

# Cognitive biases in implementing a performance management system: behavioral strategy for supporting managers' decision-making processes

Cognitive  
biases

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Received 1 November 2021  
Revised 22 December 2021  
2 February 2022  
Accepted 3 February 2022

## Abstract

**Purpose** – The purpose of this paper is twofold: to provide a clear picture on the cognitive biases affecting managers' decision-making process of implementing a performance management system (PMS), and to identify managerial practices, measures and the key challenges to manage the cognitive biases in the corporate strategy.

**Design/methodology/approach** – Semi-structured interviews, based on theoretical milestones of performance management and cognitive psychology, gathered from 104 experienced professionals' evaluations on the likelihood and impact of managers' cognitive biases in PMS implementation, potential solutions as well as drivers and connected criticalities.

**Findings** – Recurring cognitive biases, together with considerable impacts, emerged in the first, and most strategic, phases of the PMS implementation. The authors developed a roadmap to support corporate transition to integrate behavioral strategy into the PMS implementation aiming to achieve economically and efficiently sound performance.

**Research limitations/implications** – From the view of proper behavioral strategy affirmation in performance management literature, in a small way, the authors contribute to a desirable taxonomy of cognitive biases so differentiated decision-making scenarios may be built to compare results and draw new observations. Behavioral studies could transversally connect the cognitive biases of performance management to actors' sociodemographic features and personality types. Practitioners may check biases affecting their organizations by means of the questionnaire and, consequently, adopt the framework illustrated to reduce them.

**Originality/value** – Performance management literature has constantly investigated positive and negative behavioral factors related to the PMS. This study, instead, makes a theoretical and methodological contribution to the PMS implementation as a decision-making process. The authors propose a theoretical framework that integrates cognitive psychology insights and applies measures to reduce biases.

**Keywords** Performance management system, Cognitive biases, Decision-making, Behavioral strategy, Performance measurement, Organizational behavior, Conceptual framework

**Paper type** Research paper



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## 1. Introduction

The transition from “performance measurement” to “performance management” (Kaplan and Norton, 1992; Lebas, 1995; Amaratunga and Baldry, 2002) aimed to overcome simple appraisal for a holistic approach that is strategically conscious and accountable to set and achieve objectives. The change requires integration of the strategic view, at the organizational level, and includes a variety of perspectives such as vision, mission and organizational change (Aguinis *et al.*, 2011, 2013). Thus, an inclusive performance management system (PMS) had to consider new key elements and its implementation became harder. Sharing a vision, setting the mission as well as preparing a change require a series of decisions where alternatives should be weighted, selected and justified with members of the organization (Gruman and Saks, 2011). Over the years, performance management implementations substantially increased their successful rate (De Waal and Counet, 2009) while the use of the PMS acquired growing, internally and externally oriented, strategic relevance. Unbiased performance evaluation on individuals improves employees’ performance together with their present and future motivation (Bol, 2011), and PMS was applied on teams to improve organizational effectiveness and strategic interactions among members (Sum Chau, 2008). Externally, the PMS became a source of competitive human capital advantage (Aguinis *et al.*, 2013) and it even emerged as a tool needed to face a current competitive environment (Sardi *et al.*, 2020). Even risk-free decision-making models are based on strategic and operational metrics of performance management (Yildiz and Ahi, 2020).

Psychological studies highlighted the cognitive aspects at the base of the management decision-making process (Newell and Simon, 1972; Bazerman and Moore, 2013), thus directions to improve managerial choices were drawn. Assuming boundaries in human rationality (Simon, 1947, 1957) allowed moving on and proposing valuable approaches. Relevant contributions explored managers’ decisions by focusing on their cognitive characteristics and biases (Langabeer and DelliFraine, 2011; Abatecola, 2014; Cristofaro, 2020) and personality types (Haley and Stumpf, 1989; Cristofaro, 2016). Moreover, specific tools were offered to practitioners in systematic evaluation of individuals’ actions (Klein, 2007; Kahneman *et al.*, 2011; Armstrong *et al.*, 2012) and to academics regarding qualitative research to understand cognitive factors in organizational decision-making (Cristofaro, 2017) throughout the steps of the process (Nutt, 2011).

