Received: 26 March 2022 | Revised: 12 July 2022 | Accepted: 2 August 2022

DOI: 10.1002/bse.3236

RESEARCH ARTICLE

Business Strategy and the Environment

WILEY

# Indicators and countermeasures of modern slavery in global supply chains: Pathway to a social supply chain management framework

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## Abstract

Even though global supply chains are (usually unintentionally) tied to slave labor, research and practice have largely ignored the issue. This is expected to change as civil society activism and new legislation increase the risk of litigation and reputational damage to supply chain partners. To deal with and combat modern slavery in the supply chain, a theory inspired social supply chain management framework consisting of indicators and countermeasures of modern slavery in the supply chain is developed. The framework is refined in a qualitative expert interview study. The theoretical framework is then evaluated by a multimethod empirical analysis that includes a multicase study based on publicly available supply chain data from 6000 media articles and company websites as well as a quantitative empirical study based on survey data from 280 corporate sustainability experts operating in global supply networks. The results show that economic, political-legal, social, and environmental factors have a significant impact on contemporary slavery in the supply chain. The study also motivates supply chain partners to use preventative and detective measures to reduce the probability of encountering modern slavery actions in their supply chain. Theoretical and managerial implications are drawn from the findings, pointing to a holistic approach to combatting modern slavery in the supply chain.

KEYWORDS

modern slavery, multi-method, sustainable supply chain management

## 1 | INTRODUCTION

Customers expect smooth services from their suppliers. However, with the increase of globalization and the associated complexity, it has become more and more difficult to ensure a resilient supply. Given the pervasiveness of supply chain vulnerabilities, research has been conducted regarding various facets in supply chain risk management (SCRM) (Busse et al., 2016; Ho et al., 2015; Sodhi et al., 2012).

**List of abbreviations:** ATM, Adversarial-neural Topic Model; AVE, Average variance extracted; CA, Cronbach's alpha; DET, Detective measures; EC, Economic indicators; EN, Environmental indicators; EU, European Union; GAN, Generative adversarial networks; GDP, Gross domestic product; GSI, Global Slavery Index; ILO, International Labor Organization; JAC, Joint Audit Cooperation; LE, Legal indicators; NGO, Non-governmental organizations; PL, Political- legal indicators; PLS, Partial least square; PRE, Preventive measures; REA, Reactive measures; RQ, Research question; SCM, Supply chain management; SCRM, Supply chain risk management; SCS, Supply chain sustainability; SEM, Structural equation modeling; SO, Social indicators; SSCM, Social supply chain management; TE, Technological indicators; TF-IDF, Term frequency-inverse document frequency; UK, United Kingdom; USA, United States of America.

A recent survey conducted by the Business Continuity Institute found that more than three quarters of participating companies have supply chain risk management solutions in place. In SCRM literature sustainability has also gained importance (Bodendorf et al., 2022). Many global companies, such as Apple and Walmart, have implemented environmental and social sustainability practices to mitigate risks. However, very few research studies have examined the risk management process related to sustainability (Foerstl et al., 2010; Hofmann et al., 2014; Klassen & Vereecke, 2012). The aspect of sustainability in the context of social supply chain management (SSCM) includes ecological, social, and economic aspects. This research focuses on the phenomenon of dealing with modern slavery in SSCMs, where academia lacks a theoretical understanding on the identification and design of business operations to counteract these inhumane practices along supply chains (Gold et al., 2015; Sodhi & Tang, 2018). Furthermore, most research focuses on human trafficking even though the majority of modern slavery activities are forced labor cases (Gold et al., 2015). Additionally, research is lacking a comprehensive understanding of forced labor operations and does not incorporate supply chain activities. Although slavery is officially outlawed throughout the world, both socially and politically, estimates of slavery cases in global supply chains reach new highs. According to a report by the Walk Free Foundation, the Global Slavery Index (GSI) assumes 35.8 million slaves worldwide.[1] While looking at the incidence of slavery, it is noticeable that certain countries are more affected than others. For example, African and Asian countries in particular show an increased incidence (Dahan & Gittens, 2010). Nevertheless, modern slavery is by no means limited to countries or continents but also occurs in regions where slavery would not be expected. More than half a million slaves are estimated to exist in the European Union (EU). Forms of slavery today range in public debates from human trafficking and sexual exploitation to forced labor. A large part, 78% according to the International Labor Organization (ILO), is classified as forced labor.[2]

This type of slavery mainly affects simple, traditional work that is not very technologized, for example, mining, agriculture, and textile manufacturing (Bales et al., 2009). Identifying indicators that can be considered for the occurrence of modern slavery in a company can have serious impact on business operations (Meehan & Pinnington, 2021). Consequently, this paper's first research question (RQ) is the following: What indicators are considered regarding the occurrence of modern slavery in the supply chain of companies? (RQ1) Due to globally connected supply chains, the question arises to which extent companies contribute to modern slavery without consciously practicing it (New, 2015). The occurrence of modern slavery in supply chains brings ethical and reputational challenges for companies (Islam & Van Staden, 2021; Voss et al., 2019). As a result, many companies quickly integrate methods and procedures to ensure ethical and environmental standards in their supply chains (Green et al., 1996). Social responsibility in the supply chain has also become an increasingly important topic in supply chain management (SCM) research (Arya & Mittendorf, 2015; Bals & Tate, 2018; Tate et al., 2010). In particular, the issue of modern slavery attracts higher attention because governments and corresponding legislations are getting involved in this topic. One legislation, for example, is the Modern Slavery Act, which consolidates the current criminal offenses on slavery and human trafficking (Crane, 2013; Gold et al., 2015; New, 2015). To combat modern slavery in their supply chain, companies also need to adopt appropriate methods and measures. Therefore, the second research question arises: What countermeasures are used by companies to combat modern slavery in their supply chain? (RQ2) The aim of the study is to enhance the understanding in literature concerning how organizations can detect, remediate, and avoid modern slavery in their business and supply chain operations on a sub-tier supplier level. The research objectives of this paper can be summarized as follows: (1) To provide a theoretical basis for supply chain disclosure strategies in response to legal requirements; (2) to present indicators that suggest the presence of modern slavery; (3) to identify countermeasures that companies can take to prevent modern slavery in their supply chain.

## 2 | RESEARCH DESIGN

The following section introduces the research approach, which is outlined in Figure 1.

After the definition of research objectives in Section 1 as well as providing the theoretical background in Section 3, Section 4 identifies indicators of modern slavery in the supply chain and measures taken by companies to counteract. To this end, an analysis of relevant literature is done, leading to the development of a theoretical framework. Subsequently, the framework is qualitatively verified and extended by an expert interview study. These interviews are analyzed using a grounded theory approach which focuses on the systematic collection and analysis of data (Glaser & Strauss, 2017). In the next step, research hypotheses are derived and merged. To be able to answer the identified research hypotheses, a multimethodological approach is chosen. This approach combines the strengths of the different empirical research approaches, to obtain more valid results and thus, to increase the scientific value of the research. An overview of the strengths and weaknesses of the approach is provided in Table 1.

On the one hand, a case study approach uses topic modeling to analyze public data from newspaper articles and company websites of supply chain partners. On the other hand, a quantitative empirical survey approach is chosen (see Section 5). Thereby, the hypotheses are tested separately. Subsequently, both results are validated according to Dong et al. (2015) (see Section 6). Finally, implications for research and management are derived from the results. Lastly, limitations of the research work are outlined and future research interests are identified (see Section 7).

[1]Walk Free Foundation: The Global Slavery Index. https://urldefense.com/v3/__https://www.walkfree.org/projects/the-global-slavery-index/__;!!N11eV2iwtfs!tNPKYjAKJ7vkA0EDu6luv0JrXtoK29xAvkIQ57yn7fUvILDghW71phQ_UaTEPHvkMuH4D0ZXHCeHcxxYex57xw4FCA$

[2]ILO: Global report under the follow-up to the ILO Declaration on Fundamental Principles and Rights at Work. Global report under the follow-up to the ILO Declaration on Fundamental Principles and Rights at Work; International Labour Conference, 98th Session 2009, Report I (B). Geneva: Internat. Labour Off (Report of the Director-General, 98,1,B).

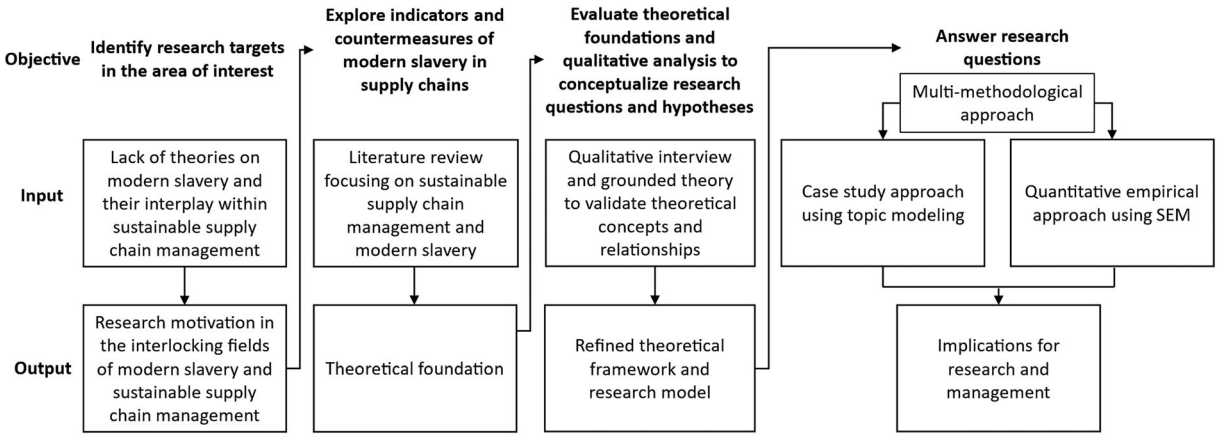


**FIGURE 1** Research approach

**TABLE 1** Strengths and weaknesses of multi-method approaches (Choi et al., 2016)

| | Strength | Weakness |
|---|---|---|
| More scientific | X | |
| Comprehensiveness | X | |
| Real-world practice relevance | X | |
| Time consuming | | X |
| Boundary (how many methods are enough?) | | X |
| Lower risk of getting biased results | X | |

## 3 | THEORETICAL BACKGROUND: SUSTAINABLE SUPPLY CHAIN MANAGEMENT AND MODERN SLAVERY

The core statement of sustainable supply chain management is based on ecological, social, and financial/economic categories (see Table 2) as well as aspects of sustainability, transparency, risk management, culture, and strategy (Bai et al., 2019; Carter & Rogers, 2008).

