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The role of trust in occupational safety: research results

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ABSTRACT

This article presents the concept and results of a study on the effects of organizational trust on the safety level in an enterprise. The research results presented provide valid and reliable statistical evidence that employees' trust in management is an important factor that significantly affects safety in a company. In particular, the research findings prove that employees' trust in management affects safety outcomes indirectly (full mediation), due to the improvement in their engagement in safety citizenship behaviour (SCB); but also that better engagement in SCB should directly or indirectly contribute to the reduction of accident event occurrence through improvement in employees' health and safety (H&S) regulation compliance (partial mediation). Moreover, the research findings prove that improvement in perceived management commitment in H&S will additionally strengthen positive relationships between trust in management and SCB engagement (interaction effect).

KEYWORDS

organizational trust; trust; safety; occupational safety; safety outcomes; accidents at work; compliance; management commitment

1. Introduction

1.1. Trust – the essential attribute of contemporary workers

Employees' trust in their superior is an extremely important ingredient for the success of an organization operating in today's world, especially useful for performing tasks requiring cooperation [1–3]. The specific nature of today's professional work entails that most employees, while carrying out work-related tasks, sooner rather than later encounter a situation of interdependence. In this situation, individuals are unable to achieve the goal on their own, without collaboration with others, because of the inevitability to rely on each other's performance or resources. The situation of interdependence occurs regardless of the organizational structure and arises both during cooperation on the same organizational level and when subordinates carry out the supervisor's instructions. In these types of situation, interdependent workers, in order to achieve their goals, are forced to voluntarily accept vulnerability to possible loss that may arise if the trustee unexpectedly acts with negative intent and harms the trustor in some way [4]. It is this readiness to accept sensitivity to the risk of harm that is indicated in the literature as a key element of trust [4–7].

Trust, which is so essential for the realization of work-related tasks, is becoming an even more important attribute of today's employees. Large-scale social processes (e.g., globalization) and technological progress (e.g., the scientific and technological revolution) have resulted in changes of contemporary working conditions. As a result, today's work is carried out in a complicated and less transparent social and organizational environment – in highly culturally diverse groups of co-workers, in new forms of work organization (e.g., crowdsourcing, platform economy) and with the use of increasingly more sophisticated technology. In these types of working conditions, doubts about key elements enabling cooperation, such as differences in perception of obligations related to their professional roles, are on the rise among employees [8,9]. As a result, the individual's uncertainty towards the attitudes, intentions and actions of colleagues increases. These changes have made trust essential for modern work execution.

In occupational safety, trust is also an important factor that has been increasingly recognized by researchers and safety practitioners. In safety management, there is currently a strong shift away from the traditional approach that narrowly focused on technical factors such as equipment design, towards increasing efforts to improve voluntary, proactive employee behaviours on safety issues. Moreover, most of the modern methods and concepts of occupational safety and health (OSH) management emphasize the need to encourage employees to cooperate. The concept of safety culture, transformational leadership and the new ISO Standard No. 45001 OHS Management Systems, just to mention the most significant, all emphasize the need to encourage employees to cooperate and to consider their needs when planning activities. The concept of safety culture, which is well established in the literature, is clearly related to the idea of trust. As, according to the theory, it is trust that forms the basis of a just culture and a reporting culture, on whose existence the third element of safety culture, knowledge-based culture, depends. It seems to be clear in the literature on the subject that trust of employees is one of the key factors influencing their proactive engagement in safety issues.

The research results presented in this article confirm that trust in management is a very important factor significantly affecting the safety level, as it contributes to a reduction in accident events through improvement in safety-oriented voluntary behaviours and their health and safety (H&S) regulation compliance.

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2. Materials and methods

2.1. Theoretical framework

2.1.1. Applied definition of trust

Trust can be defined as an emotional state involving readiness [7] to accept vulnerability to possible loss that may arise if the trustee unexpectedly acts with negative intent and harms the trustor in some way [4,10]. The trustor agrees to this risky dependence, but only under certain circumstances, in which the person who trusts believes that the partner of this relationship will not take action that could have negative consequences for the trusting person [5]. Those positive expectations of the trustee originate from a number of sources: on the one hand, from an assessment of the trustee's features, will and motives [5]; and, on the other, from the trustor's generalized assumptions about different groups, and his or her disposition to trust [10]. The acceptance of vulnerability means that the trustor has a sense of security resulting from a positive belief in the trustee's intentions, but at the same time is aware of possible negative consequences that may occur if the trustee behaves contrary to expectations.

It should be noted that there has been a wide discussion in the literature about the concept of distrust and its relationship with trust [11]. Some researches argued that trust and distrust are separate dimensions, as 'relationships are multifaceted or multiplex' [12, p. 442], and both trust and distrust can exist in the same relationship. Other researchers claimed that trust and distrust are the opposite ends of a single continuum [13]. Although both sides of the discussion have their reasons and even strong empirical evidence [14], in this study it was assumed that trust and distrust are the opposite ends of the same continuum, agreeing with Schoorman et al.'s [11] arguments that trust is willingness to take risk (i.e., be vulnerable) in a relationship, and that at the lowest level of trust one would take no risks at all, which means that the complete lack of trust and distrust are the same thing. Moreover the implication of the addition of ability to the antecedents of trust (in integrative model of trust) is that it creates trust as domain specific, which explains its multifaceted and multiplex relationship [11]. One can trust someone in certain aspects (i.e., medical doctor in medical matters) and not trust at all in another (i.e., in financial consulting), and the difference in the level of trust within the same relationship is a function of the different abilities across different domains [11].

2.1.2. Relationship between trust and safety behaviour

A theoretical explanation of a complex process of relationship between employees' trust in management and their engagement in safety behaviour can be given by social exchange theory [15] and the safety citizenship behaviour (SBC) concept [9,16].

