



# The contingent effect of job automating technology awareness on perceived job insecurity: Exploring the moderating role of organizational culture



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## ABSTRACT

This study empirically investigates the contingent effect of STARA (Smart Technology, Artificial Intelligence Robotics and Algorithms) awareness on perceived job insecurity for employees working in industries that are expected to face high degrees of automation. More specifically we empirically investigate the moderating role of learning culture and authoritative culture on the relationship between STARA awareness and job insecurity, among 291 individuals. Our findings show a significant positive relationship between STARA awareness and perceived job insecurity. An authoritarian organizational culture further enhances the effects of STARA awareness on perceived job insecurity. Contrary to expectations, the moderating effect of retraining expectations was not statistically supported.

## 1. Introduction

Digital technologies have led to organizational and societal transformations at an accelerating rate during the past few decades (Lee, 2009). Technology trends such as mobile computing, 4G, Cloud computing, internet of things, big data, and robotics have enabled new ways of work (remote, virtual), affecting entrepreneurship (Elia et al., 2020; Rippa and Secundo, 2019) and facilitating the virtual organization (Mowshowitz, 2002). Recently, a new wave of technologies such as A.I. and Robotics are promising further revolutions in production, forecasting, customer service and more (Makridakis, 2017). Scholars have been closely monitoring these technological evolutions and their wider organizational and societal implications (e.g. Hidalgo et al., 2020; Marletto, 2019; Fritschy and Spinler, 2019; Campa et al., 2019).

Automation is defined as the technology by which a process or procedure is performed with minimum human assistance (Groover, 2014). Technologies capable of automation are summarized by Brougham and Haar (2018) in the acronym STARA (Smart Technology, Artificial Intelligence, Robotics and Algorithms). STARA technologies are currently dividing the opinions of policymakers, economists and the general public (e.g. Bort, 2014; Ford, 2016; Hawking, 2016; Korinek and Stiglitz, 2017; World Economic Forum, 2018). Points of discussion are how major automation by STARA technologies could impact jobs and industries, the distribution of wealth, and the rate of unemployment. In an early study, Frey and

Osborne (2013) argue that 47% of current job occupations in the UK are at risk for job automation. In line with Frey and Osborne (2013), Manyika et al. (2017) reported that 60% of the current occupations are for at least one-third automatable. The early results of Frey and Osborne's (2013) research intrigued further research in the area (e.g. Dengler and Matthes, 2018; Lee, 2016; Nedelkoska and Quintini, 2018).

Job automation is a very pressing challenge for our economic and social environment, however, very little research has been done on the relationship between this changing socio-technological environment and perceived job insecurity (Nam, 2019). What is more, recent research found contradicting evidence on the relationship between expected technological change and job insecurity. According to existing theory-based research, anticipated organizational changes are an antecedent of job insecurity (Ashford et al., 1989). As STARA technologies are expected to revolutionize the nature of work across industries, STARA aware employees would be expected to experience threat in the face of these technologies' arrival. However, while Brougham and Haar (2018) found that STARA aware employees experience less organizational commitment and career satisfaction, increased turnover intentions, depression and cynicism, they did not find any evidence of higher job insecurity. Smith (2016) found similar results; 65% of Americans expect that within the next 50 years robots will do much of the current work, but only 18% of the Americans believe that their current profession will cease to exist within the next 50 years. In other words, job automation does not seem to increase due to

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perceived job insecurity.

These early unexpected findings seem to indicate the existence of potential contingent effects and other factors that could be shaping the effect of STARA awareness on job insecurity, urging us to further explore the phenomenon. This study focuses on a set of such organization-based moderators. Uncovering such contingent effects might help work organizations better manage the negative effect of STARA technologies on their employees' feelings of insecurity and the negative outcomes that such feelings have on their performance.

More specifically, we hypothesize that an organization could use restorative strategies for decreasing perceived job insecurity (Kinnunen et al., 2000). With restorative strategies, Kinnunen et al. (2000) refer to shaping the organizational culture in such a way that it promotes employees' contributions and organizational effectiveness by restoring job insecurity. Schneider (1975) found that organizational culture affects employees in their work behavior as well as in how they feel. In addition, organizational culture can play an important role in the successful implementation of technology since it affects how employees perceive events (Ke and Kee Wei, 2008). Considering the above, the following research question is formulated:

“What role does organizational culture play in shaping the perceived job insecurity experienced by STARA aware employees?”

Answering our research question will contribute to the existing body of literature investigating the role of expected technological change in the perceptions and feelings of employees. We will be investigating a set of contingent effects in the wake of the job automation revolution. Our results will be providing managers with insights on the role of culture in fostering or canceling the negative effects that increasing job automation will bring to their workforce. This paper is organized as follows: first, the literature related to the key constructs of our research model is discussed, followed by a description of the methods and data used. Next, the results of the empirical study are provided, followed by the discussion and a conclusion.

## 2. Literature review

### 2.1. The job market and smart technology, artificial intelligence, robotics & algorithms

Existing technologies are evolving, and new technologies are emerging with the potential to take over human tasks. Makridakis (2017) even predicts a forthcoming Artificial Intelligence (AI) revolution that could be as substantial as the industrial and digital revolution, claiming a massive impact on firms, employees and daily life. Brynjolfsson and McAfee (2011) mention a similar industrial revolution. Prominent examples are big data, which are expected to fuel deeper insights in marketing and sales, and AI and smart algorithms which will, in turn, use these insights to automate marketing and sales tasks (Syam and Sharma, 2018).

Frey and Osborne (2017) found that 47% of total job employment in the United Kingdom is at risk to be automated by AI, advanced robotics, or algorithms powered by big data. Furthermore, they argue that especially low-skill and low-wage jobs will be susceptible to computerization; low-skill and low-wage workers should be reallocated to other tasks, but to stay in the race these workers need social and creative skills. Adding to this, Agrawal et al. (2018) state that jobs requiring ethical judgment, emotional intelligence, or creativity will not be at risk for automation. Based on the recent concerns of a jobless future, Arntz et al. (2016) further investigated job automation in 21 countries of the Organization for Economic Cooperation and Development (OECD). They found that, in comparison to 47%, only 9% of jobs are automatable. However, they do stress the importance of retraining employees for new job opportunities.

