Journal of System Management (JSM)
Online ISSN: 2538-1571, Print ISSN: 2322-2301
Doi: 10.30495/JSM.2023.1994278.1866
10(1), 2024, pp. 237-255

Received: 18/08/2023
Accepted: 05/11/2023

RESEARCH ARTICLE **Open Access**

A Counterfactual Thinking Approach to Human Resources' Perception of Unfavorable Aspects of Organizational Life: A Two-Stage Methodology based on a Systematic Review and AHP Method

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Abstract

Nowadays, researchers and managers believe that paying attention to employees' thoughts facilitates sustainable competitive advantage in organizations. After the introduction of cognitive science into organizations, the identification of what it is, how it is formed, and the formulation of Counterfactual Thoughts (CTs) have been investigated and analyzed in the field of Human Resources (HR). In this study, a systematic and systematic review of the literature in the field of CT has been done with the aim of identifying the antecedents and key consequences of this field and analyzing them. In this research, a two-stage methodology has been considered including (i) Extraction of antecedents and consequences, (ii) Weighting of antecedents. In the first stage, using the screening of articles based on the seven-step method of Sandelowski and Barroso, the antecedents and consequences of their extraction, synthesis and interpretation have also been implemented through the coding method of qualitative interpretive meta-analysis. In the second stage, the consequences extracted in the field of counterfactuals are weighted using the matrix of paired comparisons based on the opinions of experts in the field of HR and the hierarchical analysis approach to weighting, which can be used to evaluate employees' thoughts and behavior. The results of the screening of the articles show that the antecedents in 4 general concepts with 12 codes and. Consequences are categorized into 2 and 8 unique codes. The results of the AHP analysis in order to determine the priority and weighting of the 8 codes pertaining to the introduced consequences show that the normalization of the condition related to the behavioral outcome has the greatest impact on the evaluation of employees' thoughts and behavior, while the regulation of related emotions as a result of attitude has the least impact among the codes introduced in this evaluation.

Keywords: *Counterfactual Thoughts (CTs), antecedents, consequences, AHP*

Introduction

In special and unexpected situations or conditions, the human mind compares and evaluates the existing conditions with the desired ones (Alipour Darvishi, 2012). It experiences a special feeling caused by the mutual relationship between thoughts, feelings and perception. Conditions that are in conflict with expectations and out of the person's control lead to negative evaluation and feelings. The perception mechanism that is activated in this direction can create different

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degrees of unpleasant feelings such as feeling insecure, the perception of organizational injustice (He et al., 2020). Between the formation of a person's perception and the time of performing an action (i.e., behavior), a mental mechanism is formed, called Counterfactual Thinking (CT) (Mehri et al., 2023).

CT is important in a wide range of organizational behaviors and behavior regulation. CT have different effects on our emotions, motivation, and behavior, depending on whether we focus on how things could be better than they actually are (i.e., progressive reactions) or negative reactions (i.e., negative reactions). Therefore, CT are one of the effective aspects in regulating individual and organizational behavior, and the development of this concept is very important in Human Resource (HR) management and organizational behavior because it can affect how employees and managers understand and respond to methods and results that affect different HR. HR behavior is the result of their perception of internal factors such as the feelings, emotions and thoughts of the individual (Sabet and Razeghi, 2019).

CT is important in extra-role behaviors such as citizenship (i.e., non-citizen), beneficial (i.e., counterproductive), adaptive (i.e., incompatible), deviant and destructive behaviors (Dimoff et al., 2014). CTs can generate protest behavior in which individuals and groups try to draw attention or express dissatisfaction with organizational events (Nicklin, 2013). Research shows that perception of justice plays a crucial role in increasing efficiency, job satisfaction, desire for violence, indifference, and organizational commitment (Azar and Darvishi, 2011). It also has a direct relationship with CTs in various fields (Alipour Darvishi et al., 2018). Perception of injustice in HR has negative consequences including decrease in job satisfaction and performance, leaving the organization, uncivil behavior and desire for violence in the workplace, social wear, aggression, workplace deviance, revenge and protest (Ramzy et al., 2018). The impact of counterproductive behaviors on employees' personal and professional well-being can impose significant costs on the organization (Nicklin, 2013; Ramzy et al., 2018).

CTs regulate HR behavior under different conditions (Ahmad and Norhashim, 2008). In general, employees resist change. CTs are considered from the point of view of improving employees' behavior, so that they can prepare people to adapt or not to adapt to the new organizational life, the predictability of certain events, and the preparation to face the future changes of the organization (Broomhall and Phillips, 2023).

A CT involves antecedents and consequences that interact closely. The purpose of studying the CT system is to improve the efficiency of a person in various conditions. However, other negative effects of CT such as feelings of regret, regret, and blame cannot be avoided in regulating employee behavior. The importance of identifying the mechanism of CT as one of the main dimensions of human cognition is that it can increase a person's awareness of the results of choosing different behavioral options and improve current performance through changes in past functional strategies (Ahmad and Norhashim, 2008).

Counterfactual inference is a type of conditional and hypothetical reasoning in which the background and result are contrary to reality. In other words, this reasoning expresses the mental process of imagining how things are different from what actually happened. Unexpected circumstances can activate CTs as an antecedent, and the reasoning process consists of three stages. To perform this type of reasoning, one must consider the causal relationship between the antecedent and the result and use counterfactual logic. In this regard, Fig. 1 explains the reasoning process of activating CTs step by step.