In essence, social exchange theory describes how series of interactions between two parties (e.g., employees and management) can give rise to the reciprocal relationship that is based on a sense of obligation, which then leads to willingness to cooperate [17]. In this type of relationship based on generalized reciprocity, trusted partners do not negotiate every exchange of goods, so that their value for both sides of the relationship is equal (exchange 'something for something', as it is in the case of a relationship based on balanced reciprocity), but pass them each time when there is a need, because they are convinced that favours will be reciprocated in the future [10,15]. For example, when employers are perceived as 'caring for employees' because they improve work organization and social context (e.g., better working conditions, support and concern for employees' well-being), this certainly evokes a sense of gratitude among subordinates for a number of beneficial consequences [18–20]. Those 'favours' create a sense of obligation to reciprocate received benefits. As the relationship gets stronger due to mutual commitments, both of them begin to trust each other more that their previous 'favours' will be reciprocated in the future. Because the nature of return is diffused and cannot be bargained [15], the future obligation often extends to anticipated expectations of the other party, even if they were not clearly stated. In that case, when employees perceive that safety is an important value for the employer, they may display safety engagement behaviour as an act of reciprocation. This mechanism is based on a 'signalling perspective' [21].

The 'signalling perspective' explains how employees' trust in the management and their perception of management commitment to H&S influence employees' propensity to engage in safety-related behaviours. Based on the 'signalling perspective', when employees interpret organizational activities that support workers (e.g., training, working condition improvement) as long-term commitment, this leads directly to reciprocal acts of citizenship [22], both organizational and safety-related [23]. This is because employees who trust their managers feel the need to reciprocate the benefits they receive, preferably on an issue that is important to the trustee, so when they perceive that the trustee is highly committed in H&S, they are more likely to proactively engage in safety-related behaviours, because they perceive the safety as a matter that is important to the trustee. Therefore, according to the theory, management's commitment to safety is a moderating variable that strengthens the positive effect between the trust and safety-related behaviours. This is consistent with Hofmann et al.'s [9] study findings that leaders not only need to have an effective working relationship with their subordinates but also must create a climate within the team that emphasizes the importance of safety. An employee perception of management commitment in H&S is a potentially important variable for explaining the relationship between trust in management and safety level in the enterprise. As it is included in the theoretical model (Figure 1), it was considered as a variable that exerts an interactional effect, that will eventually strengthen the positive relationship between trust in management and SCB, rather than the direct impact.

SCBs are important participative work-group behaviours that create a work environment that supports and encourages proactive safety behaviours and ultimately prevents accidents [24]. SCB is a higher-order construct consisting of various kinds of self-initiative and participating behaviour of employees in improving safety [16]. SCB is a counterpart of safety compliance behaviour, which involves following rules and regulations, wearing protective clothing, etc. [16]. Quite the opposite, SCB is a construct related to whistleblowing on those who violate safety and to protecting co-workers from the consequences associated with accidents and unsafe situations at work and other voluntary safety behaviours, e.g., helping co-workers with safety, promoting safety programmes, demonstrating initiative, suggesting changes for improving safety [9,23–25]. SCB stems from organizational citizenship behaviour (OCB) and, similarly, refers to discretionary, extra-role and unrewarded employee activities that are essential

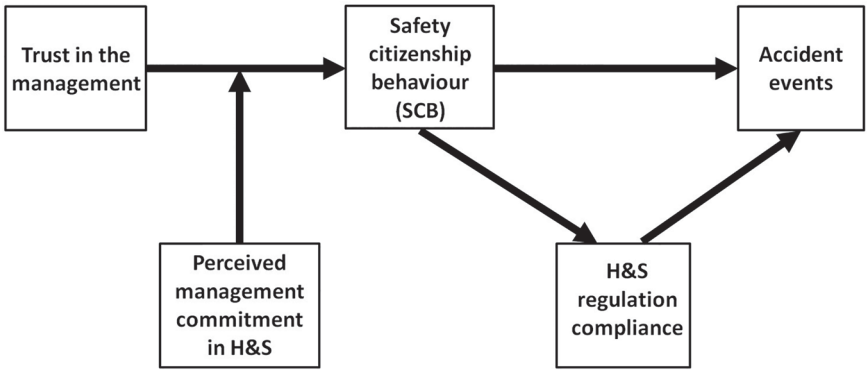

Figure 1. Theoretical model of the relationship between trust in management and safety level in an enterprise.
Note: H&S = health and safety; SCB = safety citizenship behaviour.

for the organization [23]. SCBs are equivalent to citizenship behaviours observed in organizations more generally, but they are directed towards safety issues specifically [16,24]. The concept of OCB and also SCB, drawn on social exchange theory, implies that employees may engage in discretionary and unrewarded activities as a reciprocal response to feeling cared for by an organization [16,26]. Employees who positively perceive organizational support are more likely to feel committed to their organization and engage in OCB/SCB [27]; therefore, improving organizational–employee relations is a potential motivating factor for employees to engage in participating and self-initiative safety activities. The study findings confirm that the organizational climate and quality of leader–member exchange (LMX) relationships interact and together exert an influence on the degree to which employees view citizenship behaviour as part of their formal role and to which they engage in citizenship behaviour [9]. To conclude, in the conducted study, SCBs were conceptualized as a product of social exchange.

There is also another side of trust that encourages employees to engage in safety initiatives. Employees' acts of proactive safety behaviour, e.g., reporting an error or near-miss to their supervisor, exposes them to the risk that the information will be used negatively (to discipline rather than promote learning). When doing so, employees allow themselves to be vulnerable, so employees who are willing to commit to this type of action have to trust their supervisors that they will similarly interpret the situation (as an opportunity to improve safety), rather than to discipline non-compliant workers [10].

However, as social exchange theory describes, trust is a reciprocal relationship, which means that each subsequent reciprocal commitment reinforces the trust of other side of the relationship. Therefore, this relationship consists of two sides: management's trust in employees and, conversely, employees' trust in management. However, due to the necessity of limiting the scope of the study, this study focused only on one side of this relationship, which is the trust of employees in the management.

Putting together the literature review findings and theoretical hypothesis discussed so far, one can compile a theoretical model explaining the considered impact of employees' trust in management on the safety level in an enterprise, which is presented in Figure 1.