Frey et al. (2016) mention the importance of retraining employees especially for lower-skilled workers, as do Frey and Osborne (2017). As

Skill Biased Technological Change (SBTC) favors skilled labor over unskilled labor, it explains the shift in demand for low skilled workers and has long been an explanation for an increasing wage gap. Fernandez (2001) found support for SBTC with regards to the then more recent digital revolution. However, Fernandez (2001) found that the effects of technological change are strongly mediated by organizational and human resource factors, such as the degree to which a company invests in employee training or how much the company is wage minimizing orientated. Autor (2015), argues that back in the 1900s, farm employment was declining and industry employment was increasing. Technological change does not only result in job loss but can also lead to job creation. The economy could very well grow due to automation and new technologies may also require new jobs (Manyika et al., 2017; Spencer, 2018). Again Manyika et al. (2017) do stress, as all the previously mentioned authors, the importance of employees being able to adapt to the new work environment.

### 2.2. Antecedents and consequences of perceived job insecurity

Job insecurity is defined as “powerlessness to maintain desired continuity in a threatened job situation” by Greenhalgh and Rosenblatt (1984: 438). Ashford et al. (1989) researched variables that explain the perceived job insecurity. They found that “changes anticipated in an organization” and “perceived role ambiguity” are positively correlated to job insecurity whereas “internal locus of control” is negatively correlated to job insecurity. By “changes anticipated in an organization” Ashford et al. (1989) refer to an anticipated event that threatens the current state of an organization, such as mergers, downsizings, reorganizations, new technologies and new physical dangers. On the other hand, “perceived role ambiguity” is described by Ashford et al. (1989: 806) as: “a lack of information about job requirements and procedures”. Spector (1988: 335) defines “internal locus of control” as “a generalized expectancy that rewards, reinforcements or outcomes in life are controlled either by one's action (internality) or other forces (externality)”.

Furthermore, Sverke et al. (2002) report how demographic variables affect job insecurity as well. An employee who takes care of his family might perceive elevated levels of job insecurity. But as the responsibility for others diminishes, the consequences of losing their job also decrease, and consequently, the job insecurity decreases as well. This is seen particularly among older employees. Not only age affects perceived job insecurity but also gender, as traditional values may evoke men to perceive higher levels of job insecurity than women. The skill level and education level affect perceived job insecurity because lower-level employees are thought to be more vulnerable to the threat of job loss. The type of employment contract matters to perceived job insecurity since a full-time permanent contract may lead to more feelings of being an integral part of the organization than other types of contracts. Marital status affects the social support one might receive after job loss and consequently marital status affects perceived job insecurity. Personality traits influence perceived job insecurity as well, for example, employees with high self-confidence perceive less job insecurity.

Apart from the antecedents of perceived job insecurity, Sverke et al. (2002) mention consequences as well. Job insecurity has been found to increase stress levels since increasing employment uncertainty limits the ability of employees to cope adequately with the threat. Additionally, job insecurity is negatively related to the well-being of employees. Physical and mental health complaints increase when there is more job insecurity. This is further supported by Laszlo et al. (2010), who found that employees with insecure jobs are at higher risk for poor health.

Not only does job insecurity affect employee well-being, but it also affects work attitudes and behavior. For example, employees with heightened levels of job insecurity are less satisfied with their job (Ashford et al., 1989). Also, Ashford et al. report that when employees

have increased perceived job insecurity, they have greater turnover intentions, lower trust in management and lower commitment to the organization. Eventually, because of these effects, the company performance will be influenced by job insecurity as well (Sverke et al., 2002). Furthermore, Sverke et al. (2002) add that with the increased turnover intentions of employees, the most attractive employees to the labor market who are also the most valuable to the company leave first. Additionally, when employees perceive more job insecurity, they are less involved with their job (Kuhnert and Palmer, 1991). Callea et al. (2016) found that when employees report being unsure about their career and their organizational development, they will perform their job less effectively. Furthermore, job insecurity and employees' competition are positively related, which leads to less positive behavior towards colleagues and the organization in general (Callea et al., 2016). In addition, increased job insecurity leads to less organizational identification and organizational identification is positively related to organizational citizenship behavior and job performance. Lastly, Sverke et al. (2002) and Gilboa et al. (2008) both report a low negative effect on organizational performance when job insecurity is increased.

### 2.3. Organizational culture

An organization's culture can impact organizational performance as organizational culture provides rules and a manner of conduct for its employees (Tjahjadi, 2001). In other words, the aggregated effect of organizational culture on the individual level affects the organizational level. Organizational culture could affect an employees' performance, commitment to the organization and work satisfaction (Kawiani et al., 2018). Moreover, the culture of an organization influences the employees' readiness for change (Metwally et al., 2019).

In the present study, we are particularly interested in the effects of organizational culture on employees who face job automation. Previous studies have established the individual and organizational effects of organizational culture (e.g. Kawiani et al., 2018; Metwally et al., 2019) as well as the overall detrimental effects of job insecurity for organizations (Callea et al., 2016; Gilboa et al., 2008; Sverke et al., 2002). Recently, Brougham and Haar (2018) have related the effects of job automation awareness to job insecurity. Following the above early evidence, this study is one of the first to relate organizational culture to job insecurity in a job automation context. To the best of our knowledge, no previous research has done so before.

As organizational culture is a very broad concept, this study takes a particular interest in the learning culture within an organization and the authoritativeness of the organization's culture. These aspects of organizational culture are expected to play an important role in shaping employee perceptions regarding the threat of STARA technologies. Readiness and preparedness of the individual for the future environment have been suggested to influence individual levels of perceived job insecurity (Nam, 2019). As a result, the learning and training culture of an organization is an important antecedent of perceived job insecurity. Moreover, Choi and Ruona (2011) found that employees in an organization with a learning culture have higher levels of readiness for organizational change. In addition, employability could mitigate the effects of organizational change on perceived job insecurity (Berntson et al., 2007). In order to increase the employability of employees retraining is often suggested (Cinar et al., 2014; Gowan, 2012; Heaney et al., 1994).