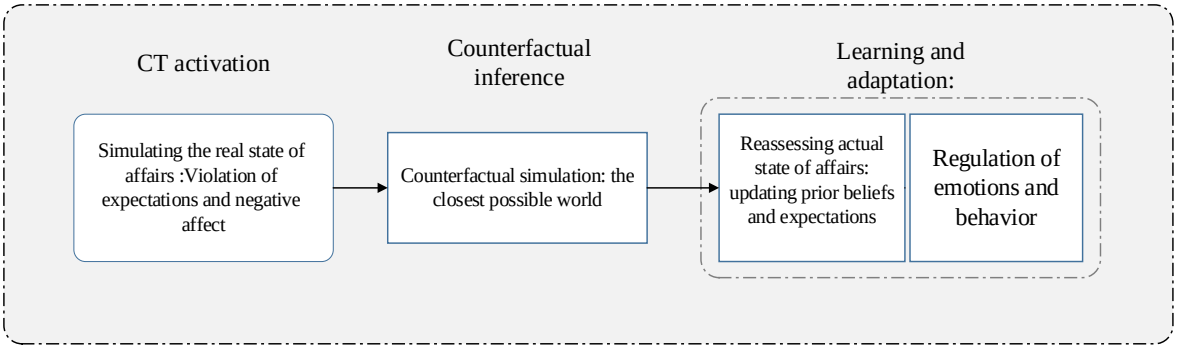

Figure 1. *The holistic structure of CT*

1. Activation of mental simulations of alternative scenarios based on the discrepancy between reality and expectations or desires.
2. A causal inference is about how changing a part of reality affects the outcome.
3. Learning and adapting from counterfactual scenarios feedback and guidance.

This study suggests that when people encounter situations different from what they expected or wanted, they may develop CTs about what could have been or what they should have done. CTs can affect how people think, feel and behave in response to unexpected situations. For example, they may use CT to learn from their mistakes, cope with negative emotions, set goals, or plan for the future. In addition, the proposed study states that CT can be an invaluable tool for adapting to and accepting changes in one's environment. Counterfactual reasoning, depending on how it is used and set up, can have positive and negative effects on cognition, feelings, and behavior about what to do.

Existing studies in this field have less investigated the effect of contextual variables on CT and CT's mediating role (Nicklin, 2013). There are key questions about the core of CT, why and how they occur, as well as their subsequent cognitive and behavioral consequences (Roese and Epstude, 2017).

- Can contextual variables such as culture predict CTs?
- Does CT affect fairness perception?
- May CT connect contextual variables and fairness perceptions?

The research review shows that most existing studies focus on certain aspects of CT, such as its antecedents, consequences, or moderators. However, they lack a comprehensive and systematic framework that integrates these aspects. In addition, most studies use empirical or correlational methods, which limits their generalizability and applicability to real-world HR contexts.

Therefore, this study provides a comprehensive and systematic framework for CT in Human Resource Management (HRM). Our goal is to answer the following research questions:

- How is CT defined and measured in HRM literature?
- What are the main factors that affect the activation and direction of CT in HR?
- What are the main antecedents and consequences of CT for employees and managers in HR?

To answer these questions, we adopt a narrative review approach that synthesizes and evaluates the existing literature on CT and HRM.

We organize our review into four main sections and use meta-methodology to achieve this goal: definition and measurement, activation and orientation, evaluation criteria, and antecedents and consequences. In each section, we identify key themes, gaps, and challenges in the literature and provide suggestions for future research. We conclude

our review using the hierarchical AHP method for theory and practice in HRM by discussing indicators' implications and weighting.

The structure of the presented article is as follows: In the next section, the history and theoretical background of counterfactual thoughts and how to activate and produce counterfactual thoughts content will be presented. In section 3, the research method and preliminary results are discussed. Section 4 includes determining the importance of the interaction between the antecedents and consequences obtained using the AHP method. The study data for weighting is given to HR experts to be used as a basis for evaluating employees' thoughts and behavior, and finally section 5 deals with the discussion, conclusions and future suggestions.

Literature Review

CT has been studied in various disciplines such as philosophy, history, economics, political science, linguistics, and computer science (Byrne, 2016). Existing research on CT shows its interdisciplinary nature and focus on cognitive science and organizational behavior. CT was defined by philosophers as a statement that contradicts reality. Kahneman and Miller's norm theory was the first theoretical basis for CT. Norm theory describes counterfactual logic as the cognitive basis for reasoning about alternative outcomes. Norms involve a pairwise comparison between a cognitive standard and an empirical outcome. As a result, the difference creates an emotional reaction, which depends on the amount and direction of the difference (Bertolotti and Catellani, 2023). Byrne's theory of logical imagination also proposed a set of cognitive principles that guide how people think about possibilities when imagining alternatives to reality. Experiments show that people think more about realistic probabilities than counterfactual ones, and more about low probabilities than other probabilities (Byrne, 2016).

Individual expectations of self and the environment are the criteria for behavior. Sometimes a person may face a situation that does not match his expectations. This inconsistency between expectations and reality creates cognitive tension and unpleasant feelings in the person. Additionally, it triggers him to subconsciously activate cognitive defense mechanisms to interpret the negative event. CT is a cognitive mechanism that explains how different perceptual (i.e., behavioral) conclusions are made in the face of an adverse event, and sometimes contrary to reality (Roese and Epstude, 2017). According to King theory, "the basis of CT is reasoning in which a person compares reality with his/her perceptions of possible states (i.e., counterfactual). In general, CT includes creating scenarios that are better or deteriorated than the current state, so one of the distinguishing features of CTs is the direction of thinking towards the positive or negative side of counterfactual scenarios (Markman et al., 2008).

CT creates both beneficial and unpleasant consequences for the individual. These paradoxical cognitive effects include: (i) are automatically activated in response to negative affect, (ii) specifically target potential causes of unhappiness, (iii) mediate negative affective consequences through the mechanism of cognitive dissonance and positive perceptual consequences through the mechanism of causal inference, and finally (iv) the net effect of CT is beneficial (Roese and Morrison, 2009). In fact, CTs affect a person's perception, motivation, and behavior (i.e., performance) (Wong, 2007).