2.2. The research method

2.2.1. Measuring employees' trust

The specific nature of trust – an ephemeral, difficult to determine, emotional state of which an individual does not always have to be aware – requires an appropriate approach to the study, especially when explored in the work environment. The research results prove trust can be both explicit and implicit [10]. Therefore, asking employees directly whether they trust their superiors does not guarantee reliable and accurate measurement. This is primarily because individuals do not fully realize their emotional states, as trust to managers may be an implicit or implicit concept, so differences in the self-awareness and understanding of trust among individual respondents may disrupt the measurement. The literature on the subject [10,13] indicates that the level of trust in an enterprise should be examined by analysing the sources on the basis of which the individual decides whether to take the risk and trust the person. These are the theoretical foundations of the concept of an integrative model of organizational trust [13,15–28], in which the following sources of trust can be identified:

- Disposition to trust (or propensity to trust) – a constant tendency of a person to trust other, unspecified members of society. It is rather a constant feature to voluntarily rely on others, not in the context of a specific situation but independent of the situation [13,29] and towards many people [30]. The level of this feature determines how much trust a given person will have before any information about the person's trustworthiness is received, the so-called blind trust or prejudice. Two trust subscales can be distinguished: generalized faith in humanity (assumptions) and trusting attitude (personal strategy) [31]. This is an inherent, relatively constant feature of the personality, only slightly changing during life.
- Generalized assumptions – the assumptions (subjective conclusions and convictions) made by the trustee towards members of various social groups, institutions and norms of behaviour [10], that are used to anticipate the actions and intentions of a potential trustee. These assumptions are formed as a result of an individual's life experience and the influence of culture [32].

- Trustworthiness – has the greatest influence on the decision whether or not to trust a particular person. It is a subjective assessment of credibility of a potential trustee in terms of its three characteristics [see 15,31]:
  - ability – the competences, features and skills of the trustee, limited to a specific field that is related to the subject of the case, e.g., in the area of safety and working conditions. It is a set of relevant abilities required to complete certain tasks, but also a trustor's belief that a potential trustee is able to use them properly.
  - benevolence – the perception of the trustee's concert in the trusting person's well-being and safety. It is a genuine, selfless, altruistic concern for other people that goes beyond cynical self-interest – beyond the particular interests and duties of the trustee [13]. The employers' benevolence results in putting the safety and well-being of employees over their own profit or the profit of the organization. Benevolent employers are more likely to share adverse information with employees (i.e., workplace hazards) and are more likely to take into consideration employees' views and encourage them to joint decision-making.
  - integrity – corresponds to trustee's openness, honesty and a strong sense of justice, and indicates the extent to which norms and values important for the good of the trusting person are also respected by the trustee [13]. It is the belief that the trustee shares the trustor's hierarchy of values and norms, which are not only jointly accepted but also, beyond the sphere of declarations, are also manifested in the form of practical actions. It also depends on the consistency of the trustee's previous actions, credible messages from others about the trustee or the belief that he or she has a strong sense of justice [13]. In the area of workplace safety, it indicates the degree to which the value of life and health has been internalized in the trustee's value system, i.e., it shows whether the trustee considers the employee's safety an important issue. The meta-analysis showed that integrity is the strongest predictor of employees' trust in management [29]. These conclusions were also confirmed by other studies [33,34].

The decision whether to trust a person is based on the function of these sources of trust and the significance of the outcome of misplaced trust. If an entity evaluates that the trustworthiness of a potential trustee, assessed on the basis of their ability, benevolence and integrity, indicates that the probability of their behaving as expected exceeds the size and probability of possible losses, then the risk of trust will be taken [13].

2.2.2. The research tool

2.2.2.1. Employees' trust. The measurement of employees' trust, used in a research tool (a questionnaire), was based on Mayer et al.'s [13] integrative model of organizational trust. The concept, explained in detail in the subsection 2.2.1, allows to measure trust as a multi-element construct consisting of five dimensions, defined by sources of trust. Each of the dimensions of trust was measured on the basis of separate subscales, consisting of several items (questions) taken from Schoorman et al.'s study [35], which were translated and adopted to the national language context. There were only some changes made, mainly due to linguistic differences, as two questions were deleted from the benevolence scale, 'Top management will go out of its way to help me' and 'My needs and desires are very important to top management', and one question was added to the propensity to trust scale, 'Nowadays, most people do not help others, but primarily look after their own interests'. In total, 28 questions were asked, using a 5-point Likert scale, to measure employees' trust in management. On this basis, five separate variables have been calculated, which together measure trust in a multidimensional perspective. However, the exploratory and confirmatory analyses, discussed in the following sections, have shown that not all of the used questions are reliable and valid enough, so the final model is calculated on the basis of a substantially reduced number of variables.

2.2.2.2. Safety citizenship behaviour. SCBs were measured similar to the Hofmann et al. [9] or Conchie et al. [10] studies, in which the measurement of SCB was mainly based on the concept of OCBs [36,37] and modified already existing citizenship scales in order to make them safety specific and adapt them to the specificity of the country. The scale items were taken from the literature on voluntary employees' safety behaviour [9,36–38] and subscales of a well-established Polish version of a safety culture questionnaire [39], which concerned employees' proactive, self initiative, extra-role behaviours towards health and safety (H&S) at work and their willingness or intention to look out for the safety of others. Finally, four scales reflecting whistleblowing, conscientiousness, helping and organizational compliance were developed. The final version of the SCB subscales consists of 24 questions that have been subjected to the explanatory and confirmatory analyses, which substantially reduced the number of selected questions in the final model. A detailed description of the SCB's subscales is included in Appendix 1.

2.2.2.3. Level of safety in an enterprise. The level of safety in an enterprise was measured by its outcome indicator, which is the occurrence of accidents and incidents at work. The respondents were asked whether, over the last 3 years, they experienced any of the following events at work: accident that resulted in absence from work; accident that caused injury but did not result in work incapacity; or dangerous occurrence where there was a high risk of serious injury, although no injury occurred. Then, after analysing the results, the items were recoded into two variables: number of injuries at work regardless of whether they cause work absenteeism or not; and number of incidents at work were there was a high probability of the injury causing absenteeism.

2.2.2.4. H&S regulation compliance. In the conducted research, H&S regulation compliance was also studied as one of the main mediating variables that exert potential impact on accident occurrence. This was measured by asking two questions about regulation avoidance: 'Sometimes I avoid health and safety regulations, especially when I perform work that I know very well' and 'Sometimes I skip the health and safety regulations to get work done faster'.