Carter and Rogers (2008) define sustainable supply chain management as "the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains." To achieve the goals, socially and environmentally responsible practices need to be introduced (Koberg & Longoni, 2019). In this context, Linton et al. (2007) highlight the shift from looking at pure cost factors to focusing on sustainable factors in companies. However, Villena et al. (2021) show the difference of social and environmental dimensions and the need to consider and handle each of them differently. Furthermore, sustainable supply chain management needs a comprehensive approach by involving multiple parties such as governmental and nongovernmental organizations (NGOs) (Gold et al., 2015). Additionally, sustainable supply chain management obliges companies to screen their supply chain operations. This effects on the one hand that companies will support their suppliers through supplier development programs. On the other hand, third-parties are used to ensure sustainability standards and increase transparency on the supplier's activities (Gold et al., 2015). Moreover, due to the rise of public interest and the development in legislation regarding sustainable concepts, political pressure for sustainable topics increases (Linton et al., 2007).

As an essential component of the sustainability literature, slavery plays a significant role on the research agenda. The definition of slavery has shifted over the last years (Landman & Silverman, 2019). We refer to slavery as the right of ownership over a person, according to the official definition of the 1926 Slavery Convention (Allain, 2015) Since slavery was abolished, new forms have emerged, including forced labor, child labor, and debt bondage (Crane, 2013). This paper focuses on modern slavery associated with a company's supply chain which is defined as follows: "[…] the exploitation of a person who is deprived of individual liberty anywhere along the supply chain, from raw material extraction to the final customer, for the purpose of service provision or production" (Gold et al., 2015). This definition highlights the most important factors of modern slavery. To begin with, workers are financially exploited since they are not paid enough to ensure basic financial stability (Gold et al., 2015). Furthermore, working conditions can be partly harsh and hazardous to employees' health. The use of physical or emotional violence can exacerbate this coercion (Crane, 2013; Simpson et al., 2021). All of these wrongdoings can happen anywhere in the supply chain (Gold et al., 2015).

Modern slavery in the supply chain is manifested primarily by poor working conditions, low-wages, contract workers, and child labor

**TABLE 2** Sustainability-related risks for the supply chain (Giannakis & Papadopoulos, 2016)

| Endogenous | Exogenous |
|---|---|
| **Ecological** | |
| • Environmental accidents (e.g., forest fires) | • Natural disasters (e.g., earthquakes) |
| • Pollution (e.g., air and water) | • Water shortage |
| • Non-compliance with sustainability laws | • Heat waves, droughts |
| • Greenhouse gas emissions | |
| • Energy consumption | |
| • Excessive packaging | |
| • Product waste | |
| **Social** | |
| • Excessive working hours | • Pandemics |
| • Unfair wages | • Social instability |
| • Child labor/forced labor | • Demographic challenges |
| • Discrimination | |
| • Unsafe working environment | |
| • Exploitative hiring policy | |
| • Unethical treatment of animals | |
| **Financial/economic** | |
| • Bribery | • Boycott |
| • False claims | • Litigation |
| • Price fixing | • Financial crises |
| • Antitrust agreements | |
| • Patent infringements | |
| • Tax evasion | |

(Gold et al., 2015; New, 2015; Schaper & Pollach, 2021). Especially the integration of third parties, such as labor agencies, which hire people outside the scope of corporate codes enables the employer to ill-treat those workers and to avoid necessary policies. Furthermore, typical practices of modern slavery are the retention or reduction of wages, the withholding of identity documents or the blackmailing of employees by using their illegal immigration status (New, 2015). Another critical point is the difficulty to detect practices of modern slavery. One factor in this regard is the various tactics to hide enslavement.

Often, conventional business activities are used to cover up practices of modern slavery, for example, through loans (Gold et al., 2015). In addition, different cultural and political conditions as well as increasing complexity of the supply chain make it difficult to detect modern-day slavery, even when transparency procedures such as auditing are in place (Lund-Thomsen & Lindgreen, 2014; Pinnington et al., 2022; Stevenson & Cole, 2018).

However, it is essential to detect and prevent modern slavery in the supply chain since the effect of abusive behavior can be severe. Due to the huge, negative impact, the respective company can suffer a massive reputational damage and consequently a major decrease of the brand value (Schaper & Pollach, 2021; Stevenson & Cole, 2018).

## 4 | LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Grounded on literature a theoretical framework for examining modern slavery in the supply chain is designed. For this purpose, indicators are identified that favor the occurrence of modern slavery in a company. Furthermore, measures to counteract modern slavery in the supply chain are explored. The factors influencing the occurrence of modern slavery in the supply chain are determined based on Porter's PESTEL analysis. Porter's PESTEL analysis is divided into political, economic, socio-cultural, technical, environmental and legal factors (Porter, 2008). Here, the research refers to socio-cultural as societal indicators. Each indicator is explained in more detail and the individual impact on the occurrence of modern slavery in the supply chain is described. To provide a more comprehensive view of modern slavery in the supply chain, a theoretical framework ensuring a sustainable and resilient supply chain is built on the basis of the Disaster Management Process (Speier et al., 2011). The Disaster Management Process can be used to identify supply chain security and protection approaches and consists of four phases: planning, detection, response, and recovery. These phases represent the actions a company should take prior to a critical slavery incident as well as after (Speier et al., 2011).

### 4.1 | Indicators of modern slavery in the supply chain according to the PESTEL analysis

Several factors are discussed as *economic indicators* for the occurrence of modern slavery in the supply chain. Crane (2013) conceives economic factors primarily in an industrial context. The author outlines agriculture, mining, and construction, among others, as sectors, which are particularly affected by slavery practices (Richards, 2004). The main characteristic is a high labor intensity, due to a limited supply of labor, which is often present in the industries mentioned above. In addition, modern slavery in the supply chain tends to occur among smaller, lower-tier suppliers, which have limited resources to create value. Other *economic indicators* that tend to increase the risk of modern slavery practices in a company according to Gold et al. (2015) are a high proportion of underpaid workers, low-skilled workers, and various production activities in conflict zones. Economic indicators also show correlations with the occurrence of modern slavery in a supply chain. For example, a higher gross domestic product (GDP) per capita leads to a lower probability of the occurrence of modern slavery (Bales, 2006). In addition, Neumayer and De Soysa (2007) show that countries that are more involved in the global market and that engage in open trade are less prone to labor rights due to higher levels of external monitoring.

In addition, *legal indicators* also impact modern slavery in the supply chain. The absence or inadequacy of laws reinforce modern slavery in the supply chain and contribute to low levels of worker protection (Bales, 2006; Gold et al., 2015). Accordingly, antislavery laws show effects on the behavior of companies in relation to modern slavery in the supply chain. For example, after the announcement of the UK Modern Slavery Act, there was a significant increase in the number of published statements by companies reporting cases of modern slavery (Flynn & Walker, 2021). *Legal indicators* are also closely related to *political indicators*, as respect for political rights is largely dependent on the strength of the respective government in the region. This is determined by the political stability, the fight against corruption, and the citizen's freedom of expression. As a result, for regions in which these indicators are not present a stronger pursuit of modern slavery is observed (Crane, 2013).

Furthermore, the influence of *technological indicators* is considered. Technological systems like IT can have both positive and negative effects on modern slavery in the supply chain. On the one hand, they can be used to monitor worker productivity and allow managers to leverage their power. On the other hand, new technologies have the potential to promote social sustainability in the supply chain. Big data analytics and machine learning are good opportunities to increase transparency in the supply chain and thus make modern slavery indicators visible (Fayezi et al., 2021). In most cases, however, low technological development of a company is a possible indicator for the occurrence of modern slavery in the supply chain. Especially so-called "basic industries" are particularly affected by this. Modern slavery enables an opportunity for cost reduction (e.g., low wages combined with inhumane working conditions) as in the case of low technological development, personnel costs often represent a very large share of profitability (Crane, 2013). A characteristic of "basic industries" is that workers do not require specific skills or special training, making it rather easy to find personnel. This in turn favors that there is hardly any investment in new technologies since price differentiation can be achieved by means of cheap labor.

Looking at the *environmental indicators*, incidence of modern slavery is not geographically homogeneously distributed and varies greatly by region (Landman & Silverman, 2019). Many primary industries are dependent on the geographic conditions of the region due to raw materials availability. Production sites are often located on the periphery which in return leads to two fundamental problems. First, the occurrence of modern slavery in the supply chain often remains undetected (Jackson & Sparks, 2020). Second, there is a shortage of labor in these remote areas, due to the limited number of inhabitants in the surrounding. This imbalance in labor supply and demand leads to an increase in wages. However, in order to work economically, modern slavery in the supply chain is often a solution to keep wages low (Crane, 2013). Another challenge is the long distance between prefabrication and the processing plant. The intervening distance is an obstacle for both, the detection of modern slavery practices and the introduction of appropriate countermeasures (Gold et al., 2015). The reason for this is due to geographic isolation as it is difficult to communicate with trade unions, law enforcement agencies, and NGOs (Crane, 2013). Furthermore, Moussa et al. (2022) show that the quality of the institutional environment has a significant impact on the prevalence of modern slavery and that sustainable human development can reduce the risk of occurrence.

*Social factors* also impact modern slavery in the supply chain. In various social groups, the deepest roots of forced labor are found in traditional and cultural norms. Perhaps the best example of this is represented by India where forced labor arises from the interplay of historical, social, and cultural factors. An example of this is the Hindu caste system which has cultural origins and was further exacerbated by the historical influence of British colonial rule, and still serves as a justification for labor law violations today (Crane, 2013; Gold et al., 2015). Likewise, the deep-rooted discrimination of minorities and the social stratification that still exists lead to a higher risk of modern slavery of fringe groups (Bales et al., 2009; Cheng, 2010). Furthermore, the faith or the belonging to a religious community can also influence modern slavery (Crane, 2013). Here the faith of people is used to gain control and to legitimate modern slavery. Lack of access to education is another factor that characterizes both marginalized groups and persons who are excluded due to their culture (Gold et al., 2015).

Also, *political indicators* impact modern slavery in the supply chain. Politics and related governance are responsible for enforcing basic human rights and thus mitigating modern slavery with the help of national antislavery laws and human right agreements. For effective governance, however, it must be ensured that there is neither corruption nor other forms of fraud. Looking at governmental forms, it can generally be said that democratic countries have lower levels of modern slavery activity. Nevertheless, having a democracy in place is no guarantee for a slavery-free supply chain as there are also cases in democratic countries (Crane, 2013; Landman & Silverman, 2019).

## 4.2 | Countermeasures of modern slavery in the supply chain according to the disaster management process

From an institutional theory perspective it can be shown that governments, NGOs, civil society organizations, and consumer groups exert pressure on companies to change their ways of doing business to combat modern slavery (Moussa et al., 2022). However, there are different ways to avoid modern slavery in the supply chain, for example, according to the "Disaster Management Process," which consists of the four phases of planning, discovery, response, and recovery (Helferich & Cook, 2002).