Additionally, Greenhalgh and Rosenblatt (1984) describe how authoritarian organizational cultures, cause employees to feel less in control of their job continuity. The high authoritarian culture of an organization leads to higher turnover intentions and a negative organization-employee relationship, both related to job insecurity (Kim et al., 2017; Staufienbiel and Konig, 2010). Furthermore, an authoritarian culture is also directly affecting perceived job insecurity in such a way that when organizational ethics are higher and power

distance is lower, job insecurity is lower (Loi et al., 2012). Therefore, authoritarian organizational culture could also affect the relationship between STARA awareness and perceived job insecurity.

## 3. Conceptual model and hypotheses development

### 3.1. Consequences of job automation and its relation to perceived job insecurity

Brougham and Haar (2018) defined the extent to which employees expect Smart Technology, Artificial Intelligence, Robotics and Algorithms (STARA) to change some workplaces and jobs within the next 10 years as STARA awareness. The prospect of job automation by STARA causes employees to have less organizational commitment and less career satisfaction while at the same time STARA awareness increases turnover intentions, depression and cynicism (Brougham and Haar, 2018). However, STARA awareness did not lead to more job insecurity (Brougham and Haar, 2018; Smith, 2016).

Extant literature, however, traditionally stresses the amplifying effect of organizational change on employee job insecurity (Greenglass and Burke, 2001; Keim et al., 2014; Lee et al., 2018). Major organizational changes such as mergers, downsizings and new technologies often lead to radical changes or elimination of jobs. These changes threaten the psychological contract an employee has with their firm and as a result, employees perceive more uncertainty and insecurity (Ashford et al., 1989).

In addition, during periods of organizational change employees tend to experience limited information and communication and will, therefore, seek out more information regarding the upcoming change. The information-seeking behavior of insecure employees facilitates the existence of rumors, which often provide worst-case scenarios and wild speculation. The rumors will then increase the perceived job insecurity of the already insecure employees (Smet et al., 2016). Even when upper management is not contemplating any organizational change, rumors preponderate in change situations. Therefore, the anticipation of organizational change, whether warranted or unwarranted, is already sufficient for increasing levels of perceived job insecurity (Ashford et al., 1989).

Given the above, we expect STARA aware employees to anticipate organizational change and consequently experience higher job insecurity. The following hypothesis is formulated:

**H1.** There is a positive relationship between STARA awareness and perceived job insecurity.

### 3.2. Organizational culture and job insecurity

In a review of the current literature on job insecurity, Shoss (2017) found that organizational culture in relation to job insecurity has yet to be investigated. Although the literature on the relationship between organizational culture and job insecurity is still thin, there is reason to believe that organizational culture affects perceived job insecurity. For example, Keim et al. (2014) found cultural variables to be moderators on the relationship between predictors (e.g. organizational change, age, locus of control) and job insecurity. In line with Keim et al. (2014), Lee et al. (2018) suggest that cultural factors shape perceptions of job insecurity as well. In addition, organizational culture affects employee perceptions (Habib et al., 2014).

Organizational culture affects the way employees perceive events, even in such a degree that it can impact the success of implementing new technology (Ke and Kee Wei, 2008). Shaping organizational culture by using restorative strategies, designed to decrease the perceived job insecurity (Kinnunen et al., 2000), have been suggested as remedies to the insecurity caused by advancing technological change. These restorative strategies promote a culture that increases individual readiness for change.

An organizational culture that has beliefs, values and policies that promote and support learning is referred to as a *learning culture* (Kinnunen et al., 2000). A learning culture helps employees with adapting to new practices and thereby with their employability. Berntson et al. (2007) found in their research that employability significantly mitigates the effects of organizational change on job insecurity. Additionally, employability also weakens the negative effects of job insecurity (Berntson et al., 2010; Jawaid et al., 2010). Following the effects of employability on job insecurity, a restorative strategy suggested by scholars is to retrain employees. Since retraining could increase the individual readiness for change by increasing their employability (Cinar et al., 2014; Gowan, 2012; Heaney et al., 1994). Accordingly, we expect STARA aware employees to experience less job insecurity when they expect to be prepared and ready for new job opportunities or new tasks through retraining. Therefore, a moderating effect is proposed of expectations of retraining on the relation of STARA awareness and perceived job insecurity.

**H2.** Expectations of retraining will moderate the relationship between STARA awareness and perceived job insecurity. Specifically, the relationship will be weaker when expectations of retraining are higher.

In addition to the learning culture of an organization and the degree to which it raises expectancies of retraining, the authoritativeness of an organization's culture could also play a role in the perceived job insecurity by its employees. An authoritarian culture can increase an employees' feeling of powerlessness, which is an important component of job insecurity. Powerlessness increases job insecurity by giving a sense to the employee of not being able to do anything about a threat (Greenhalgh and Rosenblatt, 1984). Greenhalgh and Rosenblatt name three elements of an authoritarian culture: (1) no strong norms of fairness in the organization; (2) the employee has no input into decisions and has no right to appeal; (3) high perceived arbitrariness of superiors in their evaluations and capriciousness in their decisions affecting employees. Sriramesh et al. (1996) discussed authoritarian culture in a similar manner, describing authoritarian culture as a closed system with top-down decision making reinforced by authority, tradition and trial and error; being indifferent about the personal lives of employees; being conservative; employees separating personal goals from organizational goals. More recently Kim (2016) and Kim et al. (2017) adopted this characterization of authoritarian culture from Sriramesh et al. (1996). Loi et al. (2012) studied the role of authoritarian culture in terms of ethics and power distance and found a significant relationship with perceived job insecurity. Contrary to high authoritarian organizations, organizations with a low authoritarian culture might create an elevated sense of safety for their employees concerning their jobs being automated. This is due to employees feeling they are in control and protected by the organization they belong to. Following the above, we argue that low authoritarian organizational cultures could mitigate the perceived job insecurity derived from potential job automation. Therefore, the following moderating effect is proposed:

**H3.** Authoritarian organizational culture will moderate the relationship between STARA awareness and perceived job insecurity. Specifically, the relationship will be stronger when the authoritativeness of the organization is higher.

The hypotheses are summarized in a conceptual model portrayed in Fig. 1.