2.2.2.5. Management commitment in H&S. An employee perception of management commitment in H&S was measured by 25 questions, based on safety culture questionnaire [39] subscales that relate to management commitment and participation and the importance of safety value for them. In the analysis of the results, the questions were subjected to

factor analysis that greatly reduced their number. Finally, only eight questions were considered to be significant and were used in the analysis as interaction terms. The final questions used can be divided into three subscales: general attitudes of management to H&S regulation compliance; motivating employees to participate and engage in safety activities; and importance of safety value in the enterprise.

The list of items that were used in the final measurement model is presented in Table 2, in which the items of each scale (observed variables measuring subsequent latent constructs) are listed in the rows and latent variables (unobserved constructs) are listed in the column heads.

2.2.3. The study: sample, data screening

On the basis of the developed questionnaire, a survey was carried out among 883 workers employed in industrial enterprises in Poland, carrying out activities of various types but excluding office work. The study was carried out by an external research company, and the participants were selected with purposive sampling (selective, on subjective judgement), based on availability and to ensure diversity of company sizes, economic profiles and level of safety. The study was conducted in accordance with the Polish requirements regarding ethical guidelines. All study participants were informed about the purpose of the study and the anonymity of the results and agreed to participate.

Some observations contained missing values ($< 5\%$ of sample size on a single value). Single missing values were imputed with the median value of all questions in a subscale. Observations with a greater number of missing values were deleted. Observations with a large number of the same answers, also on reversed-scale questions, were identified and removed. After the data screening procedures, the sample was limited to 831 observations, which did not contain any missing data or outliers.

A multivariate test was conducted after the measurement model. The variance inflation factor (VIF) for all of the exogenous variables was tested simultaneously. The VIFs for all variables were < 2.0, indicating that the exogenous variables are all distinct.

3. Results

3.1. Exploratory factor analysis

Even though the tested model was largely based on previously developed and empirically confirmed models, exploratory factor analysis (EFA) was carried out as part of the analysis – not to identify variables but to validate whether all of the observed variables were loaded together as expected in theory and to investigate the internal structure of a well-established part of new multidimensional model.

The EFA was conducted using maximum likelihood with promax rotation (due to the dataset size) to validate whether the observed variables were loaded together as expected, adequately correlated and met the criteria of reliability and validity. The analysis allowed to identify an 11-factor model presented in the following pattern matrix:

- Adequacy
  - The Kaiser–Meyer–Olkin (KMO) value (0.912) and Bartlett's test for sampling adequacy were significant ($p < 0.001$) and the communalities for each variable were sufficiently high (all > 0.300 and most of them > 0.600). The reproduced matrix had only 1% of non-redundant residuals > 0.05, indicating that the chosen variables adequately correlated for a factor analysis. The performed tests and analysis confirmed the adequacy of the variables of the 11-factor model.
- Reliability
  - For most of the extracted factors, Cronbach's α values largely exceed the expected minimum (> 0.70), except for 'Disposition to trust' which was 0.59 (Table 1).
- Validity
  - All model factors demonstrate sufficient convergent validity (Table 2), as their loadings were all above the recommended minimum threshold of 0.30, for a sample size of more than 350 [40]. High correlations between the factors constituted a major impediment and caused many variables to be excluded from the analysis. Finally, the factors demonstrate sufficient discriminant validity, as the correlation matrix shows no correlations > 0.70, as well as no problematic cross-loadings. However, many factors still had high correlation (> 0.6), and this issue was further tackled within the next stage of the analysis, in confirmatory factor analysis (CFA), by composing second-order and third-order factors. The 11-factor model had a sufficient total variance explained of $> 61\%$, while five extracted factors had eigenvalues < 1.0.

Table 1. Model factors: Cronbach's α values.

Factor label	Cronbach's α
Disposition to trust (trust)	0.59
Ability (trust)	0.90
Integrity (trust)	0.88
Benevolence (trust)	0.81
Generalized assumptions (trust)	0.82
Conscientiousness (SCB)	0.85
Helping (SCB)	0.86
Whistleblowing (SCB)	0.87
Organizational compliance (SCB)	0.75
H&S regulation compliance	0.78
Accident events	0.83

Note: H&S = health and safety; SCB = safety citizenship behaviour.

The EFA analysis confirmed that the 11-factor model met the criteria of adequacy, reliability and validity.

3.2. Confirmatory factor analysis

The CFA was conducted twice, before and after introducing second-order and third-order factors, as well as a common latent factor (CLF). This approach allows researchers to confirm that the core of the measurement model and also its final form are both reliable, valid and fit with the data.

3.2.1. CFA of the first-order factor measurement model

- Model fit
  - Due to poor loading, indicator oc3 was removed. Factor loading of indicator bt3 increased to an appropriate level and did not require removal. Modification indices did not suggest any changes that would significantly improve the model. The goodness of fit for measurement model

Table 2. Factor analysis pattern matrix.

Pattern matrix

	Latent variable										
Observed varable (item)	Ability (trust-worthiness)	Whistleblowing (SCB)	Conscientiousness (SCB)	Helping (SCB)	Generalized assumptions	Accident events	H&S regulation compliance	Organizational compliance (SCB)	Benevolence (trustworthiness)	Disposition to trust	Integrity (trust-worthiness)
at1	0.945	–	–	–	–	–	–	–	–	–	–
at2	0.853	–	–	–	–	–	–	–	–	–	–
at3	0.838	–	–	–	–	–	–	–	–	–	–
at4	0.669	–	–	–	–	–	–	–	–	–	–
at5	0.637	–	–	–	–	–	–	–	–	–	–
wb1	–	0.829	–	–	–	–	–	–	–	–	–
wb2	–	0.811	–	–	–	–	–	–	–	–	–
wb3	–	0.732	–	–	–	–	–	–	–	–	–
wb4	–	0.728	–	–	–	–	–	–	–	–	–
wb5	–	0.681	–	–	–	–	–	–	–	–	–
wb6	–	0.614	–	–	–	–	–	–	–	–	–
cs1	–	–	0.871	–	–	–	–	–	–	–	–
cs2	–	–	0.868	–	–	–	–	–	–	–	–
cs3	–	–	0.722	–	–	–	–	–	–	–	–
cs4	–	–	0.335	–	–	–	–	–	–	–	–
hp1	–	–	–	0.863	–	–	–	–	–	–	–
hp2	–	–	–	0.814	–	–	–	–	–	–	–
hp3	–	–	–	0.742	–	–	–	–	–	–	–
sg1	–	–	–	–	0.860	–	–	–	–	–	–
sg2	–	–	–	–	0.860	–	–	–	–	–	–
sg3	–	–	–	–	0.625	–	–	–	–	–	–
ae1	–	–	–	–	–	0.863	–	–	–	–	–
ae2	–	–	–	–	–	0.820	–	–	–	–	–

(*continued*)

Table 2. Continued.