Nevertheless, performance management literature usually focused on behavioral factors affecting the PMS across differentiated organizations and periods (De Waal, 2006; De Waal and Covert, 2007). A substantial amount of research showed individuals are motivated to obtain higher performance (Luthans *et al.*, 2008), including which behavioral factors are needed to implement a PMS with success (Bianchi and Williams, 2015; Bianchi and Rua, 2017). In particular, De Waal (2004, 2006) suggested focusing more on national cultures to implement an effective PMS as well as stimulating some critical behaviors such as members’ understanding, attitude and alignment. Some contributions (Skibniewski and Ghosh, 2009) looked at their counterparts’ attention and proposed models with rigorous and methodologically reliable indicators to figure out individuals’ perception of vagueness on objectives and measures.

To summarize, performance management literature has constantly shed light on behavioral factors, positively or negatively, in relation to the PMS but, to the best of the authors’ knowledge, no studies have satisfactorily identified the PMS’s implementation as a decision-making process to be analyzed from a psychological view. Single cognitive biases affecting decision-makers during the PMS’s implementation, together with their impact, have not been properly addressed. Existence of biases in individual performances’ evaluations were repeatedly underscored by many authors (Rich, 2007; Eremin *et al.*, 2010; John Bernardin *et al.*, 2016). These distortions were mainly explained by similarity and nearness rate among evaluators and evaluated (Wei *et al.*, 2019). The emblematic case of a

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board of directors biased by self-interest (Lin *et al.*, 2021) demonstrates how this cognitive distortion leads to a tangible agency problem. Also, unfair reward policies may be based on subjective performance evaluations because of a conflicting intragroup. Managers' biases may drive the organization toward biased objectives by means of an ineffective strategy as based on unshared motivations, previously experienced tactics (Westphal and Fredrickson, 2001) or a simplified one because of short time available to process information (Rich, 2007). Measures and targets may be formulated on the basis of old and/or limited information, thus productivity could fall because members see tasks as stringent or out of focus. Definitively, performance management literature has not convincingly integrated cognitive psychology insights on decision-makers' processes as, once biases are categorized, even in performance management practice, designing a proper organizational environment can reduce the occurrence and impacts of biases and heuristics (Echols and Neck, 1998; Cristofaro, 2017).

Thus, the research gap motivates the origin of this paper, which is focused on the following research questions:

- RQ1. What are the cognitive biases, and their impact, affecting managers in implementing a PMS?
- RQ2. How could the likelihood and impact of critical cognitive biases revealed in the PMS be reduced?

Accordingly, to address these research goals, our proposal is based on semi-structured interviews answered by 104 Italian middle and senior managers with at least five years' experience with a PMS. The questionnaire is built on milestones of both performance management and cognitive psychology disciplines. Based on the experience of their whole career, respondents were asked to evaluate themselves and others as decision-makers. Our results first report the most and least frequent managers' cognitive biases and their impact on the implementation of a PMS through descriptive statistics; then, the advantages and possibilities for addressing these issues, as well as technical and human criticalities connected to potential solutions, are processed by means of a thematic analysis. Theoretical concepts and quantitative and qualitative data were integrated to propose a theoretical framework to reduce biases in a PMS implementation. Our construction falls within ideal boundaries of a behavioral strategy discipline as it exploits cognitive psychology hints to improve strategic management practice under theoretical, empirical and practical points of view. Based on methodological pluralism and intellectual sharing, the authors gathered and processed assumptions on managers' cognition on the field to integrate a profitable psychological architecture into the organization (Powell *et al.*, 2011).