The *planning phase* addresses efforts within the supply chain to react to an incident and to take preventive action to avoid modern slavery in the supply chain (Speier et al., 2011). Here, a distinction must be made between internal and external measures of a company. External measures include national and international legislation. In this context, laws and guidelines are issued by organizations such as the UN or the respective governments. In addition, however, internal preventive measures can be categorized into three basic measures

according to Flynn and Walker (2021). First, structural changes are made to prevent modern slavery in the supply chain. These changes can be made through working and steering groups, where a long-term strategy is developed and monitored by supervisors along the supply chain. This often involves the formation of collaborations and initiatives such as the Joint Audit Cooperation (JAC) in the telecommunications industry or the European Automotive Working Group On Supply Chain Sustainability in the automotive industry. These initiatives pool resources and act more effectively (Flynn & Walker, 2021). On the other hand, political changes can also contribute to prevention, for example, by changing existing or creating new modern slavery guidelines in the supply chain or by means of practice changes which is largely reflected in written contract clauses. In addition, to raise awareness for social standards in the supply chain, further education and training should be offered internally as well as externally for suppliers (Flynn & Walker, 2021). In addition, supplier development serves as a preventive measure, as it improves the supplier's social performance (Benstead et al., 2021; Cole & Aitken, 2019).

The supply chain's ability to discover an incident is part of the *detection phase*. The challenge here is to recognize the incident in time to avoid greater damage (Speier et al., 2011). Detecting modern slavery in the supply chain faces challenges due to globally connected companies (Gold et al., 2015; New, 2015). The most common practices in use are audits against codes of conduct (Stevenson & Cole, 2018) and third-party certifications (Hutchins & Sutherland, 2008). In particular, recurring audits by third parties have proven beneficial in this context (Beanstead et al., 2021). Optimally, companies use a variety of different evidence-based sources (e.g., by observing work in the field, reviewing documents, conducting interviews with workers, having suppliers' complete self-assessment questionnaires, etc.) to obtain the broadest possible data base to discover the roots of modern slavery. Companies often have limited financial and human resources and therefore use risk assessment indices to keep their detection efforts low (Stevenson & Cole, 2018). For example, the Global Slavery Index (GSI) determines the prevalence of slavery across countries and can be used as an estimate of the likelihood of modern slavery in a country. Due to the scarcity of resources, several innovative ways to increase the probability of detection while keeping the effort low have been identified and discussed in earlier research and practice. For example, the analysis of satellite imagery represents one tool for the discovery of modern slavery as an additional option to conventional discovery practices (Jackson et al., 2019). The use of machine learning to identify modern slavery - based on socio-economic and demographic data - is also explored in recent research (Lavelle-Hill et al., 2021). Tambe and Tambay (2020) discuss the use of artificial intelligence and blockchain technology to reduce costs and the likelihood of error in the detection phase.

The *response phase* deals with the short-term actions that are taken immediately after *detection* (Speier et al., 2011). In this paper, only the actions emanating from the buyer companies are considered. In general, a distinction can be made between two immediate measures that the buyer company can opt for. On the one hand, the immediate termination of the supplier relationship and the reporting of the incident to the authorities. On the other hand, the support and thus further development of the supplier regarding modern slavery measures (New, 2015). However, the first mentioned reaction may not be feasible and as a result, is not the first choice in practice. This is mainly because the customer is often dependent on the supplier since the supplier has special expertise or required resources. If the buying company decides to maintain the business relationship, different approaches are possible. One option is to jointly implement a remediation plan to address and remedy the offenses found. The alternative is to suspend the supplier until all requirements are met (Stevenson & Cole, 2018).

The *response phase* is followed by the *recovery phase* in which long-term strategies are devised and implemented to avoid future occurrences of modern slavery in the supply chain. In this context, strategies emanating from buyer companies, governments, and NGOs are highlighted. The strategies implemented by the buying companies can either affect the buyer company to improve internal process or the strategies concern the improvement of the supplier. The buying company can achieve an initial improvement in terms of modern slavery prevention through training and awareness campaigns for internal employees. This enables the employees of the buyer company to actively support the supplier in introducing corrective measures. Furthermore, the corporate policy in the buyer company can be adjusted so that, for example, no disputed payments are withheld, or the price and delivery date pressure is reduced. In this context, a reward system for suppliers can also be introduced, characterized by longer partnerships or better prices (Stiller & Gold, 2014). Furthermore, close collaboration with the local government can be helpful. The next step is to look at the strategies that affect the supplier that has become conspicuous. As with the buying company, it is also important to create a general awareness of modern slavery among suppliers. As indicated in the *reaction phase*, it is critical to devise a strategy for resolving the abuses and preventing new ones. In this case, the buying company can decide to support the supplier as an advisor and to monitor it closely, for example, through regular audits and employing its own staff on site (Stevenson & Cole, 2018). Governments, in addition to the purchasing firms, bear responsibility for such incidents and can enact rules and regulations to address them. One approach to accomplish this is to conduct unannounced control visits to companies that have already drawn attention. These allow better monitoring of circumstances and make it more difficult to try to hide poor working conditions. For instance, the Brazilian government has launched a drone program to enable inspections to check premises suspected of modern slavery. Additionally, civilians can use forums to report incidents of modern slavery to increase the chance of discovery. Another instrument is the introduction of a publicly accessible list of companies that have become conspicuous. The potential loss of image will motivate companies not to make use of modern slavery as they will be subject to constant monitoring and fines.

Additionally, non-governmental organizations can be consolidated as an independent expert voice or advisor in the *response phase* (Stevenson & Cole, 2018). On the employee side, this includes legal information as well as attracts attention of the employer to address

their concerns. On the supplier side, the advisory role of NGOs also implies the transfer of knowledge, for example in the form of internal training or the joint implementation of best practices. In the long term, NGOs can help suppliers to introduce improvement plans that deal with the social factor within the company, especially through close cooperation. This includes the adaptation of corporate policy in favor of employees in order to improve their working conditions (Benstead et al., 2021).

### 4.3 | Qualitative analysis and conceptualization of hypotheses

To refine theory and to build a theoretical framework, qualitative expert interviews are conducted. In this context, the theoretical constructs from the literature are used and extended as needed.

The main source of the following data is taken from 10 semistructured interviews with representatives from international organizations which are conducted between April 2021 and August 2021. To ensure that a range of perspectives and possible solutions are captured, organizations of medium to large size according to international standards are selected (Gehman et al., 2018). The organizations are particularly engaged in supply chain management consulting and sustainable supply chain operations. Appendix A provides an overview of the companies included in the sample, the industries, and the role of the respondents.

A senior manager of each company is contacted first. All interviewees are either senior executives or high-level representatives. All interview partners have at least 3 years of professional experience in the desired work environment. The semistructured questionnaire includes main clusters such as (i) indicators of modern slavery, (ii) countermeasures to combat modern slavery, and (iii) methodologies to detect modern slavery.

An inductive methodology is used to examine the previously identified theoretical constructs and to evaluate their validity. This approach examines a phenomenon directly from the data collected and is often used when a research phenomenon is in a relatively early stage of development. As discussed in Section 1, the area of modern slavery in the supply chain has not been studied thoroughly which ensures that a grounded theory approach can be used in the context of this paper. Grounded theory approaches focus on the systematic collection and analysis of data to derive theories (Glaser & Strauss, 2017) and are commonly used in supply chain research (Mello & Flint, 2009). The presentation and analysis of the data is organized according to the three-step process of Gioia et al. (2013). In the first step, the interviews are analyzed individually (within-case analysis) which leads to the development of "first order codes" by using open coding. Subsequently, the within-case analysis is followed by a cross-case analysis in which the codes found in the individual interviews are compared with each other ("second order codes"). Finally, theoretical categories are formed based on the previous steps, which serve for the development of hypotheses detailed below.

Figure 2 provides an overview of the indicators, whereby 20 codes are identified in the first order analysis using the terminology from the interviews.

Finally, the 20 codes are reduced to 10 codes in the second order analysis and subsequently classified into five theoretical categories: Economic, geographical-social, environmental, political-legal, and technological indicators.

Especially industries with low profit margin and high cost pressure are repeatedly cited as a prime examples for modern slavery during the expert interviews. The economic situation in the country or company as well as price pressure in the industry stand out in this regard. We therefore put forward the following hypothesis:

> **Hypothesis 1.a.** Economic factors are considered as an indicator for the occurrence of modern slavery in companies.

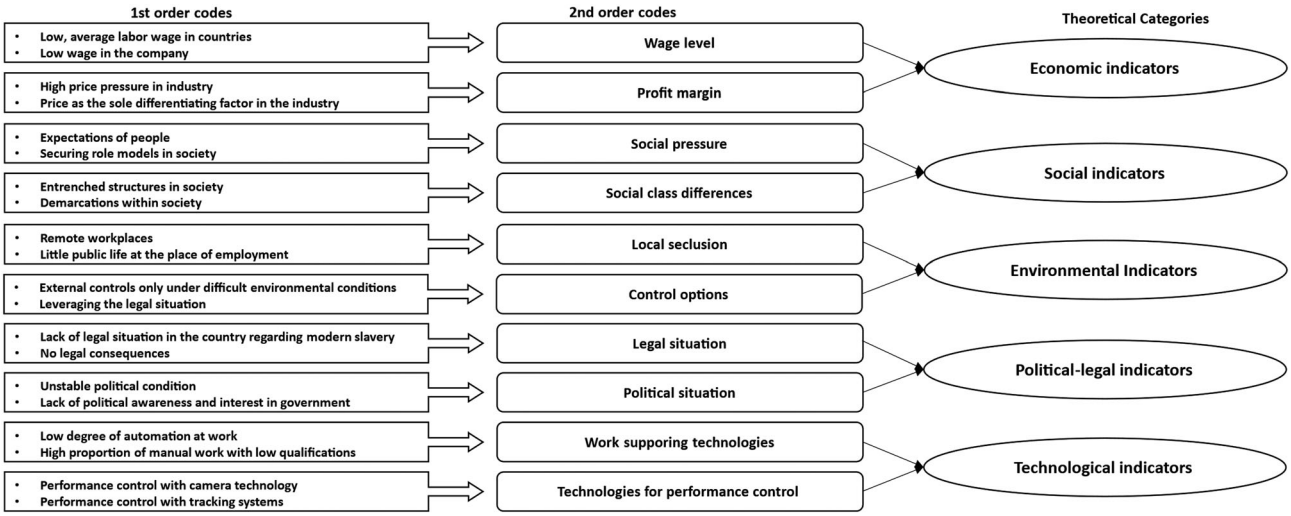


**FIGURE 2** Codes and categories of the indicators

Exploitation is justified by the fact that certain social groups of people are less valuable. Moreover, people from poor backgrounds are more dependent on wages and are therefore willing to accept dangerous working conditions and low wages.

The presence of social pressure and social class differences is also considered an indicator of the occurrence of modern slavery and is therefore described in the hypothesis:

> **Hypothesis 1.b.** Social factors are considered as an indicator for the occurrence of modern slavery in companies.

Due to the remote working location, external control units have only limited possibilities to carry out inspections. In addition, legislation in the respective countries can be more easily circumvented by the companies, as inspections rarely take place. Local remoteness and the resulting lack of control is described as an environmental indicator in the context of this work. As a hypothesis we therefore state:

> **Hypothesis 1.c.** Environmental factors are considered as an indicator for the occurrence of modern slavery in companies.