## 4. Data & method

### 4.1. Procedure and sample

This research aims to explore the role of organizational culture in moderating the relationship between STARA awareness and perceived job insecurity. The targeted population, therefore, involves those whose jobs are at a relatively high risk of being automated by STARA.

Industries that are susceptible to automation are transportation & logistics, construction, sales, education, repair & maintenance, administration & office support, service (including financial and legal), manufacturing and agriculture (Frey and Osborne, 2017; Nedelkoska and Quintini, 2018). To create a sample that represents the population, respondents could only participate in the study if they worked in the above-mentioned industries.

To reach a representable sample of the population, an online questionnaire was distributed internationally via Amazon's Mechanical Turk (Paolacci et al., 2010). The total amount of collected respondents was 594, of which 491 respondents completed the survey. During data screening, we looked for unengaged respondents by checking response time and long string answer patterns. 74 respondents were excluded from this research because they completed the survey in less than 90 s. Another 13 respondents were deleted because their standard deviation in all response scales was lower than 0.5. Lastly, the remaining respondents were checked on giving the same answers for more than six items in a row, but no further exclusion of respondents was required. The remaining sample consists of 404 respondents.

Most participants are currently residents in the United States of America (USA) (50.7%) and 36.4% of the respondents reside in India. Which is in accordance with Difallah et al. (2018) who found that most workers on Amazon Mechanical Turk are residents in the USA and India. On average, participants were 32.70 years old (SD = 11.97 years), worked 11.21 years for their organization (SD = 12.24 years) and worked 41.62 h a week (SD = 16.14). The majority of the participants were male (58.9%). More than half (51%) of the participants were married, 37.6% was never married and the remaining 11.4% was divided over the remaining marital statuses. The ethnicity of the sample was predominantly Caucasian (44.6%), the second-largest ethnic group was Asian (42.6%). Participant's highest obtained level of education was mostly a Bachelor's degree (60.9%) but a Master's degree was also common (20.3%). The industry participants worked most was administration and office support (16.6%), manufacturing (16.6%) and education (12.9%). Furthermore, the industries were approximately evenly spread, except for the poorly presented legal service (1.2%) and agriculture (1.5%). 55.7% of the participants had a white-collar job and 24.5% of the participants had a blue-collar job, the remaining 19.8% did not know whether they had a white- or blue-collar job.

### 4.2. Measures

All of the main constructs were measured by using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), except for the control variables. Cronbach's alpha is included for each scale.

#### 4.2.1. Independent variable

STARA awareness was measured using an adapted version of the Brougham and Haar (2018) four-item scale for STARA awareness ( $\alpha = 0.85$ ). Example items are: "I think my job could be replaced by STARA." and "Some tasks I perform now for my job will be able to be replaced by STARA."

#### 4.2.2. Dependent variable

Perceived job insecurity was measured using the four-item job insecurity scale from de Witte (2000) ( $\alpha = 0.85$ ). Example items are: "Chances are, I will soon lose my job.", "I am sure I can keep my job." and "I feel insecure about the future of my job."

#### 4.2.3. Moderator variables

Expectations of retraining is measured in terms of how great the expectancy of an employee is on receiving adequate retraining for new tasks or job opportunities. To capture expectations of retraining we used an adapted three-item version of the organizational support for development scale by Kraimer et al. (2011) ( $\alpha = 0.92$ ): Example items are: "If some tasks I perform now for my job will be replaced by STARA,

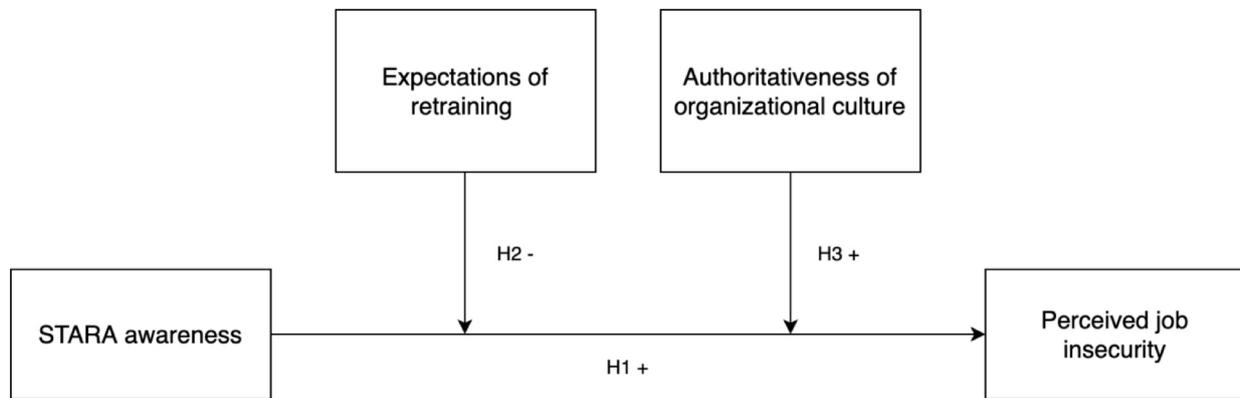


Fig. 1. Conceptual model.

I expect my organization to provide opportunities for me to adapt to the new job description.”, “When my organization replaces employees with STARA, I expect my organization to have career development programs that help employees develop specialized functional skills and expertise for new jobs.”

Authoritarian organizational culture was measured using Grunig et al. (2002) five-items scale ( $\alpha = 0.82$ ). Example items include: “Senior management in my organization believes that it must have nearly total control over the behavior of subordinates.”, “Rigid control by management often makes it difficult for me to be innovative in this organization.”

#### 4.2.4. Control variables

Following the example of similar studies in the field (e.g. Brougham and Haar, 2018), the variables chosen to control for in this research include: gender, age, education, ethnicity, organizational tenure, hours worked, job status, industry, country of residence and marital status.