Professionals may refer to the questionnaire we developed to check potential cognitive biases influencing their own PMS implementation process. Managers may adopt the framework proposed to reduce those critical biases for their organization, and academics may find a first focused view, based on primary data, on the PMS as a decision-making process that is affected by human limitations. Results could be integrated and/or differentiated in future research to create new decision-making scenarios to forward the discussion from a behavioral point of view.

## 2. Basic concepts used in the paper

### 2.1 Performance management system implementation as a strategic decision-making process

A PMS "is concerned with defining, controlling and managing both the achievement of outcomes or ends as well as the means used to achieve these results at a societal and organizational, rather than individual level" (Fitzgerald *et al.*, 1991; Otley, 1999;

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Hristov *et al.*, 2021a). In practice, an organization states its mission and vision to follow, which are translated into objectives prioritized by means of critical success factors (CSFs). Key performance indicators (KPIs) consequently developed may face quantitative or qualitative issues and, despite expressions used in practice, are mostly numerical. Strategy alignment and conciseness are crucial characteristics for useful KPIs to express values comparable to those desired. On this basis, the whole performance evaluation may be smoothly done and, consequently, reward policies may be applied and the whole process readdressed (Hristov and Appolloni, 2021). Thus, differentiated kinds of data are systematically accumulated to finally enter the decision-making process as information (Lebas, 1995). At each step of a PMS implementation, as described, managers take decisions and leave alternatives. Eisenhardt (1999) reported a definition of “strategy” based on where to go and how to go; the PMS may be definitively considered as a process chosen by strategists to understand and address their business (Vroom, 1973; Schwenk, 1995). The first strategic steps of the PMS are usually managed by senior managers, while control mechanisms (performance evaluation, reward policy) are frequently delegated to lower managers in human resources (HR) or finance departments (Otley, 1999; Malmi and Brown, 2008). Despite our analysis taking into account this general hierarchical orientation, each company may change its organizational assets for internal and/or contextual reasons.

### *2.2 Behavioral strategy to support performance management practice*

A behavioral strategy definition for management studies was offered by Powell *et al.* (2011; p. 1371):

Behavioral strategy merges cognitive and social psychology with strategic management theory and practice. Behavioral strategy aims to bring realistic assumptions about human cognition, emotions, and social behavior to the strategic management of organizations and, thereby, to enrich strategy theory, empirical research, and real-world practice.

Organizations are, thus, provided with strategically valuable information on the human side of its members (Bazerman and Moore, 2013; Garg, 2017). Behavioral strategy insights may be instrumental to designing an environment that could reduce frequent misbehaviors in groups (Sibony *et al.*, 2017) managing performance management activities.

For instance, a lack of common knowledge (Lowe and Jones, 2004) emerged as critical for KPIs’ implementation, deriving from both different executives’ backgrounds and interests (Hambrick and Mason, 1984). Potential conflict of interests may also arise when prioritizing indicators (Lämsiluoto *et al.*, 2013). KPIs’ perception may even change in different phases of a firm’s life cycle (Schumacher *et al.*, 2020), especially when considering a risky decision-making situation (Henderson and Nutt, 1980; Healey and Hodgkinson, 2017; Prietzel, 2020). Rewards and incentives are even critical; thus, Rajan and Reichelstein (2006) accept the non-verifiability of some measures such as direct observations. In the case of the balanced scorecard, a largely implemented performance management tool and matters on subjective prioritization of measures are historically reported. Managers overemphasize common measures because of attention biases (Lipe and Salterio, 2000; Merchant, 2006; Herath *et al.*, 2010), which could lead to conflicts between top management and lower levels (Budde, 2007; Wong-On-Wing *et al.*, 2007). Moreover, a biased decision approach leads managers not to rate individual performance measures equally (Rich, 2007).