Pattern matrix

Observed varable (item)	Latent variable										
	Ability (trust-worthiness)	Whistleblowing (SCB)	Conscientiousness (SCB)	Helping (SCB)	Generalized assumptions	Accident events	H&S regulation compliance	Organizational compliance (SCB)	Benevolence (trustworthiness)	Disposition to trust	Integrity (trust-worthiness)
hsr1	–	–	–	–	–	–	0.980	–	–	–	–
hsr2	–	–	–	–	–	–	0.604	–	–	–	–
oc1	–	–	–	–	–	–	–	0.823	–	–	–
oc2	–	–	–	–	–	–	–	0.714	–	–	–
oc3	–	–	–	–	–	–	–	0.382	–	–	–
bt1	–	–	–	–	–	–	–	–	0.810	–	–
bt2	–	–	–	–	–	–	–	–	0.733	–	–
bt3	–	–	–	–	–	–	–	–	0.382	–	–
dt1	–	–	–	–	–	–	–	–	–	0.612	–
dt2	–	–	–	–	–	–	–	–	–	0.593	–
dt3	–	–	–	–	–	–	–	–	–	0.474	–
it1	–	–	–	–	–	–	–	–	–	–	0.786
it2	–	–	–	–	–	–	–	–	–	–	0.708

Extraction method: maximum likelihood estimation

Rotation method: promax with Kaiser normalization

Note: at1, … , it2 are items in subsequent scales: at1–at5 = ability (trustworthiness); it1–it2 = integrity (trustworthiness). H&S = health and safety; SCB = safety citizenship behaviour.

Table 3. Goodness-of-fit measures for the first-order factor measurement model.

Metric	Observed value	Recommended value
CMIN / *df*	2.33	Between 1 and 3
CFI	0.95	> 0.95
rmsea	0.04	> 0.06
PCLOSE	1	> 0.05
NFI	0.92	> 0.90

Note: CFI = comparative fit index; CMIN / *df* = minimum sample of discrepancy divided by degrees of freedom; PCLOSE = p-value for a test of close fit; NFI = normed fit index; rmsea = root mean square error of approximation.

sufficiently met the required criteria (metrics presented in Table 3).

- Validity and reliability
  - To test the convergent validity, the average variance extracted (AVE) was calculated. For all factors the AVE was > 0.50, except for 'Disposition to trust' which obtained a very low value of 0.32. However, as this factor is one of the five indicators of an unobserved third-order factor of trust and, according to theory [10], not the most important in examining trust of a long-term relationship of experienced employees and well-known management, it was decided not to remove it at this level of analysis.
  - To test the discriminant validity, the square root of the AVE (on the diagonal in the matrix presented in Table 4) was compared to all inter-factor correlations (below the diagonal in the matrix presented in Table 4) and maximum shared variance (MSV). All factors demonstrated adequate discriminant validity as the diagonal values had greater values than the inter-factor correlations, and all MSV values were smaller than the AVE.
  - The composite reliability (CR) for each factor was also tested. For all factors, the CR was above the expected minimum value of 0.70 (Table 4), indicating that computed factors are reliable, again with the exception of 'Disposition to trust' factor which was < 0.6.

3.2.2. Common method bias

Because all of the data were collected in a single questionnaire survey and examined variables were highly correlated, it was necessary to determine whether the obtained results were affected by a common method bias (CMB). To verify this, a CMB test was conducted by adding the CLF to every observed variable and running the χ^2 differences test between the unconstrained model and the model where all paths of CLF were constrained to zero. The test allowed to indicate that the shared variance of observed variables is significantly different from zero, $\chi^2(35) = 277.5, p < 0.001$, and therefore the data were affected by CMB. As the CR and AVE for each construct kept the minimum thresholds, it proved to be necessary to retain the CLF for the structural model (by imputing factor scores in AMOS 27 with the CLF present) and thus obtain CMB-adjusted values.

3.2.3. Second-order and third-order factors

As is indicated in theory, the studied phenomena highly correlate, as they are individual dimensions of a higher-order construct of trust or SCB. Although a lot of work has been done to counteract inter-correlation by careful selection of included variables in EFA, the correlation of particular components of higher-latent constructs still biased the computed results. As it turned out, it was inevitable to construct second-order and even third-order factors in a measurement model. The model developed on the basis of multilevel factors consisted of four latent constructs (Table 5): one third-order factor 'Trust in management', which in turn was computed on the basis of one second-order factor 'Trustworthiness' and the two first-order factors 'Disposition to trust' and 'Social groups and institutions'; one second-order factor SCB, computed by measuring four first-order factors; and the two first-order factors 'H&S regulations compliance' and 'Accident events'.

3.2.4. CFA of the multi-order CMB-adjusted measurement model

The multi-order CMB-adjusted measurement model was significantly more reliable, valid and better fit with the data:

- Model fit
  - The goodness of fit improved significantly and exceeded the required criteria (metrics presented in Table 6).
- Validity and reliability
  - The convergent together with discriminant validity as well as the CR of the model were tested in the same way as previously. The tests conducted indicated no validity or reliability concerns, as all metrics were above expected thresholds (Table 7).