#### 4.3. Analysis

Scatterplots show that the direct relationships between the predictor variables (STARA awareness, retraining and authoritative culture) and job insecurity, are all linear. The distribution of the data was checked by calculating the skewness and kurtosis for each scale. The criteria for normal distribution was skewness and kurtosis between  $-1$  and  $1$ . The STARA awareness scale and the authoritative culture scale all have skewness and kurtosis within this range. The kurtosis of the job insecurity scale and the retraining scale fall within the  $-2$  to  $2$  range, which is still considered acceptable for proving normality (George and Mallery, 2010). The retraining scale is also slightly above the skewness threshold ( $-1.21$ ). Additionally, the visual presentation of the distribution of the scales was checked with the use of histograms. The histograms showed a bell-curved distribution. The STARA awareness scale, the retraining scale and the authoritative culture scale were slightly negatively skewed and the job insecurity scale was somewhat positively skewed. These moderate deviations from normality are not expected to cause complications for parametric tests (Norman, 2010).

Although the scales used are adopted from other research, some adaptations were made. Therefore, in this research, all scales were checked on reliability. Scales were considered reliable if the Cronbach's Alpha ( $\alpha$ )  $> 0.70$ . The STARA awareness scale ( $\alpha = 0.85$ ), the retraining scale ( $\alpha = 0.78$ ), the authoritative culture scale ( $\alpha = 0.83$ ) and the job insecurity scale ( $\alpha = 0.81$ ) all show to have high reliability. The corrected item-total correlation shows the correlation of each item with the total score of the scale. The reverse item “I am sure I can keep my job.” of the job insecurity scale had a corrected item-total correlation of  $0.24$ , which is below the  $0.3$  threshold. Additionally, the removal of this item would increase the Cronbach's Alpha ( $\alpha$ ) from  $0.81$  to  $0.90$ .

Therefore, the reverse item of the job insecurity scale was excluded from further analysis. All further items had a good correlation with the total scores of their respective scales (all  $> 0.3$ ). None of the other items would substantially improve the Cronbach's Alpha if they were deleted.

Moreover, in order to check the convergent and discriminant validity of the scales used, an Exploratory Factor Analysis (EFA) was conducted. Including the dependent and independent variables in a single factor analysis should be avoided (Hair et al., 2010). Therefore, the EFA was conducted on the predictor variables only. The Kaiser-Meyer-Olkin indicated no problem with sample adequacy,  $KMO = 0.847$ . Bartlett's test of sphericity  $\chi^2(66) = 2070.87, p < .001$ , indicated that correlations between items were large enough for Principle Axis Factoring (PAF). An initial test was run in order to obtain the eigenvalues from each component in the data. Three factors showed to have eigenvalues over Kaiser's criterion higher than  $1$  and combined they explained  $65.98\%$  of the variance. This corresponds to the number of scales used for this research. Therefore, three factors were retained and rotated with a Varimax with Kaiser normalization rotation.

In addition, the independence of the values of the residuals was checked. The Durbin-Watson statistic showed to be between  $1$  and  $3$  ( $1.49$ ). This indicates that the values of the residuals are independent. Also, the values of the residuals are normally distributed. As the P-P plot shows no extreme deviations from the diagonal line. Furthermore, the data contains no Cook's Distance values over  $1$ . This suggests that there are no individual cases which disproportionately affect the model.

Lastly, the homoscedasticity assumption was checked. The plot of the predicted standard values and the standardised residuals obtained showed a light pattern. This indicates a violation of the homoscedasticity assumption, which can lead to an increased chance of type I errors. In order to weaken the detrimental effects of the homoscedasticity violation, robust regression methods should be used (Rosopa et al., 2013).

## 5. Results

### 5.1. Descriptive analyzes

The descriptive statistics of the variables are displayed in Table 1. The results of the correlation analysis show that there are several significant correlations. Among these significant correlations are the correlations between STARA awareness and job insecurity ( $0.71^{**}$ ), STARA awareness and authoritative culture ( $0.54^{**}$ ), retraining and job insecurity ( $0.22^{**}$ ) authoritative culture and job insecurity ( $0.64^{**}$ ). Noticeably, expectancies of retraining do not correlate with other study variables nor with any control variable.

Lastly, tests for multicollinearity indicated that a low level of multicollinearity was present for all the variables (lowest VIF =  $1.03$  for gender, highest VIF =  $1.96$  for authoritative culture). This range of VIF

**Table 1**  
Means, Standard deviations, Correlations (n = 404).

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Gender	1.41	.49	-													
2. Age	32.70	11.97	-0.04	-												
3. Industry	6.04	2.81	.04	-0.11	-											
4. Country	135.14	59.07	.04	.28**	.02	-										
5. Education	4.01	0.90	-0.04	-0.01	.12	-0.13	-									
6. Ethnicity	2.61	1.60	.03	-0.09**	-0.02	-0.44**	.07	-								
7. Marital Status	2.86	1.97	-0.02	-0.24**	.02	-0.10	-0.09	.10	-							
8. Organizational Tenure	11.21	12.24	-0.01	.28	-0.03	-0.05	.07	.15	-0.08	-						
9. Weekly Hours	41.62	16.14	-0.11*	.17	.03	.05	.1	.06*	.08	-0.07**	-					
10. Collar	1.31	.41	.00	-0.08	-0.05	-0.05*	-0.19**	.14**	-0.01	.07	.03	-				
11. STARA Awareness	3.47	1.03	-0.07	-0.12**	.06**	-0.27**	.12	.26**	-0.05	.25**	.16**	.01	(0.85)			
12. Retraining	3.81	.94	-0.01	-0.02	.02	-0.16	.09	.16	-0.05	.12	.08	.04	.26	(0.78)		
13. Authoritative Culture	3.62	.87	-0.06	-0.15**	.01**	-0.29**	.08	.23**	-0.02	.21	.07	-0.01	.54**	.21	(0.83)	
14. Job Insecurity	3.14	1.27	-0.07	-0.16**	.01	-0.29**	.08	.27**	.05	.29**	.10	.03*	.71**	.22**	.64**	(0.90)

\*\* . Correlation is significant at the 0.01 level.  
\* . Correlation is significant at the 0.05 level.

values should not raise any concerns (Field, 2017).

5.2. Moderated hierarchical robust linear regression

To test the hypotheses a moderated hierarchical robust linear regression was performed in order to see the predictive ability of STARA awareness, expectancies of retraining and authoritative organizational culture on job insecurity.