In this context, performance management literature could benefit from affirmation of cognitive psychology in the view of recognizing individuals’ biases to guide a deeply informed PMS implementation. Indeed, relying on impressions rather than evidence, humans tend to make systematic mistakes in judgements and decisions. Faced with alternatives, individuals demonstrated taking irrational decisions that fall into categories of

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cognitive distortions predicted by rational models (Abatecola *et al.*, 2018). In particular, traps and heuristics are intrinsic elements of the cognitive operations to form such choices (Tversky and Kahneman, 1974). These biases represent the single elements to analyze, across all process steps (Nutt, 2011), as they are at the basis of the behavioral criticalities discussed.

### 3. Research methodology

#### 3.1 Research design

In this paper, the authors want to collect primary data to contribute to integrating behavioral strategy into performance management practice as a nascent field of study. To this end, we used a double-step process made up of survey (Hristov *et al.*, 2021a), to generate the sample and collecting demographic data, and a semi-structured interview approach, aiming to gather rich and detailed evaluations and impressions from managers as well, which are particularly adapted to explore the managerial perception of the main issues related to the cognitive biases in the decision-making process (Edmondson and McManus, 2007), and coherently with the research questions defined in this study, as explained in Section 1. Consequently, quantitative data emerging from structured questions are interpreted through statistical observations (Section 4). Qualitative data, collected by open questions, are interpreted by means of a thematic analysis, which is aimed to highlight recurring concepts and issues that could be confirmed or revised in future research (Section 5). Finally, in view of the results obtained, a theoretical framework is drawn up and commented on as a proposed contribution to figure out the main drivers that emerged as a key element for a responsible and successful company that proactively places itself in the competitive environment (Section 6). To provide the readers with a clear view of the whole process from the aim to the results, Figure 1, reworked from Clauss and Tangpong (2019), systematically reports the research methodology steps.

#### 3.2 Data collection and ethics

Respondents have been selected using the AIDA [1] database and personal contacts. Emails were sent to a total of 556 professionals asking some basic information and their experience with PMS issues. In this first step, we filtered companies with over 1,000 employees, as they are expected to have more sophisticated PMS to manage (Lisi, 2015; Hristov *et al.*, 2021a), and the availability of a Web page and an email address or phone number. Respondents were asked to anonymously answer on the basis of their whole career experiences and not referring to a single case. In the pre-session of the interviews, we focused on the general demographics and on work experience with PMS issues. We received a total of 145 answers. At this point of our research, to ensure the validity and the rigor of the selection process, we identified those managers to be included in our final sample based on their experience (more than five years of managing management control) and their position in the company (middle and top manager). We netted 114 managers. We identified and contacted the 114 managers by email to verify their availability for online interviews (by Microsoft Teams and by phone) and 104 (91%) confirmed their participation (Meade and Craig, 2012). All managers contacted were informed of the study's purpose and confidentiality of data. No incentives to participate were proposed. The interviews with the final sample (72 face-to-face and 32 by phone) lasted 44 min on average (from 38 to 50 min), and all the data were analyzed by categorizing the responses into the main conceptual dimensions. We asked the respondents to check the information transcribed from the interviews for potential inaccuracies (Bortolotti *et al.*, 2015). To verify and improve the validity of the results, the authors offered the participants the final results of the experiment. To improve internal

