that future research could bring improvements where needed and expand knowledge about the concepts of decent work and the enhancement of supply chain conditions.

Table 5.
Comparison of the research findings with some of the previous research backgrounds

Authour(s)	**Research objective**	**Research findings**	**Comparison of the present research findings with the background**
(Naghdi, 2016)	Assessment and analysis of supply chain maturity in Abadan Oil Refining Company	Customers, suppliers, and production perspectives fall within the realm of the first maturity level. Performance measurement systems, inventory, and information technology systems reside within the second maturity level. Human resources encompass the third level of maturity. Overall, the supply chain maturity of the Abadan Oil Refining Company is at the second level of maturity	In the current research, besides considering the economic, social, and environmental aspects, the focus has also been on the core infrastructure and foundations. Furthermore, there's been a stronger emphasis on decent work. Unlike the critical study by Hamkaran and colleagues in 2016 that solely utilized the Delphi method to identify the components of maturity, the present research has placed additional emphasis on expert interviews involving academia and pharmaceutical industry professionals.
(Bakhtiari, 2019)	Assessing the Maturity of Supply Chain Processes Using a Combined Approach of SCOR and BPO with ARAS and FAHP Methods	In the dairy industry, emphasis on the planning process holds the highest importance. Subsequently, sourcing, manufacturing, and delivery processes follow in that order, with recycling and empowerment processes positioned below them	In the current study, the component of supportive governance aligns with indicators for planning sustainability aspects, allocating resources, investing in green technologies, and formulating policies and strategies supportive of sustainability. Furthermore, the management of pharmaceutical waste was evaluated concerning standard waste disposal guidelines and proper implementation methods for pharmaceutical waste, addressing crucial aspects within the environmental dimension
(Correia, Garrido-Azevedo, & Carvalho, 2023)	Supply Chain Sustainability: A Model to Assess the Maturity Level	This paper introduces a new Sustainability Maturity Model (MM) tailored for supply chains, addressing gaps in existing models. It's built on the Triple Bottom Line (TBL) approach and consolidates sustainable practices across organizations and their supply chains. Collaborating with companies in the Portuguese moldmaking industry, the researchers refined and validated the model, emphasizing collaboration with supply chain partners. This MM serves as a practical guide for assessing sustainability maturity levels and driving improvements within functional areas, enhancing engagement across supply chains.	The current research improves upon prior studies by introducing a comprehensive Sustainability Maturity Model for supply chains, filling gaps in existing models. Unlike previous literature lacking validated and holistic approaches to sustainability, this study offers a Triple Bottom Line-based model. Collaborating with the moldmaking industry in Portugal, it emphasizes partnership collaboration—a facet often overlooked in earlier research. This model serves as a practical tool for assessing and enhancing sustainability across supply chains, bridging the gap between theory and real-world application

Authour(s)	Research objective	Research findings	Comparison of the present research findings with the background
(Correia et al., 2017)	A systematic review of the sustainability maturity model in the supply chain	From a sustainability perspective, the range of maturity models analyzed primarily revolves around the triple bottom line (TBL) axis, focusing predominantly on environmental dimensions and often centered around a specific process (such as environmental design and new product development), lacking a broad perspective	The present study, in addition to relying on prior studies, focused on conducting specialized interviews with academic and pharmaceutical industry experts. It highlighted ethical work practices and the social aspects of the supply chain.
(Popovic et al., 2018)	Quantitative indicators for assessing the social sustainability of supply chains	Based on the reviewed literature and content analysis, 31 quantitative indicators of social sustainability were compiled, enabling the comprehensive assessment of the entire supply chain. The proposed indicators can be used both for performance evaluation and periodic monitoring of supply chains	In the research by Popović et al. (2018), only social sustainability evaluation indicators based on qualitative content analysis of literature were identified. However, in the present study, alongside the examination of the social aspect and a focus on decent work, a comprehensive maturity model was entirely designed.
(Seidel-Sterzik, McLaren, & Garnevska, 2018)	Life Cycle Management Framework" is an integrated approach used for measuring and managing environmental impacts	They identified the structure, culture, resource access, life cycle management strategy, knowledge, market needs, and communications within the maturity model, emphasizing the environmental aspect of the supply chain	The present research is entirely unique as it prominently highlights the social aspect of sustainable supply chains, focusing on ethical labor. It identified and ranked over 21 key indicators for the maturity model
(Reefke & Sundaram, 2018)	Sustainable Supply Chain Management: Decision Models for Transformation and Maturity	Exploratory Delphi Study combines research findings to provide decision support for supply chain managers, which is critically needed for advancing sustainable development and implementation	The implementation of the maturity model and emphasis on the social aspect of ethical work is the distinguishing factor in this study. In essence, this research completely evaluates the pharmaceutical supply chain based on specialized criteria and the three pillars of sustainability. It also considers the supportive and infrastructural aspects
(Soundararajan, Wilhelm, & Crane, 2021)	Humanizing the research on working conditions in supply chains: Building a path toward ethical work	Methods for 'humanizing' research on working conditions in supply chains were presented across four dimensions: actors, subjects, domains, and methodologies. Through humanization, supply chain research can have a significant scientific impact and aid in achieving ethical work within supply chains	In line with Sundarajan et al. (2021), the current study also emphasizes the humanization of supply chain sustainability, identifying seven key criteria for the social aspect of ethical work. These include productive employment, a fair social support system, establishing work-life balance, workplace safety and health, opportunities for human capital development, adherence to human rights and labor standards, and the design of responsible crisis management systems—all evaluated within the maturity model

Authour(s)	Research objective	Research findings	Comparison of the present research findings with the background
(Caiado et al., 2021)	The maturity model of operations and supply chain management in the fourth industrial revolution wave	Based on fuzzy logic and Monte Carlo simulation, the actual model in a multinational manufacturing organization has been validated and approved. The results indicate that this approach provides a robust and practical diagnostic tool for measuring the digitalization of manufacturing industries based on a set of operational and supply chain management indicators	The current research not only relied on previous studies but also focused on interviews with pharmaceutical industry experts, highlighting ethical work practices and social aspects within the supply chain.

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