In step 1 of the regression analysis, all the control variables were added. This model was statistically significant  $F(10,393) = 10.64$ ;  $p < .001$  and explained 18.0% of variance in job insecurity. In step 2, the independent variables were added to the regression analysis. By doing so, the total explained variance of job insecurity increased with 36.0% to 54.0%  $F(13,390) = 40.83$ ;  $p < .001$ . Finally, in step 3 the moderator variables were added to the regression analysis. This model was statistically significant as well  $F(15,388) = 46.90$ ;  $p < .001$ . The introduction of the interaction effects of STARA awareness with expectancies of retraining and with authoritative culture explained an additional 2.28% of the variance of job insecurity. The total variance explained in the final model is 56.3%.

The direct effects of the control variables and predictor variables can be seen in Table 2 at steps 1 and 2 respectively. Of the control variables, age has a negative relation with job insecurity ( $\beta = -0.08$ ,  $p < .05$ ) and organizational tenure is positively related to job insecurity ( $\beta = 0.12$ ,  $p < .01$ ). In other words, the older the employee the less insecure he or she becomes about their job and if organizational tenure increases, job insecurity increases as well. Hypothesis 1 predicted a positive relationship between STARA awareness and job insecurity. Table 2 shows a positive significant relationship between STARA awareness and job insecurity ( $\beta = 0.49$ ,  $p < .001$ ). This result is in line with hypothesis 1, consequently, hypothesis 1 was accepted. Furthermore, the direct effects of retraining and authoritative culture on job insecurity are significant. Expectancies of retraining has a negative relationship with job insecurity ( $\beta = -0.15$ ,  $p < .05$ ). Authoritative organizational culture has a positive relationship with job insecurity ( $\beta = 0.39$ ,  $p < .001$ ). So, if an employee has higher expectations of retraining for new career opportunities, he or she is less insecure about his or her job. Contrarily, if the employee works in a relatively high authoritative environment, he or she will likely perceive more job insecurity.

The interaction effects can be seen in Table 2 in step 3. Hypothesis 2 predicted a negative relationship between job insecurity and the interaction effect of STARA awareness and expectancies of retraining. The coefficient in step 3 of Table 2 provides no evidence to support hypothesis 2 ( $\beta = -0.04$ ,  $p > .10$ ). Although the interaction effect of STARA awareness and expectancies of retraining on job insecurity is

**Table 2**  
Moderated hierarchical robust linear regression.

	R	R2	R2 change	B	SE	$\beta$	t
<b>Step 1: Control variables</b>	.42	.18***					
Gender				-0.09	.32	-0.04	-1.19
Age				-0.01	.08	-0.08*	-2.32
Industry				.01	.00	.02	.60
Country				-0.00	.01	-0.01	-0.27
Education				-0.04	.05	-0.04	-0.89
Ethnicity				.03	.03	.04	.86
Marital Status				.03	.02	.06	1.69
Organizational Tenure				.01	.00	.12**	3.30
Weekly Hours				-0.00	.00	-0.06	-0.177
Collar				.08	.08	.03	0.96
<b>Step 2: Independent variables</b>	.73	.54***	.36***				
STARA Awareness				.51	.05	.49***	9.55
Retraining				-0.15	.06	-0.15*	-2.21
Authoritativeness				.40	.04	.39***	6.55
<b>Step 3: Interaction</b>	.75	.56***	.02***				
STARA Awareness x Retraining				-0.04	.04	-0.04	-0.69
STARA Awareness x Authoritative Culture				.16	.05	.18***	3.69

Note. Statistical Significance: \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

statistically not significant and hypothesis 2 is rejected, the direct effect of expectancies of retraining on job insecurity is statistically significant. So, expectancies of retraining do not soothe the effect of STARA awareness on job insecurity but expectancies of retraining still decrease job insecurity. Hypothesis 3 predicted a positive relationship between job insecurity and the interaction effect of STARA awareness and authoritative culture. There is a significant interaction effect between STARA awareness and authoritative culture on job insecurity ( $\beta = 0.18$ ,  $p < .001$ ). Consequently, hypothesis 3 is supported. In conclusion, the size of the effect of STARA awareness on perceived job insecurity depends on the authoritativeness of the organization but not on the employee's expectations of retraining. So, when an employee perceives job insecurity as a result of STARA awareness he or she is likely to report even more perceived job insecurity when the organizational culture of this employee is high in authoritativeness.

**Table 3**  
Conditional effect of STARA awareness (X) on job insecurity (Y) at the values of retraining (M) and authoritative culture (W).

Retraining	Authoritativeness	Effect	SE	t	p
-0.94	-0.94	.239	.06	7.19	.00
-0.94	.21	.58	.05	11.02	.00
-0.94	.90	.68	.06	10.68	.00
.21	-0.94	.35	.06	6.39	.00
.21	.21	.53	.05	11.46	.00
.21	.90	.64	.06	11.37	.00
.98	-0.94	.32	.07	4.79	.00
.98	.21	.51	.06	8.75	.00
.98	.90	.62	.06	9.57	.00

5.3. Post-hoc analysis

Dawson and Richter (2006) recommend further examination of interaction effects with post-hoc tests. Suitable methods for this research, are: (1) testing the significance of the relationship between the independent and dependent variables at different levels of the moderator variables and (2) plotting the relationship between the independent and dependent variables at different levels of the moderator variables. In order to perform these two tests a PROCESS regression analysis is used. The results of the PROCESS regression yield no significant differences in comparison to the results of the moderated hierarchical linear regression. The significance of the relationship between STARA awareness and job insecurity at different values of expectancies of retraining and authoritative culture is depicted in Table 3. Additionally, the PROCESS regression found the relationship of STARA awareness and job insecurity to be significant for all values of expectancies of retraining and authoritative culture ( $p < 0.001$ ). However, the effect size increases more for higher levels of authoritativeness than for higher levels of retraining. Coherently, the interaction plot depicted in Fig. 2 shows parallelism between the lines of the retraining interaction but a different steepness for the lines of the authoritativeness interaction. Indicating that there is only an interaction effect for authoritativeness and STARA awareness. Which is in line with the previous findings.