An unstable political situation can be seen as a cause of the lack of political awareness to combat modern slavery. In addition, the prevalence of corruption may also encourage modern slavery actions. In addition, the political and legal conditions in a country we summarized. Both can increase the likelihood of the occurrence of modern slavery in the supply chain which leads to the following hypothesis:

> **Hypothesis 1.d.** Political-legal factors are considered as an indicator for the occurrence of modern slavery in companies.

The last indicator that can be identified in the context of the present research relates to technologies. Work-supporting technologies can be seen as an aid for the employee. However, technologies can also be misused as employee monitoring and can exert enormous pressure on employees to perform well. We therefore hypothesize the following:

> **Hypothesis 1.e.** Technological factors are considered as an indicator for the occurrence of modern slavery in companies.

The implementation of a three-step expert interview analysis process by Gioia et al. (2013) is also executed to find out countermeasures against modern slavery in the supply chain. Three theoretical categories emerge that can be used as countermeasures for the occurrence of modern slavery: preventive, detective, and reactive (see Figure 3).

In this paper, preventive measures are understood as measures that can be applied to ensure that modern slavery does not occur in the supply chain. Detective measures are used to identify modern slavery in the supply chain while reactive measures describe the behavior of companies after the occurrence of modern slavery in the supply chain.

Previous research streams identify public commitment to combat modern slavery in the supply chain by the choice of the suppliers and the supplier loyalty. These measures can be summarized as prevention within a management process. Thus, we state the following hypothesis:

> **Hypothesis 2.a.** Companies that combat modern slavery in the supply chain with a regulated management process work with preventive measures.

The occurrence of modern slavery in the supply chain can also never be completely avoided despite preventive measures. Therefore, companies conduct supplier assessments and try to increase transparency in the supply chain. These measures can be summarized as

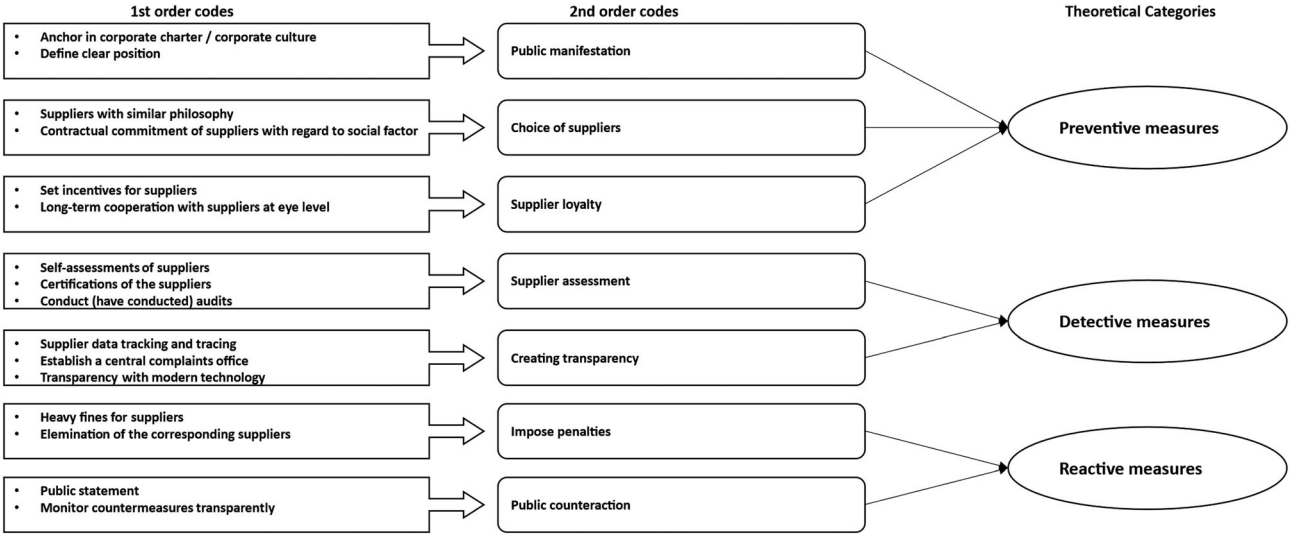


**FIGURE 3** Codes and categories of the countermeasures

detective measures according to the theoretical framework. Therefore, we state the following:

> **Hypothesis 2.b.** Companies that combat modern slavery in the supply chain with a regulated management process work with detective measures.

So, when a case of modern slavery occurs in the supply chain, a company should take appropriate reactive countermeasures. According to the current state of research, these include imposing penalties on the supplier and publicly declaring the case. To test this, the following hypothesis is developed:

> **Hypothesis 2.c.** Companies that combat modern slavery in the supply chain with a regulated management process work with reactive measures.

Grounded on literature, indicators for the occurrence of modern slavery in the supply chain and countermeasures taken by companies to combat modern slavery in the supply chain are presented. By executing expert interviews, findings are validated. The presentation of the framework follows the PESTEL analysis and disaster management process. In summary, the indicators can be divided into economic, social, environmental, political-legal, and technological aspects. The management process includes countermeasures which can be characterized by prevention, detection, and reaction (see Figure 4).

The modern slavery framework and the derived hypotheses are merged into an integrated research model (see Figure 5).

## 5 | METHOD

In this section, the two selected methodological approaches of the multimethod approach are explained in more detail. The case study

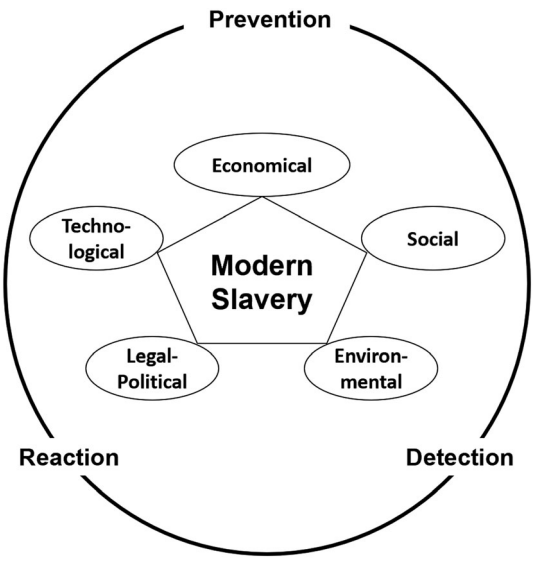


**FIGURE 4** Modern slavery framework

approach follows the principle of Wu et al. (2016). Public textual data from global supply chain partners is first preprocessed and afterwards used for topic model analysis. Topic modeling is an effective statistical tool to analyze text based datasets in order to identify the correlation between various topics and to extract the key statement of a document by means of word occurrence (Brust et al., 2017). The following superordinate structure for the topic modeling procedure refers to (Bastani et al., 2019). As shown in Figure 6, the approach is divided into three phases: data collection, data preprocessing, and topic modeling.

### 5.1 | Data collection and preprocessing

First, a representative database needs to be selected and prepared. To achieve meaningful results a particularly large dataset is beneficial. In a similar study by Aziz et al. (2022), a database of almost 6000 documents and articles is used as a guideline for orientation. In the following, the data collection procedure is described before taking a closer look at the collected data.

The data to be processed is obtained from either newspaper articles or webpages of companies operating in globally networked supply chains. The selection process of both newspaper articles and web page articles can be separated by indicators and countermeasures as shown in Table 3. The collection of the newspaper articles is conducted manually using an online electronic journal collection tool. Subsequently, a search is conducted with adequately selected search terms. To identify suitable search terms, multiple key terms are tested in advance; some for indicators of modern slavery database and some for countermeasures of modern slavery database. Regarding the indicators of modern slavery in the supply chain, the search terms are "modern slavery and indicators" and "modern slavery." Concerning the database for countermeasures of modern slavery the search terms are limited to "modern slavery and countermeasures." Furthermore, all selected articles are published no later than 2019. To ensure the informative value of the topics, a word limit is set since text mining techniques perform better on shorter texts (Sbalchiero & Eder, 2020). In addition, duplicates are removed in case the same article is published multiple times in different newspapers. Lastly, to get meaningful and formal results, the publication type is filtered by newspaper.

The data preprocessing step deals with the preparation of the dataset for the succeeding analysis. This phase is crucial since poorly preprocessed data may affect the performance of the topic modeling algorithm. The data preprocessing task follows the approach of Bastani et al. (2019) and will not be discussed in detail.

### 5.2 | Topic modeling

The Topic modeling section follows an Adversarial-neural Topic Model (ATM). The ATM approach is preferred for topic modeling in comparison to traditional topic models due to the increased representation ability, which enables a true data distribution and more coherent

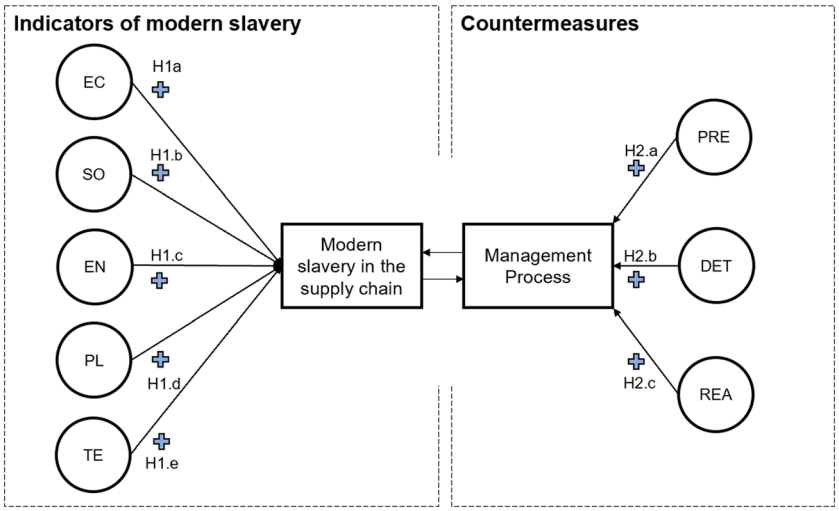


**FIGURE 5** Research model (EC: economic indicators, SO: social indicators, EN: environmental indicators, PL: political-legal indicators, TE: technological indicators, PRE: preventive measures, DET: detective measures, REA: reactive measures)

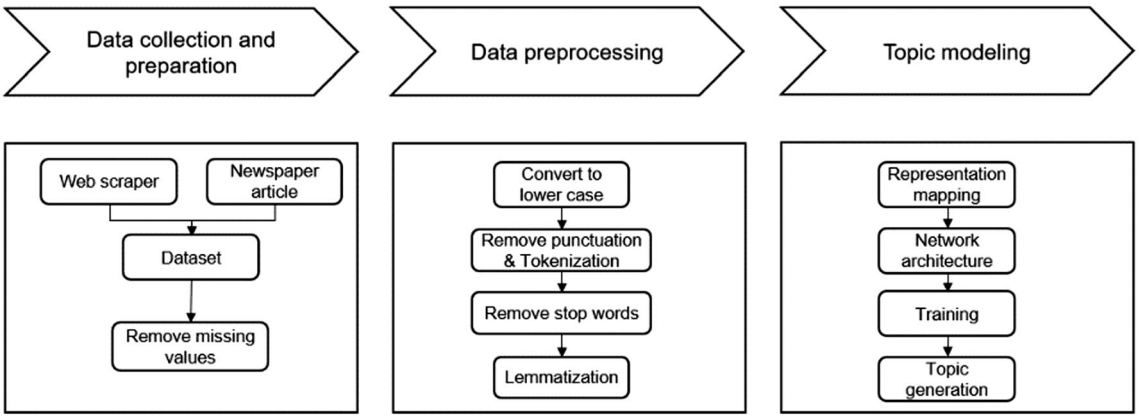


**FIGURE 6** Overview of the case study approach

topics (Wang et al., 2019). The ATM approach is based on Generative Adversarial Nets (GANs). GANs are a technique for unsupervised and semisupervised learning and enable deep insights with minimal labeled data. This is accomplished by a training procedure that is based on two competing networks, the Generator Network and the Discriminator Network. During the training process, the Generator Network creates a fake document which is handed off — together with a real document — to the Discriminator Network. The Discriminator Network needs to differentiate these two documents and identify the real document (Goodfellow et al., 2014). The ATM algorithm can be split in three parts: Document sampling, Generator Network, and Discriminator Network as depicted in Figure 7.