3.3. The structural model

3.3.1. Hypotheses

The structural model was constructed on the basis of a theoretical model (Figure 1) consisting of four mediations and one interaction effect:

- Mediation hypotheses
  - SCB mediates a positive relationship between trust in management and H&S regulation compliance.
  - H&S regulations compliance partially mediates negative relationship between SCB and accident events.
  - SCB mediates negative relationship between trust in management and accident events.
  - SCB and H&S regulations compliance mediates negative relationship between trust in management and accident events (serial mediation).
- Interaction hypotheses
  - An increase in perceived management commitment in H&S will strengthen a positive relationship between trust in management and SCB.
- Model components
  - Composite variables were created using factor score imputation in AMOS while the CLF was present.
  - Interaction terms were created by standardizing and multiplying the relevant independent variables (perceived management commitment in H&S and trust in management).

3.3.2. Hypothesis testing

3.3.2.1. Mediation. Based on the theoretical model, in which the potential partial and full mediations were present, the direct and indirect effects were analysed. Mediations were tested using 2000 bias-corrected bootstrapping resamples in AMOS. The results are summarized in Table 8. All mediation hypotheses were confirmed.

Table 4. Validity and reliability metrics.

Model factor	CR	AVE	MSV	1	2	3	4	5	6	7	8	9	10	11
1. Organizational compliance (SCB)	0.752	0.604	0.473	**0.777**	–	–	–	–	–	–	–	–	–	–
2. H&S regulation compliance	0.780	0.639	0.203	0.451	**0.800**	–	–	–	–	–	–	–	–	–
3. Accident events	0.842	0.729	0.039	−0.051	−0.115	**0.854**	–	–	–	–	–	–	–	–
4. Disposition to trust	0.587	0.324	0.242	0.282	0.069	−0.051	**0.569**	–	–	–	–	–	–	–
5. Integrity (trustworthiness)	0.888	0.799	0.524	0.305	0.146	−0.097	0.491	**0.894**	–	–	–	–	–	–
6. Benevolence (trustworthiness)	0.821	0.609	0.511	0.316	0.137	−0.099	0.441	0.696	**0.781**	–	–	–	–	–
7. Generalized assumptions	0.830	0.623	0.234	0.356	0.307	−0.197	0.198	0.375	0.484	**0.790**	–	–	–	–
8. Conscientiousness (SCB)	0.854	0.597	0.473	0.688	0.296	−0.111	0.269	0.289	0.324	0.451	**0.772**	–	–	–
9. Helping (SCB)	0.856	0.665	0.448	0.535	0.229	−0.133	0.334	0.345	0.336	0.479	0.669	**0.815**	–	–
10. Whistleblowing (SCB)	0.873	0.536	0.329	0.536	0.438	−0.147	0.208	0.157	0.248	0.453	0.574	0.445	**0.732**	–
11. Ability (trustworthiness)	0.896	0.634	0.524	0.410	0.233	−0.108	0.492	0.724	0.715	0.460	0.445	0.427	0.267	**0.796**

Note: AVE = average variance extracted; CR = composite reliability; H&S = health and safety; MSV = maximum shared variance; SCB = safety citizenship behaviour, the values in bold represent the square root of the average variance extracted (AVE).

Table 5. Multi-order latent factors pattern matrix.

Third-order factors	Second-order factors	First-order factors
Trust inmanagement	Trustworthiness	Ability
		Integrity
		Benevolence
		Disposition to trust
		Generalized assumptions
	Safety citizenship behaviour (SCB)	Conscientiousness
		Helping
		Whistleblowing
		Organizational compliance
		H&S regulation compliance
		Accident events

Note: H&S = health and safety.

Table 6. Goodness-of-fit measures for the multi-order CMB-adjusted measurement model.

Metric	Observed value	Recommended value
CMIN / *df*	2.077	Between 1 and 3
CFI	0.963	> 0.95
rmsea	0.036	> 0.06
PCLOSE	1	> 0.05
NFI	0.931	> 0.90

Note: CMB = common method bias; CFI = comparative fit index; CMIN / *df* = minimum sample of discrepancy divided by degrees of freedom; PCLOSE = p-value for a test of close fit; NFI = normed fit index; rmsea = root mean square error of approximation.

First, it has been statistically confirmed that SCB provides a full mediation effect of a positive relationship between trust in management and H&S regulation compliance. Therefore, the effect of the trust of employees on their regulation compliance is fully explained by the intervention caused by SCB as a mediator in that process. The mediation effect is statistically significant and its power should be interpreted as close to large (Table 8).

Other mediation effects provided by the theoretical model were statistically confirmed as partial mediations. This is due to the fact that the mediation variable 'H&S regulation compliance' in many cases can intervene in the process, but in some parts of the relationship the link just goes directly to accident events, without participation of a mediator. All partial mediation effects proved to be statistically significant and had enough power, but their effect size should be statistically interpreted as rather small. However, considering that the incidence rate for Poland is about 5–6 per 1000 workers [41], the obtained results, based on a sample size of 883, should be interpreted as clear evidence of a rather strong relationship.

3.3.2.2. Interaction. The conducted analysis confirmed that there is a statistically significant interaction effect of IVs (Table 8). As shown in Figure 2, interpretation of the interaction effect can be as follows: when management is trusted by employees and also perceived as committed to H&S issues, then employees are more likely to engage in SCB, compared with the situation where entrusted management is not committed or committed management is not trusted. In other words, perceived management commitment in H&S will strengthen the positive relationship between trust in management and SCB.

In order to measure the magnitude of interaction, the f^2 effect size was calculated [42]. Based on the research practice and a more realistic standard for effect size interpretation [43,44], the obtained interaction effect size (0.009) should be interpreted as medium. The model fit did not change significantly for the final moderated model and should be evaluated as very well fit with the data (Table 9).

3.3.3. The model fit

The model in its final form fits the data more than very well, as the goodness of fit measures largely exceeds the required thresholds (Table 9). An almost perfect data fit was not disturbed by the inclusion of mediation and interaction effects.

4. Discussion

The main result of the presented research is that trust in management is an important factor that significantly affects the

Table 7. Validity and reliability metrics.

	CR	AVE	MSV	1	2	3	4
1. SCB	0.807	0.516	0.430	**0.719**	–	–	–
2. H&S regulation compliance	0.744	0.593	0.122	0.349	**0.770**	–	–
3. Trust in management	0.755	0.516	0.430	0.656	0.239	**0.718**	–
4. Accident events	0.837	0.721	0.031	−0.176	−0.120	−0.177	**0.849**

Note: AVE = average variance extracted; CR = composite reliability; H&S = health and safety; MSV = maximum shared variance; SCB = safety citizenship behaviour, the values in bold represent the square root of the average variance extracted (AVE).