6. Discussion & conclusion

Increased perceptions of job insecurity could affect the well-being of the employee as well as the company's performance. Moreover, job

automating technologies are on the rise. Yet, the literature on employee perceptions of automation technologies and perceived job insecurity is still limited (Brougham and Haar, 2018; Nam, 2019). As a result, we explored the research question: "What role does organizational culture play in shaping the perceived job insecurity experienced by STARA aware employees?". In order to answer this research question, we focused on learning culture and authoritative culture as two important aspects of organizational culture. Successively, our study contributes to the literature on STARA awareness and perceived job insecurity and additionally provides nuances in the relationship between these two constructs by investigating the moderating roles of retraining expectancies and authoritarian organizational culture.

6.1. Implications

First, this study adds to the literature on employee job insecurity by investigating the role expected technological change as an antecedent of perceived insecurity. Although job insecurity and job automation are thoroughly researched constructs, very little research could be found on the relationship between job automation and perceived job insecurity (Brougham and Haar, 2018). The results of the current study showed support for the hypothesized direct effect of STARA awareness on perceived job insecurity in line with previous research on the relationship between anticipated organizational change and perceived job insecurity (e.g. Ashford et al., 1989; Greenglass and Burke, 2001; Keim et al., 2014). The perceptions of employees on the role of STARA technologies in shaping their workplace in the near future are captured in their level of STARA awareness. In this context, novel technologies such as STARA, are perceived as a threat to workplace stability, leading to organizational change and higher insecurity. This finding answers to a recent call for research on the impact of automating technology on the individual employee (Brougham and Haar, 2018; Termino and Rimbau Gilabert, 2018). Specifically, drawing on fundamental literature on anticipated organizational change and perceived job insecurity (Ashford et al., 1989; Greenhalgh and Rosenblatt, 1984) our study highlights the recent technological developments in the work environment. As discussed in the literature review, the consequences of the increased job insecurity are most likely noticeable for both the employee and the organization (e.g. decreased well-being, work attitudes and organizational performance).

At the same time, the supported direct relationship between STARA awareness and perceived job insecurity is in contrast with the findings

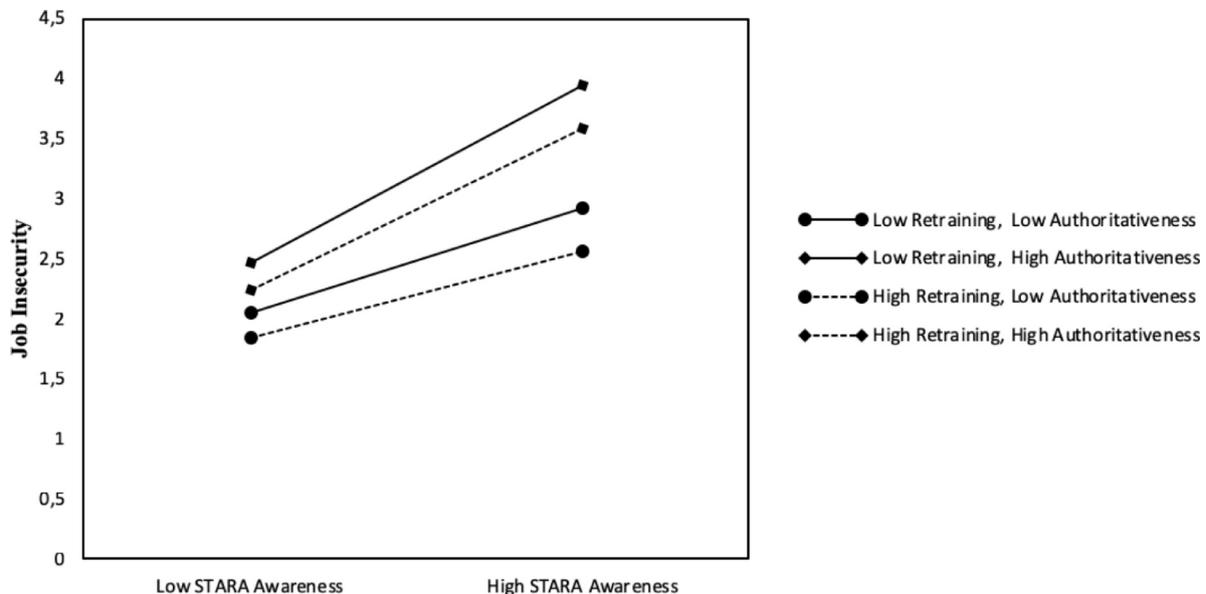


Fig. 2. Interaction plot.

of some previous early studies such as Brougham and Haar (2018) and Smith (2016). One possible explanation for these different results could be related to the salience of the applicability of automation technologies over time. With the high pace of technological advancements, it could be that the effects of automation technologies on careers became more salient to the public in the last few years. Especially with corporations recently announcing plans involving job or task automation. For example, the recent plans of Uber's self-driving car in the media, which poses an obvious threat to taxi drivers (Davies, 2019). This argument is congruent with the fact that the mean of STARA awareness of the current study is 3.47 (SD = 1.03) is higher than the mean of STARA awareness found by Brougham and Haar (2018) ( $M = 1.7$ ,  $SD = 0.77$ ). A second explanation could be that in the last few years people had the time to grow more acceptant of the idea that their job could be automated by STARA technology, which is in line with the five stages of grief (Kübler-Ross, 1970). This widely accepted theoretical model suggests that when people face adversity, they will first be in a denial of this situation but will eventually grow to accept it. Lastly, the different results could also be due to the different study designs and samples. The sample of Brougham and Haar consisted of 120 participants out of New Zealand, the sample of this study consists of 404 participants globally recruited via Amazon Mechanical Turk. The study of Smith (2016) interviewed their respondents by means of a telephone conversation, this study used an online survey.

Second, this study contributes to the nascent body of knowledge regarding the potential contingent effects of perceived job insecurity. Previous literature mentioned the importance of retraining and readiness for new tasks or jobs with regards to job automation (Arntz et al., 2016; Frey and Osborne, 2017; Manyika et al., 2017; Nam, 2019). Additionally, retraining is often mentioned as a solution to decrease job insecurity (Cinar et al., 2014; Gowan, 2012; Heaney et al., 1994). Despite this evidence, expectations of retraining have not been previously explored as a moderator between job automation and perceived job insecurity.