The document sampling module can be split into representation mapping and network architecture. The representation mapping uses term frequency - inverse document frequency (TF-IDF) to identify the relevance of a word to a document within a collection of documents.

In the operative ATM topic modeling process the optimal number of topics must be determined. Therefore, following the research results of (Wang et al., 2019), which show that a high number of topics result in worse performance of the algorithm, in combination with a repetitive execution of the algorithm the best performance is reached using 20 topics. The framework considers the indicators and countermeasures separately, thus ATM is executed twice, first with the dataset of indicators and subsequently with the countermeasure's dataset. By using the ATM algorithm, 20 different topics and the respective topic terms are extracted. Next, the topics are manually assigned to categories in order to get meaningful, interpretable clusters (Aziz et al., 2022). Thereby, the topics are assigned to a category of the theoretical framework which reflects the core of the topic best. The different indicator categories are as follows: economic indicators, social indictors, legal-political indicators, environmental indicators, and technological indicators. Finally, the results are detailed in Section 6.

For the quantitative empirical approach, a questionnaire is used to test the hypotheses set up in Section 4.3. To guarantee reliability, validity, and generalizability in the process, this research follows a defined process. As shown in Figure 8, the approach is depicted in three phases: Development of the questionnaire, sample and data collection, and data analysis method.

## 5.3 | Development of the questionnaire

The designed questionnaire contains the theoretical constructs from literature and the results of the qualitative expert interviews (see

**TABLE 3** Definitions and constructs in the model

| Constructs/items | Definition | References | Code used |
|---|---|---|---|
| **Economic indicators (EC)** | | | EC |
| Wage level | The wage level defines the salary that a company pays to its employees | Bales (2006) | EC1 |
| Profit margin | The profit margin defines the profit that a company usually achieves in the industry | Expert interviews | EC2 |
| **Social indicators (SO)** | | | SO |
| Social pressures | Social pressure defines the social compulsion to work even under precarious working conditions | Expert interviews | SO1 |
| Social class differences | Social class distinctions describe that within society demarcations are made and certain groups of people are categorically suppressed | Gold et al. (2015); Crane (2013) | SO2 |
| **Environmental indicators (EN)** | | | EN |
| Local seclusion | Local remoteness means the remote geographic location of a business or workplace | Jackson et al. (2020) | EN1 |
| Control options | Control possibilities refer to the lack of possibility to carry out external controls in a company or a workplace | Crane (2013) | EN2 |
| **Political-legal indicators (PL)** | | | PL |
| Legal situation | The legal situation describes the existence of laws against modern slavery in the country where the company or workplace is located | Gold et al. (2015) | PL1 |
| Political situation | The political situation describes the local government awareness | Crane (2013) | PL2 |
| **Technological indicators (TE)** | | | TE |
| Work support technologies | Work assistive technologies describe that in a company there is support for employees so that strenuous work does not have to be done manually | Crane (2013) | TE1 |
| Technologies for performance control | Performance monitoring technologies describe that in a company the performance of employees is monitored | Fayezi et al. (2021) | TE2 |
| **Preventive measures (PRE)** | | | PRE |
| Public manifestation | Public statement describes that the fight against modern slavery in the supply chain is publicly advocated and carried out by the company management | Expert interviews | PRE1 |
| Choice of suppliers | Choice of suppliers describes that the supply chain only works with suppliers who (contractually) reject and fight modern slavery | Flynn and Walker (2021) | PRE2 |
| Supplier loyalty | Supplier loyalty describes those incentives are set by companies for suppliers to fight modern slavery | Expert interviews | PRE3 |
| **Detective measures (DET)** | | | DET |
| Creating transparency | Creating transparency means trying to track what the social situation is like in the respective companies in the supply chain | Flynn and Walker (2021) | DET1 |
| Supplier assessment | Supplier assessment describes that companies regularly check their suppliers, e.g., in the form of self-assessments or audits. | Gold et al. (2015); New (2015) | DET1 |
| **Reactive measures (REA)** | | | REA |
| Impose penalties | Impose penalties describes that after a case of modern slavery comes to light, appropriate penalties are imposed on the supplier | New (2015) | REA1 |
| Public counteraction | Public counteraction describes that after a case of modern slavery in the supply chain, the company makes a public and transparent statement about the situation | Expert interviews | REA2 |

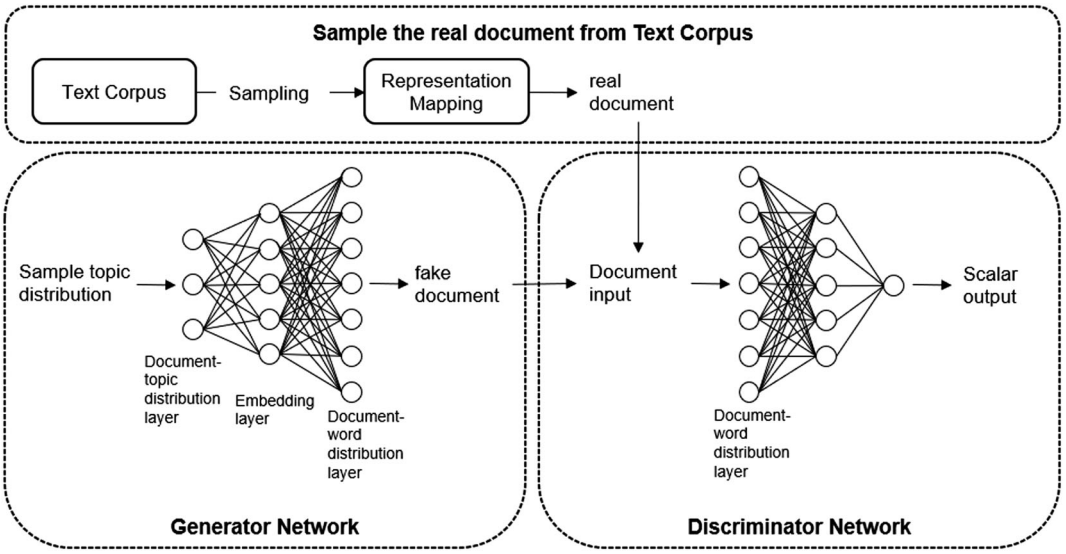


**FIGURE 7** Functionality of the ATM algorithm

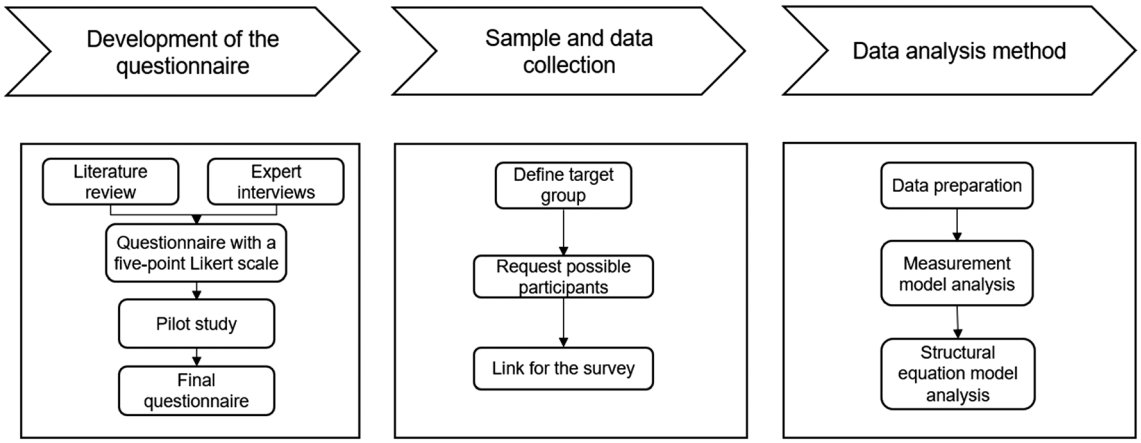


**FIGURE 8** Overview of the quantitative empirical approach

Table 3). The questionnaire consists of two parts. The first part asks about the indicators of modern slavery in the supply chain while the second part looks at the countermeasures taken by companies (see Appendix B). Each item is measured using a five-point Likert scale, with 1 indicating *strongly disagree* and 5 indicating *strongly agree*. Thus, a score of 1 implies that the respondents disagree with the statement at all, whereas a score of 5 implies that the respondents completely agree with the given statement. After the design of the questionnaire and before the final implementation of the questionnaire, a pilot study is conducted with members of the expert group to ensure that the questionnaire is understood by the participants. As a result of the pretest, context-specific changes are made to refine the questionnaire. For example, individual phrases that are misunderstood by the participants during the pretest are modified.

## 5.4 | Sample and data collection

The survey is distributed to supply chain managers via corporate and social networks starting January 2021 until December 2021. Several steps are taken to ensure that respondents are aware of the most important issues. Beside direct contact to those companies also targeted in the case study the social network "LinkedIn" is used where job descriptions are visible. On average, respondents work in the field of sustainable supply chain management, also focusing on modern slavery for at least 3 years; 280 completed responses are received, for a 35.2% response rate (280/795). There is no need to compensate for missing values in responses as all participants answer all questions. The participating companies represent companies of different sizes (see Table 4), industries (machinery: 102, electronics: 96, textile: 82), and locations worldwide (UK: 152, Germany: 67, USA: 61).

## 6 | EMPIRICAL RESULTS

The results are structured according to the multi-methodological approach outlined in Section 2. First, the case study results from topic modeling are presented followed by the quantitatively empirical results from SEM.

Focusing on the case study's results Table 5 shows which categories the individual topics are assigned to. It also depicts the interpretation of the topics conducted by using the topic terms and findings obtained in Section 3.