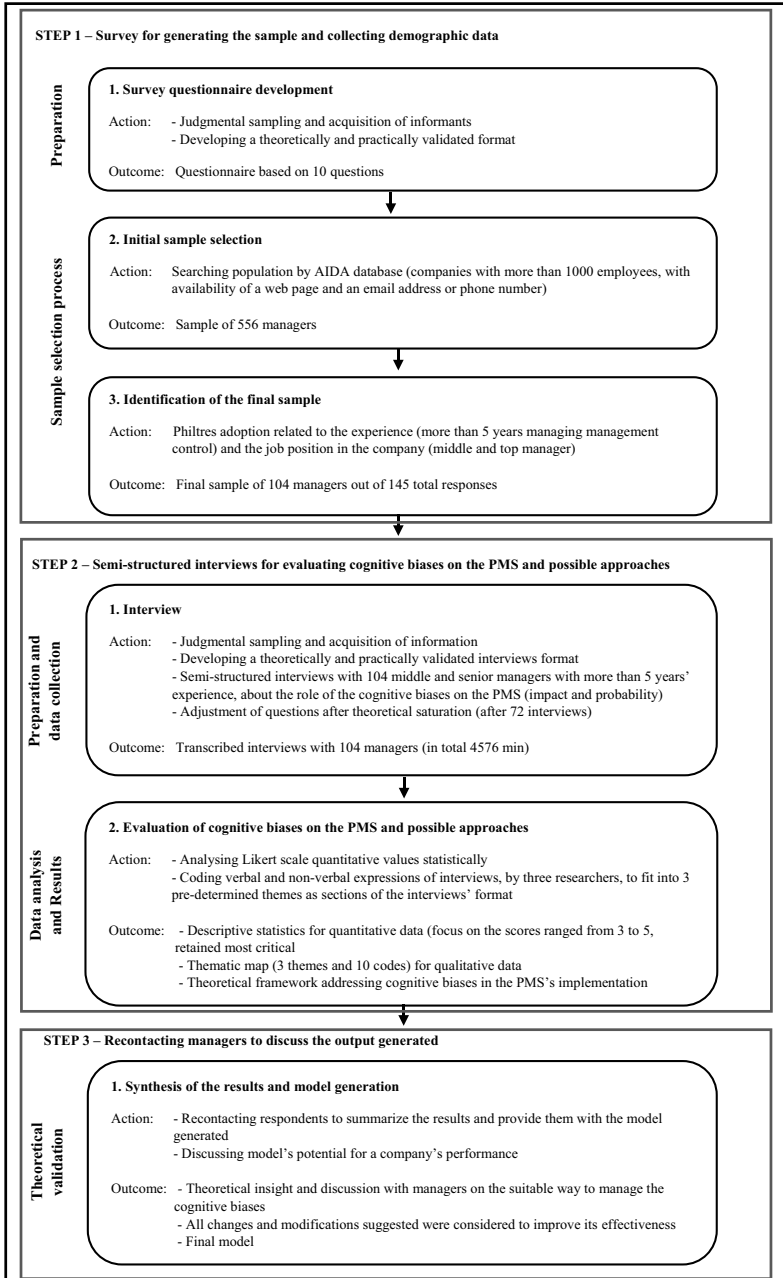


Figure 1. Research methodological approach

validity and reduce researcher bias, we triangulated the data collected from the interviews with secondary data from the literature reviewed (Eisenhardt and Graebner, 2007).

Table 1 shows all demographic data of the final sample selected with regard to experience, job position, gender, age and industry. Thus, it is possible to generate a prototype of the respondent. It is revealed that most frequent kind of participant was a male (64%), who worked in the field of financial services (47%) and occupied senior positions (65%) as he has 6–10 years' experience on a PMS (57%). However, it is fitting to specify that the selected sample is influenced by the filters applied in the preliminary step of research, as explained before.

### 3.3 Data analysis

To analyze data, we used a rigorous procedure, described as follows. Data provided by managers were analyzed by using a specific research procedure and aimed to support the research questions defined. First, quantitative data were analyzed based on a statistical description of the scores attributed by the managers on the probability and impact of the cognitive biases. In particular, to make the experiment data more focused and manageable, possible answers are limited and expressed by the five-point Likert-type scale (Lisi, 2015)