As a result, it can be comprehensively stated that CT leads to an increase in performance in the future in one of two ways: (i) CTs as a substitute for current reality may affect a person's cognitive orientation (Kray et al., 2009), and (ii) CTs enable people to make effective connections between past experiences and future performance outcomes

through experiential awareness. It is the desire of people to perform these actions in the future that will improve their performance.

Roese and Epstude (2017) functional theory and self-regulation theory also examined CT in terms of the variety and causality of CTs. Functional theory states that CT has a secondary behavioral regulation function that influences behavior. Functional theory examines how CT works and what cognitive processes are involved for individuals. Since CT and emotions are two-way relationships and negative emotions can activate CT, CTs can also cause negative emotions (Zarrinabadi et al., 2023). Positive or neutral events and consequences are less likely to lead to counterfactual thoughts than negative and unexpected events because these upward thoughts prevent adverse events from occurring in the future. After a negative outcome event, upward thoughts are more common than downward thoughts, and upward thoughts are more common than downward thoughts.

CT is divided into different categories based on direction, structure and reference criteria (Roese and Morrison, 2009). In terms of direction, CTs are divided into two directions, up and down.

1. The upward direction imagines better and more favorable results than what happened, and the downward direction imagines worse results.
2. In terms of structure, thoughts are divided into two types: additive and subtractive. An addition structure adds a new element to a situation and reconstructs it. For example, "If I had an umbrella, I wouldn't get wet". Subtractive structures also try to create another reality by removing elements from the situation. For example, "If it didn't rain, I wouldn't get wet" (Khoshouei and Nouri, 2009).
3. In terms of reference criteria, our thoughts either attribute the outcome to our own actions or activities, "self-referential" (e.g., "I should drive more slowly") (Epstude and Roese, 2008).

Mental representations of counterfactual possibilities (e.g., imagining past events or imagining future outcomes that are not yet available) provide context for learning from past experiences, planning and anticipating the future, supporting creativity, and generating emotions (e.g., regret and blame). CTs typically use an "if ... then" conditional sentence in which the antecedent (if) specifies a change in a person, action, or circumstance, and the consequent (then) specifies an alternative better or less desirable outcome (He et al., 2020). CT specifies a situation or scenario that did not actually happen, and this scenario may be understood as the consequences of conditional statements that contain an antecedent (if) and a conclusion (then) (Roese and Epstude, 2017). Some focal consequence of the actual event is commonly the point of CT activation. Some of these consequences may replace or change some of the antecedents of the actual event, allowing us to evaluate the outcomes of alternative mental scenarios more accurately (Grundmann et al., 2022). To better understand the causes and consequences of these types of thoughts, it is necessary to know the processes related to them from formation to occurrence. In this study, we intend to examine the three main stages of formation and consolidation of counterfactual thoughts: activation, content generation, and influence.

Factors affecting thought activation

A systematic review of the literature on CTs shows that the significant distinction between the activation phase and the content generation phase of thoughts is in their temporal order and sequence. The activation stage is necessary for any effect on thoughts content, but the opposite is not true (Roese and Epstude, 2017). The following factors can activate CTs.

- ✓ Outcome expectancy factor (i.e., whether the actual outcome is surprising compared to the person's expectation) also affects counterfactual activation (Zarrinabadi et al., 2023). The factor of hope for results in CT in HRM can activate CT. Expectations of results may focus on the immediate and tangible outcome in decisions and priorities. In addition, they may increase stress and pressure on the individual due to the pressure to achieve a real and immediate outcome. As a result of hope, the individual loses motivation and commitment to long-term objectives and tasks as well as a shift in values and priorities towards immediate results. Finally, this expectation of the result may cause a change in the evaluation of performance and the person is evaluated more based on the immediate and tangible result instead of paying attention to other factors such as effort and cooperation.
- ✓ The proximity factor (in terms of time, place, and number) is the ratio between the actual result and the mental desired result. Proximity to CT in HRM can cause changes in decisions, priorities, increase stress and pressure, decrease motivation and commitment, change in values and priorities, and performance evaluation. If there is incorrect thinking, it may lead to unstable decisions and negative consequences in HRM. Each of these cases affects CT activation.
- ✓ Factor of normality/abnormality of the antecedent: This factor activates counterfactual thoughts (CTs). CTs also often involve the transformation of an abnormal antecedent into a normal antecedent. People tend to change any unusual initial action (i.e., an antecedent) to change the outcome of the actual event (Tran et al., 2021).
- ✓ An action-inaction factor describes how people perceive that behavior leads to expected outcomes and inaction leads to unexpected outcomes (for example, acting is normal and inaction abnormal). The variable has the potential to influence the content of CT (Daniel Kahneman and Miller, 1986).
- ✓ The passage of time factor: the passage of time factor in CT in HRM may cause a person to feel that he does not need more effort to achieve the result due to the passage of time, and this can reduce the motivation and commitment of the person to goals and long-term tasks. Over time, CT content may be considered a function of outcome value and outcome difference (Bertolotti and Catellani, 2023). Gilovich and Medvec (1994) also identified time as another antecedent of variables that determine counterfactual content. In the short term, counterfactual content tends to be more action-oriented and people tend to focus on taking action, but after time passes, they choose not to take action. In addition, this can decrease motivation and commitment to long-term goals and tasks.
- ✓ Antecedent controllability factor: It seems that the controllable antecedent is more changeable than the uncontrollable antecedent. Research has shown that counterfactual thoughts tend to influence actions under people's direct control (Drayton et al., 2011).
- ✓ Factor of outcome value and outcome expectation: Sanna and Turley (1996) examined the effect of outcome value or burden (e.g., positive outcomes versus negative outcomes) and the effect of outcome expectancy (e.g., one's expectations versus an unpleasant outcome) (Helgason and Effron, 2022).