**TABLE 4** Company size of the study participants

| Company size | Frequency | Percentage (%) |
|---|---|---|
| Up to 9 employees | 95 | 33.9 |
| 10 to 49 employees | 35 | 12.6 |
| 50 to 249 employees | 70 | 25.0 |
| More than 249 employees | 80 | 28.5 |

After considering the topics regarding *indicators* of modern slavery in the supply chain the topics related to *countermeasures* of modern slavery in the supply chain are analyzed and described. Table 6 shows the topics and the respective topic terms. The discovered topics are clustered into the following three categories: *preventive* measures, *detective* measures, and *reactive* measures.

To summarize, first *indicators* will be considered. The first three categories *economic*, *social*, and *legal-political* seem to be the most comprehensive ones. However, it can be stated that especially the two latter categories strongly depend on the category *environmental*. According to the situation in the region the supplier is situated, the factors social and legal-political differ since every region has an own political framework and legislation and varying social norms, traditions, and levels of education. In terms of the economic situation of the region, a relationship between *economic* and *environmental* can be observed. However, all other economic factors do not depend on the region but on the OEM and the overall financial situation of the company. Besides the already mentioned, essential categories, the technological one shows only low influence on indicating modern slavery in the supply chain and thus will be neglected.

**TABLE 5** Topic interpretation of indicators

| Category | Topic | Topic terms | Interpretation |
|---|---|---|---|
| Economic | Cost pressure | Cut-Price, Competition, Pricing | Companies have a tight budget and therefore need to reduce expenses |
| | Low wages | Work-related, Poor, Bondage | Companies can achieve cost savings by keeping wages low |
| | Currency | Country, Liability, Weak | A country's weak economic situation can be exploited to produce at low cost |
| | Subsidiarity | Cooperation, Procure, Providers | Higher risk of modern slavery at the lower (tier-) level of the supply chain |
| | Expansion | Transnational, Country, Investment | Complex and deeply intertwined supply chains make it hard to track actions |
| | Sector leading | World leader, Investors, Champion | The OEM bears responsibility in the supply chain, as it has a significant influence on pricing pressure |
| | Sales related | Business, Upside, Size | Small companies are more likely to practice modern slavery |
| Social | Education | Unskilled, Academies, Illiterate | A low level of education tends to result in low paid jobs with poor working conditions |
| | Illiterate | Language, Read, Study | |
| | Manners | History-driven, Native, Catholic | Cultural traditions can provide a justification for an inferior role of a person and their unfair treatment |
| | Caste | India, Demonetization, Debt-bondage | |
| | Poorest | Starve, Malnutrition, Homeless | People can be exploited more easily if they are in a precarious financial situation |
| | Language | Communication, English, Education | A language barrier leads to isolation and prevents people from knowing their fundamental rights |
| Legal-political | Parliament | Administrative, Counselor, Politics | Legislation for modern slavery is required |
| | Prosecution | Convict, Bureau, Persecutor | Actions of modern slavery must be prosecuted in all cases |
| | Bribery | Non-legislative, Illegal, Fraudulent | |
| | Judiciary | Rights, Lawyers, Commissioner | A fair and nonbiased trial must be ensured |
| Environmental | Region | East, Africa, West | The respective country or region has its own conditions, laws or customs |
| | State | Mexico, Brazil, Malaysia | |
| Technological | Surveillance | Observers, Supervise, Data-driven | Technologies can be abused to monitor employees |

**TABLE 6** Topic interpretation of countermeasures

| Category | Topic | Topic terms | Interpretation |
|---|---|---|---|
| Preventive | Data | Records, data-driven, information | Suppliers should be examined based on available data |
| | Organization | Human rights, Solwodi, aid | Cooperation with aid organizations provides knowledge transfer and additional support |
| | Senate | Regulations, immigrants, juristic | Introduction of new and additional legislation is essential |
| | Cabinet | Resettlement, rights-modern, government | |
| | Code of conduct | Self-policing, law, contract | Modern slavery should be covered in the company guidelines |
| | Policy | Principles, conduct, business plan | |
| | Sensibilization | Awareness, editor, acceptance | Awareness raising and further training in this area must take place actively |
| | Speech | Attention, public, proclaim | Awareness of modern slavery in the supply chain |
| | Conversation | Relation, media, spread | |
| Detective | Report | Indicate, transparent, record | Reporting increases transparency |
| | Transparency | Insiders, export, overview | Due to more transparencies suspicious suppliers are noticed more quickly |
| | Surveillance | Traceable, scanning, room | Continuous monitoring can help to detect signs of modern slavery early |
| | Data mass | Innovation, cyber, tool | Using the available data and analyzing it can provide useful information |
| | Innovation | Investor, co-founding, smartly | New approaches and tools can be an opportunity |
| | Machine learning | Data, prediction, technicians | Predictions of patterns can help to investigate modern slavery better |
| Reactive | Deduction | Punishment, financial, revoke | Cases of modern slavery should be penalized |
| | Guardian | Managerial, mate, allocate | Close monitoring of the supplier |
| | Surveillance | Traceable, scanning, room | Continuous control of the supplier |
| | Prison | Arrest, police, punish | Responsibility of legal authorities to penalize offenses |
| | Procedure | Examine, process, plan | A business process including reactive measures should be in place |

Considering *countermeasures*, all three categories *preventive*, *detective*, and *reactive* are necessary to combat modern slavery in the supply chain. However, the participation of the companies, legal authorities and aid organizations is necessary to make a difference. Besides, *preventive* countermeasures are most comprehensive and elaborate since they are on the one hand about raising awareness and changing the mindset of people in the long run. On the other hand, *preventive* countermeasures also deal with the formation of new structures in a company as well as the extension of legislation. Furthermore, changes are required regarding *detective* and *reactive* countermeasures, as there is the need for more transparency and monitoring. In addition, penalties need to be implemented in regards of *reactive* countermeasures.

Based on the findings of the case study a structural equation model (SEM) is used to test the hypotheses detailed in Section 4.3. SEM is particularly well suited for identifying correlations between different theoretical constructs (Lin et al., 2005; Su & Yang, 2010). Explicitly, the component-oriented and prediction-oriented SEM is used, which is also called partial least square (PLS) as it considers the effect between constructs (Peng & Lai, 2012). In the context of this work, the software SmartPLS 3 is used for the analysis to assess the quality of both the measurement model and the structural equation model.

First, the constructs derived from literature presented in Table 8 are analyzed for their reliability and validity. Given a univariate normal distribution of the data, values between −1.5 and 1.5 are expected for both kurtosis and skewness (Tabachnick et al., 2019). This analysis is performed for the developed indicator and countermeasure framework model. The results are shown in Table 7.

The results show that all values of the constructs fall within the specified range between −1.5 and 1.5, so a univariate normal distribution of the data can be confirmed. To check whether respondents interpret the questionnaire similarly, the internal consistency and reliability of the factors within the questionnaire are analyzed using Cronbach's alpha (CA). A value of CA > .7 indicates acceptable reliability. The analysis of convergent validity also shows a high correlation of the items of a single construct. Convergent validity applies when the consistent factor loading is greater than .7, the average variance extracted (AVE) for each construct has a value greater than .5, and the reliability of each construct has values greater than .7 (Tabachnick et al., 2019). Table 8 presents all values for the CA, the AVE, and the composite value of reliability (CR for short) of each construct that is

**TABLE 7** Mean, standard deviation, kurtosis, and skewness of the items

| Items | Mean value | Median | Standard deviation | Kurtosis | Skewness |
|---|---|---|---|---|---|
| EC1 | 4.029 | 4 | 0.747 | −1.207 | −0.048 |
| EC2 | 4.176 | 4 | 0.663 | −0.755 | −0.214 |
| SO1 | 3.882 | 4 | 0.867 | −0.164 | −0.590 |
| SO2 | 3.765 | 4 | 1.059 | 0.730 | −1.016 |
| EN1 | 4.294 | 4 | 0.620 | −0.636 | −0.298 |
| EN2 | 4.265 | 4 | 0.656 | −0.740 | 0.341 |
| PL1 | 4.235 | 4 | 0.597 | −0.467 | −0.139 |
| PL2 | 4.206 | 4 | 0.719 | −1.023 | −0.331 |
| TE1 | 3.118 | 3 | 0.867 | −0.164 | 0.590 |
| TE2 | 3.147 | 3 | 0.845 | −0.040 | 0.600 |
| PRE1 | 4.382 | 4 | 0.543 | −0.932 | −0.075 |
| PRE2 | 4.353 | 4,5 | 0.723 | −0.844 | −0.652 |
| PRE3 | 4.382 | 4 | 0.595 | −0.670 | −0.381 |
| DET1 | 4.265 | 4 | 0.559 | −0.434 | −0.011 |
| DET2 | 4.353 | 4 | 0.588 | −0.667 | −0.285 |
| REA1 | 3.235 | 3 | 0.730 | 0.308 | 0.516 |
| REA2 | 3.235 | 3 | 0.689 | −0.022 | 0.198 |

**TABLE 8** CA, AVE, and CR of the constructs

| Construct | CA | AVE | CR |
|---|---|---|---|
| EC | .737 | .791 | .883 |
| SO | .806 | .835 | .910 |
| EN | .754 | .802 | .890 |
| PL | .728 | .786 | .880 |
| TE | .700 | .751 | .857 |
| PRE | .920 | .862 | .949 |
| DET | .758 | .805 | .892 |
| REA | .788 | .768 | .866 |

**TABLE 9** Discriminant validity scores of the indicators

| | EC | SO | EN | PL | TE |
|---|---|---|---|---|---|
| EC | **.890** | | | | |
| SO | .411 | **.914** | | | |
| EN | .449 | .519 | **.896** | | |
| PL | .599 | .350 | .578 | **.886** | |
| TE | .094 | .404 | .458 | .285 | **.867** |

**TABLE 10** Discriminant validity scores of the countermeasures

| | PRE | DET | REA |
|---|---|---|---|
| PRE | **.928** | | |
| DET | .504 | **.897** | |
| REA | .093 | .171 | **.876** |

calculated. The model shows convergent validity and acceptable reliability due to all CA values are greater than .7.

In addition, a discriminant analysis is performed to exclude correlations between items of different constructs. To do this, the correlations between the different constructs must be smaller than the square root of the AVE value (Gefen & Straub, 2005). Table 9 and Table 10 present the results of this analysis which is conducted using SmartPLS. The results for indicators as well as countermeasures are evaluated separately.

The bold values represent all AVE values of the square root whereas the other values represent the construct correlations. It can be clearly seen that all correlation values are lower than the AVE values of the square root, so that the discriminant validity can be confirmed.

Based on the presented framework in Section 4.3, this research study examines the pathways from the constructs EC, SO, EN, PL, and TE to the occurrence of modern slavery and from the constructs PRE, DET, and REA to the defined management process and its countermeasures. Their presumed relationships to each other are indicated in Figure 9. Using the bootstrapping method, the t-values as well as the path coefficients for the paths' analysis can be determined. The bootstrapping method allows the stability of the data to be assessed by creating random subsamples from the available database. These random subsamples are iteratively processed by an estimation algorithm. According to Streukens and Leroi-Werelds (2016) the number of subsamples should be large to obtain reasonable estimates. In this paper, following the research of Guner and Acarturk (2020), the subsamples are set to 1000. Based on the above settings, the structural model in Figure 9 is obtained, showing the path coefficients, the outer factor loadings, and the values of $R^2$ for the latent constructors.