The results showed that employees who scored relatively high on the expectancies of retraining scale have lower perceptions of job insecurity. However, no support was found for an interaction effect between STARA awareness and expectancies of retraining on job insecurity. The interaction of STARA awareness and retraining expectancies does not decrease or increase the amount of perceived job insecurity in comparison to the sum effect of these two variables. In other words, expectations of retraining do make employees feel less insecure about their job but not more so when they have higher STARA awareness.

The results regarding retraining expectancies seem to be partly in line with the literature building up to the expectations of the current study. The previous literature suggests that employability mitigates the negative effects of organizational change on perceived job insecurity (Berntson et al., 2007, 2010; Jawaid et al., 2010). The current study shows partial support for the relationship between employability, expected organizational change and job insecurity when it is adjusted to match a STARA related setting. The adjustments are that employability is represented by retraining and expected organizational change by STARA awareness. It could be that employees who expect to be retrained, regardless of their STARA awareness levels, expect themselves to become more employable. Therefore, they will perceive less job insecurity. However, the role of STARA awareness is trivial for their perceived employability. Hence, this might be why there is no interaction effect of STARA awareness and retraining expectancies on job insecurity.

Third, this study uncovers the detrimental role of authoritative culture on enhancing the positive effect of STARA awareness on job insecurity. Although authoritarian organizational culture is a widely researched construct and has been researched before as a moderator for job insecurity (Loi et al., 2012), it has not been placed in the context of job automation. Theoretic frameworks about authoritarian control

suggest that an authoritarian culture provides little comfort to the employee, a lack of protection and a sense of powerlessness. These ingredients of an authoritarian culture will eventually lead to more perceived job insecurity (Greenhalgh and Rosenblatt, 1984; Sriramesh et al., 1996). The results of this research seem to add support for the positive effect of authoritarian culture on perceived job insecurity. Specifically, in the context of job threatening STARA technology. In light of the rapidly and continuously changing technology in the work environment, this theoretical contribution is especially relevant. It adds to the knowledge of how organizational culture should be shaped in these dynamic times, where job automation is on the horizon. Our study shows that when an organization has STARA aware employees, authoritarian culture will enhance the perceived job insecurity by these employees.

According to previous research, it is reasonable to expect major shifts in the job market due to automatization (Arntz et al., 2016; Frey and Osborne, 2017; Spencer, 2018). This research suggests that the more aware employees are of STARA technologies the more job insecurity they will perceive. Managers should take into account that their employees could become more STARA aware over the years, which would result in more job insecure employees. Consequently, employee's well-being, work attitude and behavior could be negatively affected which in turn leads to decreased organizational performance (Callea et al., 2016; Laszlo et al., 2010; Sverke et al., 2002). Furthermore, this research provides managers with insights on how to mitigate the negative effects of increased job insecurity as a result of STARA awareness. First, when employees expect to receive retraining if they are replaced by STARA technology, they will experience less job insecurity in general. Therefore, it might be of interest for companies to provide sufficient retraining opportunities for their employees. Second, this research suggests that managers should carefully evaluate the degree of authoritativeness embedded in the organization's culture and potentially take necessary steps towards moderating it due to its negative interaction with technological change when it comes to experienced job insecurity by the employees.

## 6.2. Limitations and further research

The current research comes with certain limitations. First, as with all cross-sectional designs no conclusions can be drawn on the development of the measured constructs over time or causality claimed. Future research could adapt the current study to a longitudinal design to look into the development of STARA awareness and job insecurity over time.

Second, it could be interesting for future studies to research the effect of culture on a societal level on the perceptions of employees regarding the threat of job automation. Different cultural elements found within organizations seem to be influencing the relationship between STARA awareness and job insecurity, as demonstrated by our results. However, wider cultural dimensions, such as Hofstede's 5 dimensions (Hofstede et al., 2010) could be playing a role to the extent that technological change translates into higher or lower feelings of job insecurity.

Third, job automation via STARA technologies is an emerging phenomenon therefore future research can look at further moderating or mediating variables such as employability (in the extent of retraining expectancies). As we found no interaction effect between retraining expectancies and perceived job insecurity but only a direct effect, it would be interesting to further investigate the role of employability in this matter. Also, Shoss (2017) suggests, in an agenda for future research of job insecurity, to research individual performance, organizational performance management systems, supervisor-subordinate relationships, and self-employment.

Finally, as we aimed to reach an international sample of the population, our sample was susceptible to a disproportionate failure of response across groups. Our sample's non-response bias is twofold. Firstly,

although our sample contains residents from 25 different countries among 5 continents, our sample is geographically biased towards residents of the United States of America and India (87.1%). Secondly, 81.2% of our sample is highly educated (Bachelor's degree or higher), thereby our sample yield a bias towards a highly educated population. According to Blair and Zinkhan (2006), variability in sample quality does not pose generalizability issues per se, as the generalizability of academic research is fairly robust to variations in sample quality. However, the non-response bias in our sample could potentially limit the generalizability of our results. Therefore, based on Blair and Zinkhan's (2006) recommendations for generalizability, future research could replicate our study in an effort to validate our findings.

## 7. Conclusion

In conclusion, with regard to novel tensions between technological and societal changes, this study offers several findings that contribute to the literature regarding job automation technologies and perceived job insecurity. Specifically, this study found that STARA awareness increases employees' perceptions of job insecurity. However, the effects of STARA awareness on perceived job insecurity are more severe in an authoritarian organizational culture. Additionally, a low authoritarian organizational culture lowers the overall perceived job insecurity directly. Furthermore, in the context of job automation by STARA technologies, expectancies of receiving retraining have a direct negative relationship with perceived job insecurity but no interaction effect of STARA awareness and retraining expectancies on perceived job insecurity was found. More moderating effects on the relationship of STARA awareness and perceived job insecurity still need to be explored. Also, future research could explore the development of the relationship between STARA awareness and perceived job insecurity over time and at different phases of the implementation cycle.

## Declaration of Competing Interest

The authors declare that there is no conflict of interest.

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