Factors affecting the formation of CT content

After the stage of CT activation, the next stage is the production of CT content. In this stage, a person uses his memory, experience, knowledge, and creativity to construct a

counterfactual thought. CTs depend on the elements or factors that somehow correct or modify the antecedents that create unpleasant conditions. This change in the antecedent represents a tool that can make the original unpleasant outcome "impossible". Factors affecting CT formation are:

- ✓ Factor of normality of existing conditions: This factor restores normal conditions by taking the false content into account. The basis of counterfactual content is often a deviation from previously expected routines or behavior to normalize the existing situation (Xie et al., 2023). When conditions are generally calm and normal, a person may fall into counterfactual and incorrect thinking due to the absence of significant pressures and threats. This may cause a person to focus more on immediate and tangible results and reduce long-term results. Also, the person may show reduced motivation and commitment to long-term goals and tasks due to the absence of significant pressures and threats. As a result, the factor of normality of existing conditions can activate CT in HRM.
- ✓ Action versus inaction factor: If the individual's inaction is perceived as a norm or the status quo, the counterfactual content may perceive actions that stand out as sudden deviations from the norm as largely caused by the individual's inaction (Wang et al., 2021). The factor of action versus inaction can make a person feel that they have to act due to the absence of significant pressures and threats. This may increase motivation and commitment to long-term goals and tasks. Also, this factor focuses on long-term and strategic results.
- ✓ Antecedent controllability factor: Daniel Kahneman and Tversky (1982) Kahneman and Tversky manipulated the initial normal antecedent in such a way that the participants tended to frame their CT around the abnormal antecedents. When a person feels that the conditions and work environment are controllable, he may fall into counterfactual and incorrect thinking. In this situation, the antecedent controllability factor can make a person feel that he has to act due to the presence of control and the ability to change the situation, and this may increase the motivation and commitment of the person to long-term goals and tasks.

Factors influencing CT's content

At this stage, a person influences his feelings, behaviors and decisions by repeating and fixing his/her CTs. For example, a person may feel frustration, fear, anger, or guilt because of CTs. Or, because of his/her CTs, he/she may perform behaviors that intensify or maintain these types of thoughts. For this reason, it is necessary for a person to get out of this broken circle and move towards growth and improvement by identifying and correcting his/her CTs. Factors affecting CT effect are summarized as follows:

- ✓ Repetition factor: the more a person repeats his/her CTs, the more he believes them and the more they affect him/her.
- ✓ Reinforcement factor: the more a person matches his/her counterfactual thoughts with reinforcing evidence, sources, opinions or behaviors, the more he believes them and the more they influence him/her.
- ✓ Adaptation factor: the more a person matches his/her CTs with beliefs, attitudes, laws and cultural and societal values, the more he believes them and the more they influence him/her.

Methodology

Metasynthesis method

In this research, using the meta-composite analysis method, information and findings from qualitative studies related and similar to the topic of investigation and samples related to the research question were selected from

qualitative studies. The meta-combination method analyzes the studies' findings and interprets the original data review (Sandelowski and Barroso, 2006). Interpretive metasynthesis provides a systematic approach for researchers to discover novel and fundamental themes and metaphors. It improves current knowledge, and creates a comprehensive and broader view of issues. The researcher combines the findings and presents words for a more comprehensive representation of the phenomenon and provides a greater result than the sum of the parts. In terms of executive content, meta-composition is similar to foundational data theory, and with open and category coding, modeling is done to create a relationship between identified variables and categories. The proposed metacombination method consists of 7 steps, shown in Fig. 2.

Figure 2. *The proposed metacombination method (Sandelowski and Barroso, 2006)*

The metacomposite method collected data through secondary data called documents and past documents, which includes all CT research. Document analysis is the method of collecting data. In this method, the text of past research (i.e., review and research) is considered data, which is documented exactly like the interview text. Articles are screened according to "title", "abstract" and "content", as shown in Fig. 3.