In addition to the closed questions, participants answer one open-ended question as part of the survey. The question about the occurrence of modern slavery in the supply chain is made transparent by companies in practice and by methods used for this purpose. A choice could be made between "Through audits" (73.50%), "Through self-assessment of the suppliers" (85.30%), "Through new technologies (e.g., Big Data Analysis)" (44.10%), and "Further" (17.60%).

First, Table 8 is used to assess the occurrence of modern slavery in the supply chain. Since a value of 2.5 on a Likert scale of 1 to 5 represents a medium probability of occurrence, the mean values can be regarded as an increased probability of the occurrence of modern slavery in the supply chain. The respective items show a high similarity among each other (AVE > .7 for all constructs, see Tables 9 and 10). As mentioned before, the mean values of all indicators show a higher probability for the occurrence of modern slavery and therefore call for a detailed consideration. Table 7, shows that the mean values are higher on average especially for the environmental ($\overline{EN1}$ = 4.294, $\overline{EN2}$ = 4.265), political-legal ($\overline{PL1}$ = 4.235, $\overline{PL2}$ = 4.206), and economic ($\overline{EC1}$ = 4.029, $\overline{EC2}$ = 4.176) indicators. The mean values of the social indicators are barely lower ($\overline{SO1}$ = 3.882, $\overline{SO2}$ = 3.765) while the technological indicators have the lowest mean values ($\overline{TE1}$ = 3.118, $\overline{TE2}$ = 3.147). The bootstrapping results (see Table 11) show that the economic, social, environmental, and political-legal indicators have a significant ($p < .01$) influence on the occurrence of modern slavery in the supply chain. Thus, Hypotheses 1.a to 1.d can be supported. In addition, hypothesis 1.e addressing the impact of technological indicators on the occurrence of modern slavery in the supply chain not significant ($p = .711$).

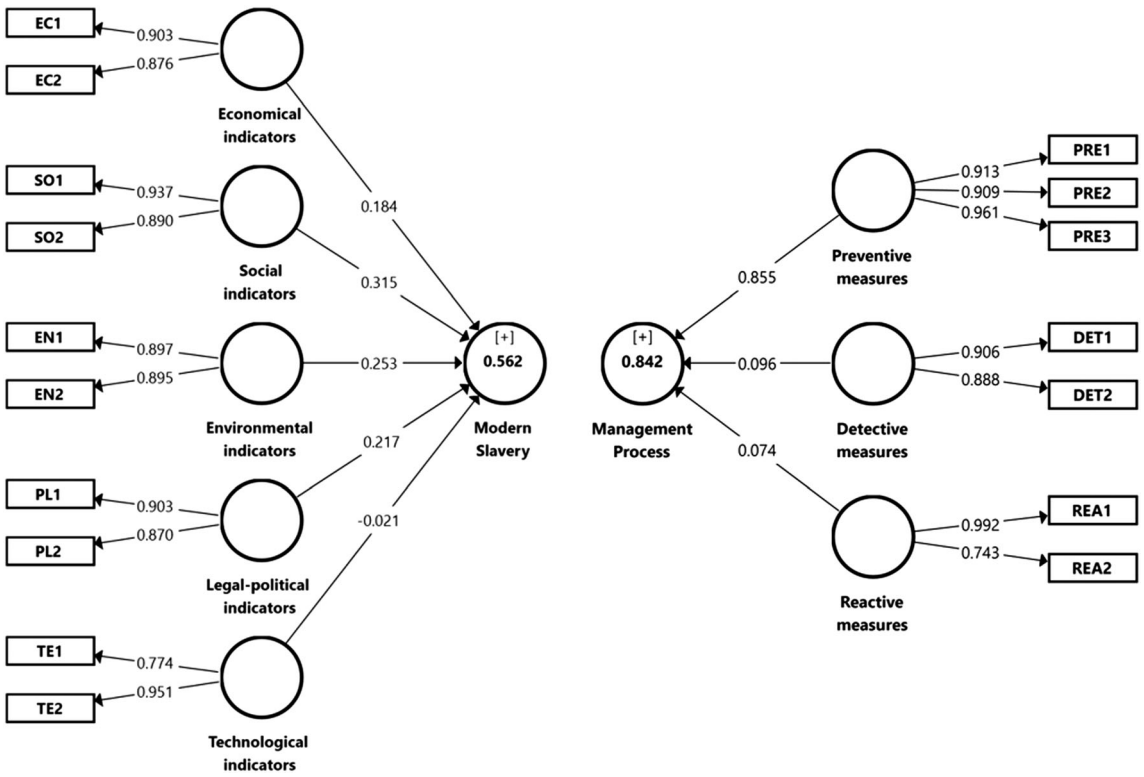


**FIGURE 9** Structural model with the external charges, path coefficients, and $R^2$ of the latent constructors

**TABLE 11** Results of the bootstrapping analysis using SmartPLS 3

| Relationship | Path coefficients | Sample mean | Standard deviation | *T*-statistics | *p* values | Significance ($p < .01$) |
|---|---|---|---|---|---|---|
| EC → MS | .184 | .188 | .072 | 2.547 | .011 | Significant* |
| SO → MS | .315 | .309 | .064 | 4.949 | .002 | Significant * |
| EN → MS | .253 | .245 | .081 | 3.105 | .003 | Significant * |
| PL → MS | .217 | .223 | .074 | 2.945 | .000 | Significant * |
| TE → MS | −.021 | −.016 | .056 | 0.371 | .711 | Not significant |
| PRE → MP | .855 | .855 | .028 | 31.054 | .000 | Significant * |
| DET → MP | .096 | .097 | .035 | 2.742 | .006 | Significant * |
| REA → MP | .074 | .069 | .031 | 2.369 | .018 | Not significant |

The countermeasures to combat modern slavery in the supply chain are recorded and evaluated separately from the indicators in this study. Here, too, a Likert scale with values from 1 to 5 is used to measure the influence. The influence of the concrete countermeasures on the existence of a defined management process is measured. The mean values of the preventive ($\overline{PRE1} = 4.382$, $\overline{PRE2} = 4.353$, $\overline{PRE2} = 4.382$) and the detective ($\overline{DET1} = 4.265$, $\overline{DET2} = 4.353$) measures are higher than the mean values of the reactive measures ($\overline{REA1} = 3.235$, $\overline{REA2} = 3.235$). The construct "preventive measures" show the highest significance ($p = .000$). In the path model, the path coefficient is also significantly higher than that of the other measures (path coefficient = .855). However, in addition to the preventive measures, the detective measures also show a significant influence, although slightly lower than the preventive measures ($p = .006$). Thus, hypotheses 2.a and 2.b can be confirmed by the quantitative empirical approach.

The results of bootstrapping analysis for the indicators and countermeasures are summarized in Table 12, indicating whether the hypotheses depicted in Figure 5 are supported or not. To evaluate Hypothesis 2.c, the influence of the reactive measures on the management process is considered. This hypothesis shows a low significance ($p = .018$).

In addition, it is examined how often a company uses different methodologies to detect modern slavery. Most companies rely on self-assessments by their suppliers (85.30%). The great advantage of this method is that it is very cost-effective. However, a real verification is not guaranteed since you rely on the honesty of the suppliers. Another popular method is to conduct on-site audits of suppliers in the supply chain either self-performed audits or audits by certified organizations from outside (73.50%). However, this involves comparatively high costs that not every company can afford or wants to incur on a regular basis. Another possibility, which has already been suggested in research and is also confirmed in the expert interviews, is the use of modern technologies to increase transparency in the supply chain (Fayezi et al., 2021). However, this option is not used by less than half of the companies (44.10%). This option is seen as having great potential as the financial and personnel costs are significantly lower than for executing audits. In addition, transparency in the supply chain is improved more reliably than in the case of self-assessment by suppliers.

**TABLE 12** Results of the hypotheses tests of the research model

| Relationship | Hypotheses | Result |
|---|---|---|
| EC → MS | H1.a | Supported |
| SO → MS | H1.b | Supported |
| EN → MS | H1.c | Supported |
| PL → MS | H1.d | Supported |
| TE → MS | H1.e | Not supported |
| PRE → MP | H2.a | Supported |
| DET → MP | H2.b | Supported |
| REA → MP | H2.c | Not supported |

Both in the literature and in the expert interviews, big data analysis is mentioned in this context. In this paper, however, it becomes apparent that its use in corporate practice is still quite low.

To validate the robustness of the model used in this research paper, an invariance test of the constructs is run by using the CFA approach (Steenkamp & Baumgartner, 1998). First, the data is split into two geographically determined groups to obtain higher validity: "UK" and "Germany and USA." If this subdivision is not made or if the regions are regrouped, the robustness is still given. The unconstrained CFA model is run with two groups in a measurement model and yields a satisfactory fit ($\chi^2/df = 1172.21/514$, CFI = .951, GFI = .913, AGFI = .892, TLI = .941, RMSEA = .034). All factor loadings are above .70 and significant ($p < .01$). Thus, it can be concluded that all constructs across the two groups exhibit satisfactory configural invariance. To test the significance of $\Delta\chi^2$ between the unrestricted and restricted multigroup models, an additional $\chi^2$ test is applied. For the restricted CFA model, the regression weights of all items in the two groups are fixed. The result of the restricted CFA model remaines satisfactory ($\chi^2/df = 1162.93/545$, CFI = .951, GFI = .913, AGFI = .901, TLI = .934, RMSEA = .031) and $\Delta\chi^2$ is significant ($\Delta\chi^2 = 12.356$, $\Delta df = 18$), providing additional support for the configuration invariance of the measurement model.

## 7 | DISCUSSION

### 7.1 | Key results

The key findings from the multimethod approach can be summarized as follows. First, to identify modern slavery in the supply chain, several indicators need to be considered. The indicators found in the qualitative analysis are examined in more detail using a quantitative empirical research and a case study approach. The results show that economic, political-legal, social, and environmental indicators have a significant influence on the occurrence of modern slavery in the supply chain. Technological indicators, however, cannot be confirmed as indicators of the occurrence of modern slavery in the supply chain by neither the empirical research nor the case study. In summary, a holistic approach must be taken to assess the risk for the occurrence of modern slavery in the supply chain.

Second, the countermeasures used by companies to address modern slavery in the supply chain can be categorized into three groups by the qualitative analysis: preventive, detective, and reactive. The empirical results show that companies having a defined management process to combat modern slavery in the supply chain implement preventive as well as detective measures. The case study can confirm this statement. Reactive measures, however, are not significant for corporate practice in this study. But the case study shows that these measures play an important role in fully combating modern slavery in the supply chain. The holistic fight and the application of all countermeasures (i.e., preventive, detective, and reactive measures) are very important to successfully minimize modern slavery in the supply chain.