Table 8. Hypothesis summary.

Hypothesis	Statistical evidence	Type of relationship
Mediation		
SCB mediates a positive relationship between trust in management and H&S regulation compliance	Direct β without mediator: 0.29∗∗∗ Direct β with mediator: −0.05 (*ns*) Indirect β: 0.23∗∗	Full mediation
H&S regulation compliance partially mediates a negative relationship between SCB and accident events	Direct β without mediator: −0.29∗∗∗ Direct β with mediator: −0.19∗∗ Indirect β: −0.03∗	Partial mediation
SCB mediates a negative relationship between trust in management and accident events	Direct β without mediator: −0.21∗∗∗ Direct β with mediator: −0.12∗ Indirect β: −0.1∗∗	Partial mediation
SCB and H&S regulation compliance mediate a negative relationship between trust in management and accident events (serial mediation)	Direct β without mediator: −0.21∗∗∗ Direct β with mediator: −0.12∗ Indirect β: −0.02∗	Partial mediation
Interaction		
An increase in perceived management commitment in H&S will strengthen a positive relationship between trust in management and SCB	Interaction effect (β): 0.051∗	Strengthen the positive effect

∗Statistically significant at $p \leq 0.05$.
∗∗Statistically significant at $p \leq 0.01$.
∗∗∗Statistically significant at $p \leq 0.001$.
Note: H&S = health and safety; SCB = safety citizenship behaviour.

level of safety in an enterprise. The conducted research has shown that employees' trust in management affects safety outcomes (reduction of accident event occurrence) indirectly, due to improvement in employees' engagement in proactive, social citizenship behaviour and through improvement in their H&S regulation compliance. Moreover, it was proved that perceived management commitment in H&S will additionally strengthen the positive relationship between trust in management and SCB (through the identified interaction effect).

These results are consistent with other studies findings, as according to many researchers the impact of trust on occupational safety primarily manifests through increased involvement of employees in the area of occupational H&S [10,15,16]. Research results have shows that when subordinates

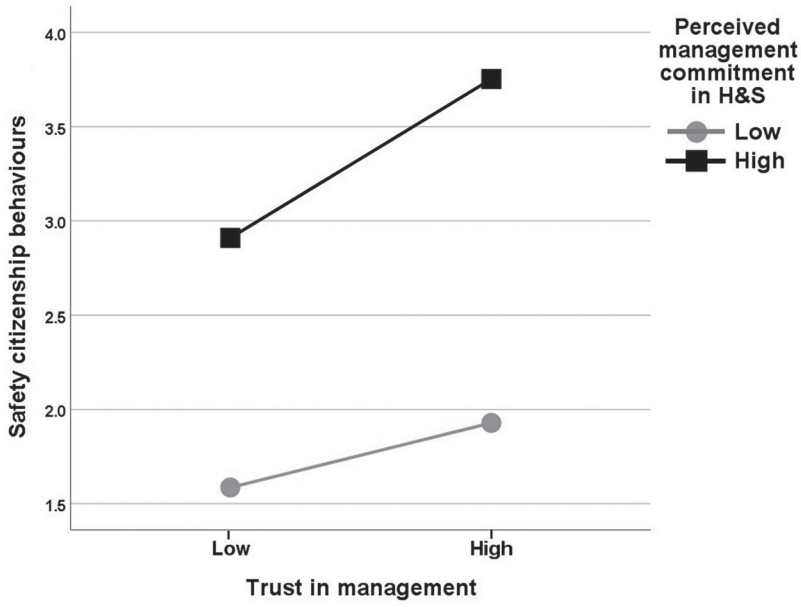

Figure 2. Interaction effect of perceived management commitment in H&S on the relationship between trust in management and SCB (levels selected according to standard deviation).
Notes: H&S = health and safety; SCB = safety citizenship behaviour.

Table 9. Goodness-of-fit measures for the final form structural model.

Metric	Observed value	Recommended value
CMIN / *df*	1.613	Between 1 and 3
CFI	0.998	> 0.95
rmsea	0.027	> 0.06
PCLOSE	0.854	> 0.05
NFI	0.995	> 0.90

Note: CFI = comparative fit index; CMIN / *df* = minimum sample of discrepancy divided by degrees of freedom; PCLOSE = p-value for a test of close fit; NFI = normed fit index; rmsea = root mean square error of approximation.

trust their supervisors and managers, they exhibiting more positive safety behaviours, e.g., reporting near misses and challenging unsafe acts, resulting in fewer occupational injuries and better organizational safety performance [45]. Many studies have shown that high trust of employees in management correlates with increased readiness to follow orders from their superiors and greater willingness to take self-initiatives by employees [45–47]. In addition, according to study results, organizational trust has an impact on broader working conditions and organizational outcomes, that have also an indirect influence on safety at work, e.g., increased job satisfaction, productivity and performance, as well as decreased absenteeism and turnover [48–52].

As discussed in the Introduction, these results are also consistent with the modern approach to occupational safety and literature on the subject, since most of the modern methods and concepts of OSH management place strong emphasis to improve employee behaviour in complying with safety rules and regulations [53] and encouraging employees to be proactive in dealing with safety issues [16], by engaging in SCBs. First, the concept of safety culture, which is well established in the literature on the subject, is clearly related to the idea of trust. It is argued and empirically proven that trust plays a central role in models of safety culture, as Reason [54,55] suggested, and Burns et al. [14] provided strong empirical evidence that trust may be a key element in integrating all subcomponents of safety culture – a reporting culture, a just culture and a learning culture – into an effective safety culture. According to many researchers, the impact of trust primarily manifests through increased involvement of employees in the area of occupational H&S [10], which strengthens the positive impact of safety culture [10,15,16]. In addition, research results show that transformational leadership, which is another example of modern safety management approach, also has a stronger effect when employees have high trust in their superiors [56–58]. Finally, the new ISO Standard No. 45001:2018 OHS Management Systems [59] strongly emphasize the need to encourage employees to cooperate and to consider their needs when planning activities. Moreover the standard guidelines clearly emphasize that active employees' participation and communication based on mutual trust is one of the basic conditions for achieving the intended results [60].