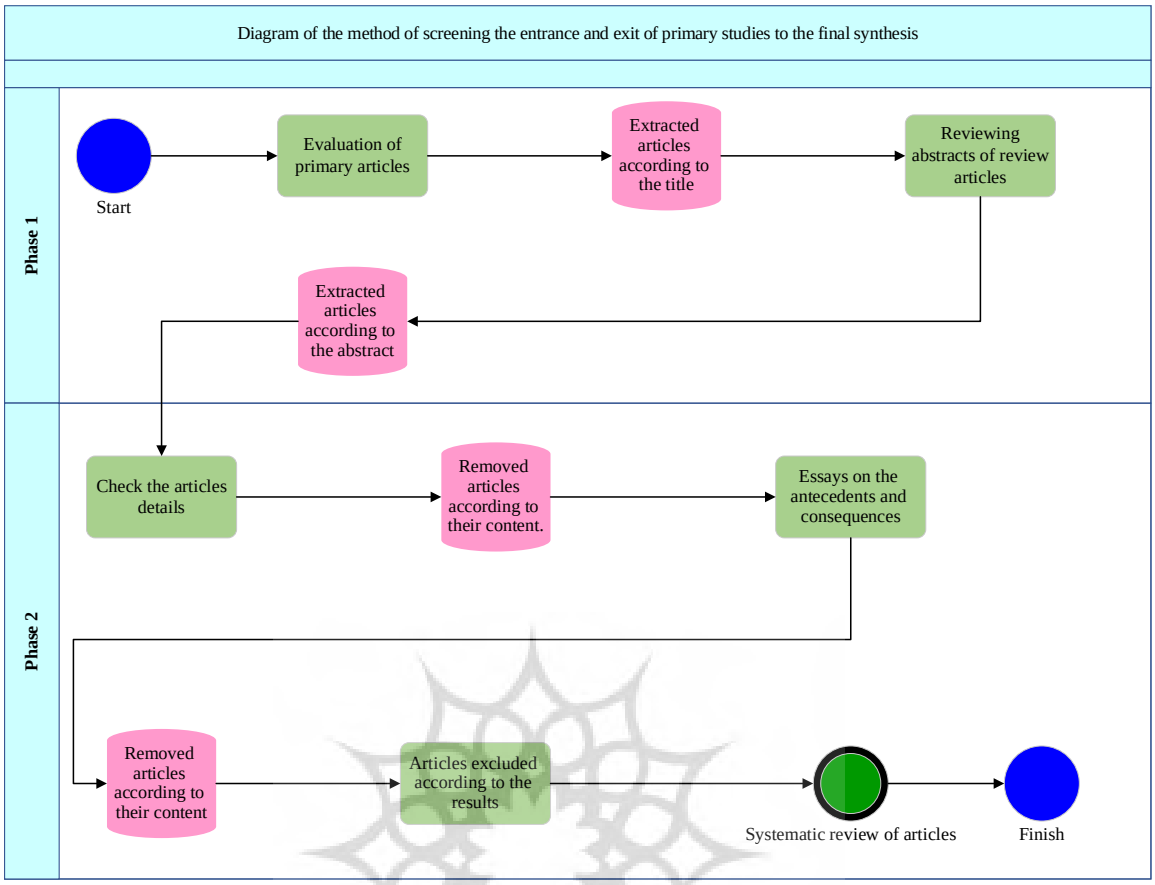

Figure 3. *Diagram of the method of screening the entrance and exit of primary studies to the final synthesis*

According to Fig. 3, the number of 55 primary articles related to the topic of antecedents and consequences of counterfactual thoughts in the time period (1990-2020) was selected and in the form of a systematic review, antecedents and consequences simultaneously from scientific documents, research reports, databases, internal journals, and valid foreigners were extracted. Figs. (4) and (5) show screening study results.

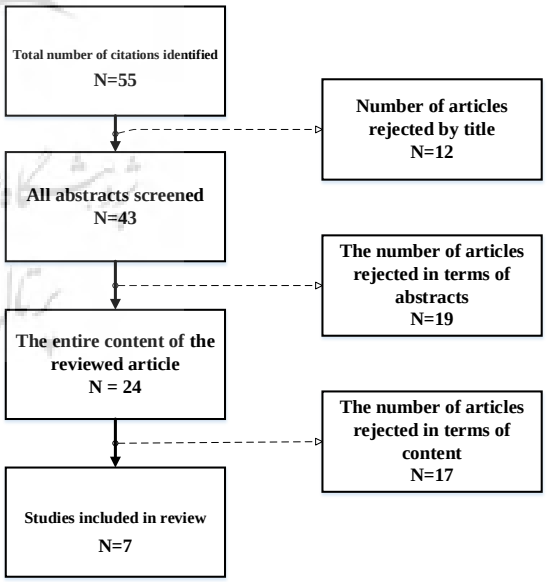

Figure 4. *Screening process of articles*

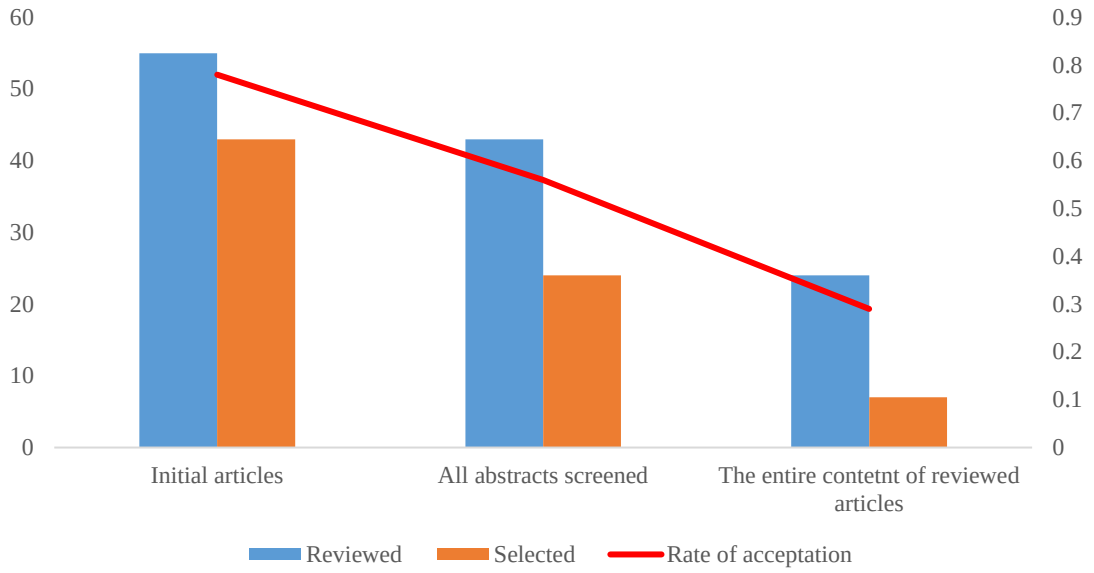

Figure 5. *The results of screening the entry and exit of primary studies into the final synthesis*

Fig. 6 shows the sequence of CT antecedents, activation, content generation and consequences.