Third, this study provides insights into the use of modern technologies to combat modern slavery in the supply chain. However, the use of conventional methods, such as conducting audits or filling out supplier self-assessment questionnaires, is significantly higher. In contrast, the evaluation of the case study shows that the use of modern technology can play a greater role in the future. Especially, modern technologies like machine learning are likely to be used in the near future. For the coming years, this trend could play a significant role in the detection of modern slavery in practice.

## 7.2 | Implications for research and management

From a theoretical perspective previous studies examine different parts of sustainable supply chain management and modern slavery in the supply chain. These studies analyze the challenge of modern slavery from different perspectives. Crane (2013), for example, considers the influence of various conditions on modern slavery by gathering previous findings in literature whereas Beske and Seuring (2014) evaluate guidelines for practicing sustainable supply chain management based on literature. This paper extends the previous research streams, by taking an operational perspective. We supplement literature-based studies, providing a comprehensive overview of the indicators of modern slavery in the supply chain. Besides, the knowledge of potential countermeasures for the detection of modern slavery, which Gold et al. (2015) present, is extended. Furthermore, a proposal shows which risk management tools can be useful depending on the respective social situation in the supply chain.

From a managerial perspective a holistic approach is essential by assessing the social risk of a supplier. As already discovered, the interaction of all indicators influences the likelihood of modern slavery in the supply chain. Hence, it is not sufficient to consider only one factor but instead you have to address a variety of factors and consider their correlations. Especially the environmental indicator has a huge influence on the political-legal and social situation and thus highly influences the conditions which are present on site, for example, the legislation in the country or prevailing traditions. Moreover, the social factor influences the economic situation of a country and vice versa. Another implication deals with collaborations which should be established with suppliers. By entering a partnership with an aid organization, a company could benefit by gaining deeper insights into this topic and receiving help in how to handle slavery issues. Furthermore, aid organizations can show another point of view and can help to understand the root cause of the issue better. In addition, partnering with other suppliers and sub-suppliers could be beneficial. This would enable a better knowledge transfer between suppliers, but more importantly, resources of both money and manpower could be combined. These resources could be used to increase transparency within the supply chain. The transparency could also be increased by giving an overview of all involved suppliers in the supply chain and, in addition, enabling a direct communication between supply chain partners. Moreover, new and innovative technologies offer another approach to combat modern slavery. Innovative technologies in this area are not yet standardized but are currently being tested. However, they may potentially be useful and thus different kind of technologies should be incorporated into the company and developed further. Lastly, it is recommended to strengthen reactive measures within a company. This includes above all a close cooperation with the supplier as well as a control mechanism.

## 7.3 | Limitations and future research

This study does identify the countermeasures used by companies to combat modern slavery in the supply chain and analyzes their frequencies. However, no conclusions can be drawn from this analysis about the effectiveness and impact on actual countermeasures. No relationship has been evaluated between the "management process" and "modern slavery." Therefore, in further research, this relationship can be investigated and thus the interplay between a management process and the occurrence of modern slavery in the supply chain can be evaluated. Furthermore, not only the effectiveness of the overall management process, but also the effectiveness of the individual submeasures is of great interest and can be studied in more detail in the future. However, companies have to provide information on the occurrence of cases of modern slavery in the supply chain, so that extremely sensitive data would be requested. Valid results could thus be very difficult to achieve. Another limitation is that in both the empirical study and the case study no restriction is made regarding data acquisition in terms of company sectors, sizes, or countries. In future research, company and country differences in relation to modern slavery can be examined more closely. Especially regarding company size, different countermeasures for combatting modern slavery in the supply chain can be assumed here, because they obtain different monetary resources for the implementation of measures. The influence of legislation, which differs depending on the country considered, might also reveal differences in the fight against modern slavery in the supply chain and can be studied. A third limitation is that the empirical study uses only two items for each construct. The items are derived from the results of the literature review and the expert interviews and presented in Table 8. Therefore, the number of items can be expanded in further research to increase the validity of the results.

# 8 | SUMMARY AND CONCLUSION

This paper investigates and analyzes possible indicators of the occurrence of modern slavery in companies and possible countermeasures for combatting modern slavery in the supply chain. In a multimethodological approach a theoretical framework and its constructs are tested. Based on the results, the main findings are as follows:

- Economic, social, environmental, and political-legal indicators are significant for the occurrence of modern slavery in the supply chain.

- Technological indicators are not significant for the occurrence of modern slavery in the supply chain.
- Comprehensive measures (preventive, detective, and reactive) are significant to combat modern slavery in the supply chain.
- New technologies have a high potential for detecting modern slavery in the supply chain, but are currently little in use compared to traditional methods.

## ACKNOWLEDGEMENTS

Open Access funding enabled and organized by Projekt DEAL.

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**How to cite this article:** Bodendorf, F., Wonn, F., Simon, K., & Franke, J. (2023). Indicators and countermeasures of modern slavery in global supply chains: Pathway to a social supply chain management framework. *Business Strategy and the Environment*, *32*(4), 2049–2077. https://doi.org/10.1002/bse.3236

## APPENDIX A: OVERVIEW OF THE COMPANIES INCLUDED IN THE INTERVIEW SAMPLE

| Country | Interviewee | Operating status | Industry | Informant role | Interview length (min) |
|---|---|---|---|---|---|
| EU | A | Firm | Management consulting | Managing director | 36 |
| EU | B | Firm | Management consulting | Partner | 31 |
| US | C | Firm | Forwarding company | Managing director | 34 |
| EU | D | Firm | Management consulting | Consultant | 39 |
| US | E | Firm | Management consulting | Consultant | 46 |
| US | F | Government organization | Service point | Project officer | 33 |
| US | G | Firm | Technology company | Managing director | 37 |
| CH | H | Firm | Management consulting | Managing director | 37 |
| CH | I | Non-government | Non-governmental organization | Consultant | 32 |
| EU | J | Firm | Management consulting | Managing director | 35 |

## APPENDIX B: QUESTIONNAIRE

**Introduction**

Modern slavery affects over 40 million people worldwide, many of whom are part of multi-level, complex supply chains. These people work in extremely harsh conditions, are underpaid, deprived of their freedom, and often work in very risky situations that can affect both their physical and mental health. This social problem has a high degree of complexity, insecurity, and multi-causality, and is reflected in various UN Sustainable Development Goals, such as Goal 8 on promoting decent work and economic growth. National legislation such as the Modern Slavery Act also combats modern slavery in supply chains.

The literature provides evidence on a wide range of indicators of the occurrence of modern slavery. In addition, larger companies are already implementing risk management measures to limit it as much as possible in their supply chains. In the following section, indicators as well as possible countermeasures of modern slavery in the supply chain will be examined.

**Indicators of the occurrence of modern slavery**

The occurrence of certain indicators, which can be divided, for example, into economic, social, political-legal, geographical and technological indicators, increases the probability of the occurrence of modern slavery in companies. These indicators can be used in the analysis of suppliers to better assess the risk of the occurrence of modern slavery.

In the following section, a self-assessment will be made in terms of the company. Here, "we" refers to the company of the interviewee. If you are a member of a consulting firm or a consulting agency, please answer the questions in terms of your clients or in terms of self-assessment for other companies.

2. We consider the wage level in a company or in the country where the company operates as an indicator of the occurrence of modern slavery. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

3. We consider the industry in which a company operates as an indicator of the occurrence of modern slavery. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

4. We consider social class differences in the region in which a firm operates as an indicator of the occurrence of modern slavery. *

Social class differences result, for example, from the categorical oppression of certain groups of people or the existence of so-called caste systems.

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

5. We consider social pressure in the region in which a company operates as an indicator of the occurrence of modern slavery. *

Societal pressure arises in certain cultural circles through the opinion that certain role models must be fulfilled (e.g., a father who must work as a family provider even under precarious conditions)

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

6. We consider the geographic location of a firm in a country as an indicator of the occurrence of modern slavery. *

Geographical location refers to the local environment of a company's place of business. For example, a company that mines raw materials may be very remote in terms of location.

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

7. We consider the difficulty of controlling a company through external controls (e.g., conducting on-site audits) as an indicator of the occurrence of modern slavery. *

For some companies, accessibility for external controls is very difficult to realize. As an example, the mining of raw materials or fishing operations at sea can be mentioned here.

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

8. We consider the legal situation regarding modern slavery in the country in which a company operates as an indicator of the occurrence of modern slavery. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

9. A government may take other actions in addition to legal action to address modern slavery in the country. We consider these measures taken by the government of a country in which the Company operates as an indicator of the occurrence of modern slavery. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

10. We consider the degree of technologization of a worker support enterprise as an indicator of the occurrence of modern slavery. *

Worker assistance technologies refer to technologies that can automate heavy tasks so they do not have to be done manually.

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

11. We consider the use of employee performance monitoring technologies in a company as an indicator of the occurrence of modern slavery. *

Performance monitoring technologies can be, for example, camera monitoring systems or tracking systems.

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | du fully agree |

## Opportunities for a company to counteract modern slavery in its supply chain

To enable companies to combat modern slavery in their supply chain, various countermeasures exist. These can be divided into preventive, detective and reactive measures and are already being used by companies in practice.

### Preventive measures

Preventive measures are measures that can be applied so that modern slavery is less likely to occur in the supply chain in the first place.

12. We have made a public commitment as a company (in annual reports, press releases, etc.) to fight modern slavery in our supply chain. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

13. When selecting our suppliers, we already make sure that they are contractually bound with regard to the fight against modern slavery. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

14. We rely on incentives for our suppliers that they, too, drive the fight against modern slavery in the supply chain. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

**Detective measures**

Detective measures are used to uncover practices of more modern slavery in the supply chain.

15. We try to increase transparency in our supply chain in order to be able to better assess the social situation with our suppliers

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

16. We conduct supplier assessments (e.g. audits or self-assessment questionnaires) in our supply chain to better detect modern slavery. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

17. In order to better detect modern slavery in the supply chain, we create transparency through the following means. *

- [ ] About audits of the companies on site
- [ ] Through self-assessment questionnaires of the suppliers
- [ ] About new technologies (e.g. Big Data)
- [ ] Further

**Reactive measures**

Reactive measures describe the behavior of a company after the occurrence of modern slavery in the supply chain.

18. As soon as a case of modern slavery in our supply chain becomes known, we impose appropriate penalties (e.g. fines or removal of the company from the supply chain) *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

19. As soon as a case of modern slavery in our supply chain becomes known, we issue a public statement on the incident. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| do not agree | ◯ | ◯ | ◯ | ◯ | ◯ | do fully agree |

## General data

Finally, please answer five questions about your company and yourself.

20. How many employees work for your company? *

- ◯ up to 9 employees
- ◯ 10 to 49 employees
- ◯ 50 to 249 employees
- ◯ more than 249 employees

21. What was the annual turnover of your company last year? *

- ◯ not more than EUR 2 million
- ◯ between EUR 2 million and EUR 10 million inclusive
- ◯ between EUR 10 million and EUR 50 million inclusive
- ◯ more than EUR 50 million

22. In which industry does your company operate? *

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