A review of the literature on the subject indicates that employees' trust in management, which positively affects cooperation, may be a prerequisite for positive influence of the leadership and the safety climate, as well as other methods of OSH management that place great emphasis on encouraging employees to cooperate. However, the existence of the relationship between employees' trust in management and the level of safety in an enterprise, so clearly demonstrated in theoretical concepts, has so far not been clearly confirmed in extensive quantitative research and a multivariable, holistic model.

Although there are many positive effects of trust, it should be kept in mind that it may also be detrimental to safety [10]. First, some researchers point out that a certain degree of creative mistrust [61] is necessary to maintain the desired team alertness in order to identify emerging hazards. No less important is an adverse effect of the overconfidence that is often a precursor of a decision-making error, which is well known among accident investigators as captainitis [62]. Captainitis is a tendency of team members to quit their responsibilities when their acts or opinions are contrary to their superior's decisions, even when those decisions are clearly wrong and can cause catastrophic effects. Although captainitis results primarily not from trust but from power distance, it is a certain exemplification of a negative impact of too much subordination of employees to their superiors' orders.

The limitations of this study, first, relate to its fundamental issue, which is to examine employees' opinions on the trustworthiness of their management, in terms of their ability (qualifications), benevolence and integrity. Although for practical reasons the study was conducted in the workplace, appropriate efforts were made to assure employees of the full anonymity of the results. Even though there is some possibility that the answers were not completely honest, a thorough analysis of the results did not confirm the lack of reliability of the results. Another limitation of the study is related to the multitude of variables included in the model. Because the literature review indicated that the impact of employees' trust on safety is multidimensional and does not influence directly, but through indirect moderation effects (mediation and interaction) of other factors, the number of factors/variables included in the study was very large and the obtained statistical model is complicated. Including such a large number of variables in the study, while maintaining an appropriate response rate, required limiting the number of questions in the subsequent scales to the necessary minimum only. For this reason, the study results certainly require further exploration and confirmation, in future research that will be conducted with a more specific approach. The final limitation of the study is the number of companies that participated in the study. Increasing this number and diversifying their economic activities in future replications of the study should validate the results.

5. Conclusion

Trust in the enterprise is an important organizational resource, especially useful for performing tasks requiring cooperation. But even more important is its potential effect on the safety level in a company. The results of the research presented in this article confirm that trust in management is a particularly important factor significantly affecting the level of safety at work. As full mediation has been statistically confirmed, it is now known that employees' trust in management affects safety outcomes indirectly, due to improvement in their engagement in proactive, social citizenship behaviour. The research findings also prove that better engagement in SCB, in the end, should directly contribute to the reduction of accident event occurrence, although, in some cases, SCB can affect accidents indirectly, through improvement in employees' H&S regulation compliance (the effect of confirmed partial mediation).

Moreover, employees' evaluation of management commitment to H&S issues also proved to be an important factor affecting the relationship between trust and engagement in SCB through an interaction effect. Statistical analysis confirmed that improvement in perceived management commitment in H&S will additionally strengthen the positive relationship between trust in management and SCB engagement.

The results of the research presented in the article provide statically confirmed evidence that employees' trust in management is a particularly important factor that significantly affects safety in a company. A trusted management that is also committed to H&S should benefit from a proactive attitude of employees who willingly engage in SCB, comply with H&S regulations and, in the end, should be less prone to accident event occurrence.

The results also present evidence that the adopted research methodology is appropriate to examine organizational trust in its workplace safety context, even despite the specifically ephemeral and difficult to determine nature of the trust. Despite the many difficulties discussed in the article in examining the trust of employees in their management, the research tool provided valid and reliable results, enabling to develop a statistical model that is significant, very well fit to the data and provides clear interpretation of the studied phenomenon.

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Appendix 1

Safety citizenship behaviour used in the study and an abbreviated and translated version of used items:

Whistleblowing: reporting and monitoring of other team members' unsafe behaviour and potential safety violations. Explaining to other members that safety violations will be reported. Reminding others to follow safe working procedures and that violations of these procedures are not tolerated [9].

Abbreviated and translated version of items: reacting if colleagues do not use or use incorrectly personal protective equipment (PPE); reacting if colleagues use inappropriate or damaged tools or machines; reacting if there are unnecessary objects in the workspace; reacting if colleagues do not comply with the instruction; reacting when colleagues act with bravado (bold, risky behaviours); reacting if co-workers work intoxicated.

Conscientiousness: going 'far beyond the minimum necessary' on job role requirements [32]. It was assumed that it is a sense of responsibility for the well-being of colleagues, customers and workplace. Feeling of obligation to ensure that others are safe from safety hazards, injuries and risky situations.

Abbreviated and translated version of items: feeling responsible for safety in an enterprise; feeling responsible for safety of customers and visitors; feeling responsible for safety of co-workers; knowing what are the hazards in the workplace; knowing the company benefits from working safely; knowing how to behave in the case of an accident; reporting hazards perceived in the workplace; involvement in various activities improving health and safety in an enterprise.

Helping: all discretionary types of behaviour aimed at helping a specific individual in the organization (e.g., a co-worker, supervisor, customer) with a work-related task or safety issue [32,33]; helping create a bond with the organizations' members.

Abbreviated and translated version of items: volunteering for safety committees; helping others in safety procedures; help and support from other employees on safety issues; importance of employee safety and health in the enterprise; feeling of connection to the work group; concern for the individual safety of the employee by his/her colleagues.

Organizational compliance: self-disciplined types of behaviour with regard to organizational rules; they are different to rule and regulation compliance, as they do not simply imply an obedience to the everyday rules but the overall adherence to the organization's general vision and policy [33]. It was assumed that this category also includes courtesy behaviour [33], which can be defined as consideration of the interests of those parties whose work would be affected by one's decisions or actions (e.g., leaving a place in a better condition than it was in when you came).

Abbreviated and translated version of items: compliance with health and safety regulations; checking the technical condition of the tools and devices before work; using recommended PPE; bringing to the right place tools left by another employee; reporting to the supervisor the poor technical condition of tools (devices, machines) that may pose a threat to safety.