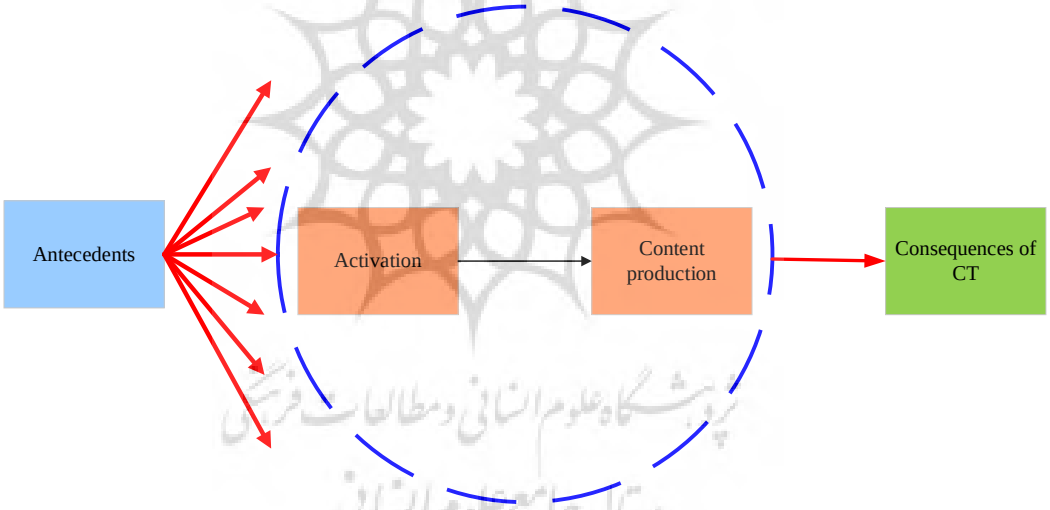

Figure 6. *The order of content activation and production procedure*

To analyze qualitative data, the text of these researches is used as data to answer research questions. The proposed method is exactly the same as the first stage of data coding in studies that use the data-driven theory method. In the first stage, the text of the study articles and the elements related to the two critical elements of the formation of counterfactual thoughts are categorized under the titles of "contradiction effect" and "causal inference effect". In the next step, the codes of the first stage are coded again to form relevant concepts. Eventually, in the third stage, these concepts are coded to form categories. During the coding stages, things like CTs are often conditional propositions that include both the antecedent and consequence. In addition, the counterfactual activation stage is a necessary condition for any content effect in CT, but the opposite is not true.

It is deduced from these expressions that the antecedents caused by the conflict effect and the effect of causal inference lead to behavioral and attitudinal consequences. These consequences regulate behavior in the form of reactive, avoidance, and passive behaviors through a change in the intention or a change in the individual's mentality. Here is an example of how to extract codes from the reviewed sources. First, the influential factors of the thought activation stage and the content stage of counterfactual thoughts were determined and coded. For example, the negative effect is a factor that is related to elements such as hope for the result and proximity to the desired result, and is among the main factors that activate CTs. This factor activates thoughts through the "contrast effect" mechanism. The stage of formation of counterfactual content is also determined by factors such as the normality of the antecedent or the factor of action against non-action. In the continuation of the review of the articles, all of the effective components of the activation stage and the thought content stage were identified and coded. Table 1 shows the results of this systematic review.

Table 1.
The results of this systematic review

category	subcategory	Code (concept)	Author(s)																	
			Daniel Kahneman and Miller (1986)	Landman et al. (1995)	Turley et al. (1995)	Markman et al. (2008)	Kray et al. (2009)	Nasco and Marsh (1999)	Dunning et al. (1995)	Lewin (1935)	Brendl and Higgins (1996)	Daniel Kahneman and Tversky (1982)	Landman, J et al. (1995)	Epstude and Roese (2008)	Gilovich and Medvec (1994)	Einhorn and Hogarth (1981)	Sanna and Turley (1996)	Kahneman and Tversky (1981)	Klauer and Migulla (1995)	Daniel Kahneman and Miller (1986)
CT	activation	negative effect																		*
		Hope for the result																	*	
		Being close to the desired result (in terms of time/spatial/numerical distance)																*		
		Expectancy Violation Effects and Outcome Value															*			
		Normality is the antecedent																		*
	The content of CT	Action against inaction														*				*
		Antecedent controllability																*		
		passing of time													*					
Antecedents of CT	Conflict effects (caused by upward or downward comparison)	negative emotional effect (expectation violation effect)							*											
		Avoid repeating the result								*	*									
		Antecedent controllability effects										*								
	Effects of causal inference	Useful inferential effects (neutralization of contrast effect)											*							
		Effective action to promote future improvement											*							
	Content-specific path (intent)	The negative effect of the problem on thoughts												*						
		The influence of thoughts on behavioral intention												*						
		The effect of behavioral intention on behavior												*						

category	subcategory	Code (concept)	Author(s)																		
			Daniel Kahneman and Miller (1986)	Landman et al. (1995)	Turley et al. (1995)	Markman et al. (2008)	Kray et al. (2009)	Nasco and Marsh (1999)	Dunning et al. (1995)	Lewin (1935)	Brendl and Higgins (1996)	Daniel Kahneman and Tversky (1982)	Landman, J et al. (1995)	Epstude and Roese (2008)	Gilovich and Medvec (1994)	Einhorn and Hogarth (1981)	Sanna and Turley (1996)	Kahneman and Tversky (1981)	Klauer and Migulla (1995)	Daniel Kahneman and Miller (1986)
	Content neutral path (mentality)	incremental mentality (improving performance and generating creative ideas)												*						
		Deductive mentality (task of analyzing and solving problems)												*						
		Motivation (upward and downward comparison)												*						
		self-inference												*						
consequences of CT	Behavioral consequence (change in behavioral intention or change in the content of CT)	Normalization of conditions	*	*																
		Action for lack of action	*	*																
		Controllability of the antecedent	*	*																
	Attitudinal consequence (change in mentality)	The impossibility of the outcome in the future			*															
		Predicting changes in the future											*							
		Change in mood				*														
		Change in strategic thinking				*	*													
		Regulation of emotions						*												

The activation stage is affected by the codes listed in the table due to the fact that the actual result differs from the expected result. Depending on the codes, the thought content stage also creates different mental scenarios. A number of factors influence antecedents of thoughts, such as the "contradiction effect" and "causal inference effect" as well as the path of "specific content" and the path of "neutral content".

Two emotional factors "negative effect" and "cause misperception" caused by antecedents, cause mental simulations to reduce the distance between the actual result and the desired result. Comparing and evaluating the outcome of each mental scenario with the actual outcome makes a person adjust his behavior based on the conditions.

AHP Method

AHP is one of the conventional approaches to determine the subjective weights of criteria. In the AHP method, the weights of criteria are computed based on expert judgments (Dalvand and Zohdi, 2023). In order to determine the weights based on the AHP method, the following steps are conducted (Tajik et al., 2023).

Step 1: Developing a pairwise comparison matrix for criteria, based on Saaty's scale, which is demonstrated in Tables (2) and (3) (Tajik et al., 2020). In this step, each criterion is compared with other criteria.

Table 2.
Saaty's scale of pairwise comparisons

Intensity of significance	Description
1	Equal Importance
2	Weak
3	Moderate Importance
4	Moderate Plus
5	Strong Importance
6	Strong Plus
7	Very Strong
8	Very, Very Strong
9	Extreme Importance

Table 3.
Reciprocal Saaty's scale of pairwise comparisons

Intensity of significance	Description
1/9	Extremely low importance
1/7	Very, very weak
1/5	Very weak
1/3	Weak Importance
1	Equal Importance
3	Strong Importance
5	Very Strong
7	Very, Very Strong
9	Extreme Importance

Owing to Table 2, when two criteria impress equally to the objective, "Equal Importance" is used in the comparison matrix.

Step 2: For each one-by-one comparison, the priority of criteria is determined by assigning a score in the comparison matrix $B = \|b_{ij}\|$ written in Eq. (1).

$$B = \begin{pmatrix} b_{11} & \cdots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{n1} & \cdots & b_{nn} \end{pmatrix} \quad (1)$$

Where, n is number of criteria. $(i, j = 1, 2, ..., n)$

Step 3: Constructing the normalized comparison matrix $R = \|r_{ij}\|$ using Eq. (2):

$$r_{ij} = \frac{b_{ij}}{\sum_{j=1} b_{ij}} \quad (2)$$

Step 4: Calculating the priority vector $\vec{V}$ of criteria based on Eq. (3):

$$v_i = \frac{\sum_{j=1} r_{ij}}{n} \quad (3)$$

Step 5: Forming the weighted sum matrix by multiplying B and priority vector V.

Step 6: Dividing all elements of the weighted-sum matrix by their respective V vector element.

Step 7: Calculating the average of values computed in Step 6 to gain λ_{max}.

Step 8: Computing the consistency index (CI) as follows:

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (4)$$

Step 9: Determining the consistency ratio (CR) based on Eq. (5):

$$CR = \frac{CI}{RI} \quad (5)$$

Where, RI is determined based on Table 4.

Table 4. *Average random consistency*

Size of Matrix	Random Consistency
1	0
2	0
3	0.58
4	0.9
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

Step 10: The judgment consistency is investigated based on CR of CI with the suitable value in Table.

Results

The amount of CTs is determined by counterfactual antecedents and consequences and their interaction parameters. Their effect on upward or downward thoughts cannot be determined by a planned experiment. Also, they cannot be quantitatively compared, because their elements are measured differently. Based on AHP, this study presents the compatibility calculations of experts' estimates in the process of determining the weight of consequences. To calculate the weights assigned to the consequences and to estimate the similarity of the ranks based on the criteria, Kendall's correlation coefficient has been used. Finally, by referring to the use of correlation analysis of ranks and weights, this review highlights the importance of paying attention to CTs as a new topic for analyzing and evaluating employee behavior. The significance of the calculated pairwise correlation coefficients allows us to consider that experts' opinions about the influence of the interaction of elements of antecedents and counterfactual consequences on predicting employees' behavior adjustment are consistent. The calculations results are given in Fig. 7.

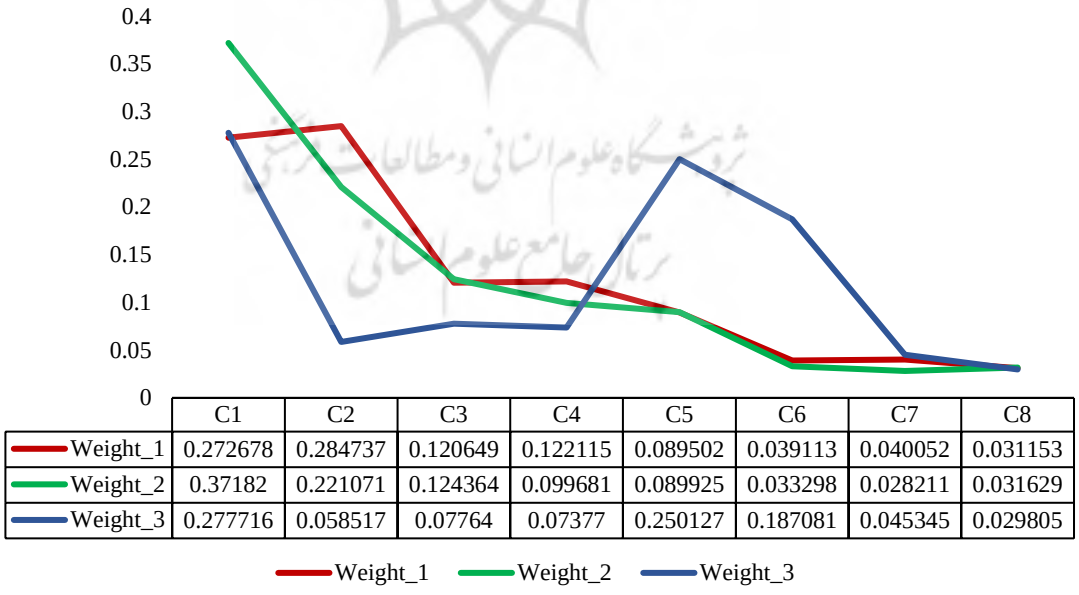

Figure 7. *The weights of consequences with respect to three DM preferences*

C1: Normalization of conditions, C2: Action for lack of action, C3: Front controllability, C4: The impossibility of the outcome in the future, C5: Predicting changes in the future, C6: Change in mood, C7: Change in strategic thinking, C8: Regulation of emotions

As indicated in Fig. 7, C1 (i.e., Normalization of conditions) is the most significant criteria, while C7 (i.e., Change in strategic thinking) and C8 (i.e., Regulation of emotions) are the most disappointing criteria. Furthermore, C6 (i.e., Change in mood) has similar weights (0.03) with respect to DMs (1) and (2), but its weight is 0.18 with respect to DM 3. To evaluate the calculated weights based on three DMs preferences, the correlation between these consequences weights is provided in Table 5.

Table 5.
Correlation between these consequences weights based on three DMs preferences

Consequences	DM1	DM2	DM3
DM1	1	0.928**	0.88
DM2	0.928**	1	0.905*
DM3	0.88	0.905*	1

Table 5 shows the maximum correlation between calculated consequences weights is related to DMs (1) and (2), while DMs (1) and (3) have the least correlation. In this regard, the calculated consequences weights by DMs (1) and (2) can be used to evaluate persons based on CT.

Conclusion

CT in HRM can affect people's emotions, motivation and behavior. CT can be activated in certain situations such as immediate and tangible decisions, more pressure and stress, reduction of motivation and commitment, change in values and priorities, etc. CTs are one of the effective aspects of regulating individual and organizational behavior, and the development of this concept is very significant in HRM and organizational behavior. CT can be an effective tool to adapt and accept changes in your environment. Existing studies in this field have less investigated the effect of contextual variables on CT and the mediating role of CT. This study provides a comprehensive and systematic framework for CT in HRM.

In the field of HR, paying attention to employees' thoughts has become imperative because it facilitates sustainable competitive advantage in organizations. After the introduction of cognitive science into organizations, the identification of what it is, how it is formed, and the formulation of counterfactual thoughts has been investigated and analyzed in the field of HR. A systematic and systematic review of the literature of CT has been done to identify the key antecedents and consequences of this field.

The review of systematic studies conducted on the process of CT formation shows that these thoughts are formed in three stages: activation, content production and CT consequences. These stages differ in chronological order and sequence. In the activation stage, a person encounters an external or internal factor that causes CT. This factor can be an incident, news, a sound, an image, etc. In this regard, without activation, there is no impact on the content of thoughts, and the activation stage is a necessary condition for any impact on CTs. After the stage of CT activation, the next stage is the production of thoughts content. In the content generation stage, a person shapes his/her CTs by using his various resources, such as memory, experience, knowledge and creativity. For example, a person may experience negative emotions such as dissatisfaction, fear, anger, or regret due to their CTs. As a result of his/her CTs, he/she may perform illogical behaviors such as running away and searching, which perpetuates the vicious cycle of CTs. Therefore, it is necessary for a person to get out of this unhealthy pattern by identifying and correcting his/her CTs and moving towards acceptance and improvement.

In this study, a two-stage methodology is considered. In the first stage, by using the screening of articles based on the seven-step method of Sandelowski and Barroso, the antecedents and consequences of their extraction, synthesis and interpretation have also been implemented through the coding method of qualitative interpretative meta-analysis. In the second step, the results extracted in the field of counterfactuals were weighted using the matrix of paired comparisons based on the opinions of experts

in the field of HR and the hierarchical analysis approach to weighting, which can be used to evaluate employees' thoughts and behavior.

In this study, we use the method of screening articles to synthesize and evaluate the existing literature in the field of CT and HRM. We categorize the causes and consequences of CT in the framework of four general concepts: contrast effects due to upward or downward comparison, causal inference effects, content-specific path based on intention and content-neutral path based on subjectivity. Each of these concepts contains 12 unique codes that show CT antecedents. Also, we examine CT consequences in two categories: behavioral consequences and attitudinal consequences with 8 separate codes. To determine the priority and weighting of these codes, we use the AHP method. The use of this method increases measurement accuracy and reduces evaluation bias by quantifying factors.

The results show that the normalization of conditions has the highest weight in behavioral outcomes and the regulation of emotions has the lowest weight in attitudinal outcomes. CTs can affect a person's mental and professional performance in two ways. In a situation where a person thinks about how to create better working conditions for himself/herself instead of accepting the situation, the normality of the situation increases dissatisfaction, regret and depression. This condition reduces the person's self-confidence, creativity and performance. On the other hand, when instead of regretting, the person thinks about how she managed to avoid problems and inappropriate work relationships, the normality of the situation increases gratitude, happiness and optimism. This state increases self-confidence, creativity and performance. The factor of normality in CT can have a positive or negative role in human resource management, depending on the individual's mental orientation. Managers should maintain a balance between realism and creativity by identifying and correcting CT in themselves and their employees. Also, the results of the research have special importance for increasing managers and researchers' awareness of HR. In addition, the results improve the ability to analyze the existing harms caused by the HR system's actions and activities centered on CTs. At this stage, the person selects elements or factors that, by changing or modifying them, make an unpleasant outcome unlikely to happen. At the influence stage, a person has a positive or negative effect on his/her moods, behaviors and decisions by repeating and reinforcing his/her CTs.

The limitations of this study can be addressed in more detail in future studies. Researchers have argued that pre-factual thinking involves directly speculating about the future and planning behavior. In this regard, CTs and pre-factual thinking may be able to guide behavioral intentions easily (e.g., (Ferrante et al., 2013; Mercier et al., 2017)). It is suggested to consider pre-factual thinking in future research. On the other hand, the experts involved in scoring are limited and are from one country. In order to obtain higher accuracy, it is suggested to increase the number of specialists from different fields and different geographies.

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