Description	Survey		Final sample	
	No.	(%)	No.	(%)
<i>Years of experience on PMS</i>				
>10	46	32	45	43
6–10	61	42	59	57
2–5	38	26	0	0
Total	145	100	104	100
<i>Position</i>				
Senior	78	54	68	65
Middle	45	31	36	35
Junior	22	15	0	0
Total	145	100	104	100
<i>Gender</i>				
Male	82	57	67	64
Female	63	43	37	36
Total	145	100	104	100
<i>Age</i>				
51–60	23	16	16	15
41–50	47	32	39	38
30–40	63	44	48	46
<30	12	8	1	1
Total	145	100	104	100
<i>Sector</i>				
Manufacturing	16	11	15	14
Commerce	18	12	11	11
Oil and gas	12	9	5	5
Financial services	60	41	49	47
Informatic services	15	10	9	9
Other	24	17	15	14
Total	145	100	104	100

**Table 1.**  
Demographic data

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ranging from 1 (lowest value of probability and impact) to 5 (highest value of probability and impact). The average scores of all items are reported to draw conclusions on the most and least critical cognitive distortions.

Second, the qualitative data were analyzed by using a structured thematic analysis approach (Braun and Clarke, 2006), based on three main “themes” inductively generated (practices and measures in evaluating cognitive biases, value drivers to implement PMS oriented to manage cognitive biases and main critical issues related to the adoption of strategy aimed to reduce the impact of the cognitive biases on the performance), as explained below. The authors chose this method because of its recognized suitability for psychological studies and specific procedures for qualitative analyses are observed.

First, once preliminary analyses had been developed from the respective datasets, the authors combined the analyses and transcribed the answers of the interviews into a written form to familiarize themselves with the data (Riessman, 1993). Reading of the outputs was deep and repeated, and the extensive transcriptions of the interviews aimed to capture verbal and non-verbal expressions (hesitations, winks). “Themes,” generally accepted as meaningful groups where data interpretation occurs (Tuckett, 2005), are already represented by pre-determined sections of the questionnaire (practices and measures in Section 3, value drivers in Section 4 and integration criticalities in Section 5). Separately, for each theory-driven theme, the “coding” process was manually performed following a deductive approach (Boyatzis, 1998). We assigned one or more short sentences to each answer transcribed. The process even included drawing and signaling, through colored pens; each kind of data extracted to ensure all contents were coded, including those unmeaningful data that will be discarded later. In Table 3, examples of the codes assigned to the qualitative data are provided (Braun and Clarke, 2006). In gathering the qualitative information from interviewees, we reached data saturation (Guest *et al.*, 2006) relatively late. This is likely because of the novelty of the topic and/or the independence of interviews performed individually, and the total number of codes (10) was created after 72 interviews.

All data generated were used, first, to provide a clear picture of the cognitive distortions, and their impact, affecting managers in implementing a PMS (RQ1). In addition, the interpretation of the results, and their discussion with the managers, supported the development of the theoretical model oriented to a suitable integration of the cognitive biases in the PMS (RQ2).

## 4. Research findings

### 4.1 Descriptive analysis

The interview protocol used in this paper (see Appendix 1) is based on Kahneman *et al.*'s (2011) checklist. Such checklist successfully gathers significant potential biases related to the human cognitive process, including several kinds of distortions reported in literature (Tversky and Kahneman, 1973; Russo and Schoemaker, 1990; Hammond *et al.*, 1998). A profitable application of the checklist was already provided by Cristofaro (2017) for deciphering and reducing biases of decision-making processes in complex organizations. In particular, Kahneman (2011) divided human cognitive functioning into two isolated brain systems: System 1, responsible for perceptions (intuitive and unconscious thoughts flow uncontrolled and effortlessly), and System 2 oversees judgements, whereby thoughts are consciously controlled. Based on these assumptions, Kahneman *et al.*'s (2011) checklist is considered for exploiting System 2 of a third party to recognize cognitive biases in System 1 of decision-makers (Caputo, 2016) through specific questions to practitioners. Therefore, we formulated our own structured questions for interviews to identify and assess managers' cognitive biases during a PMS's implementation. In particular, the process of implementing



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the PMS is developed through precise steps, which are theoretically and practically tested by [Ferreira and Otley's \(2009\)](#) framework. By means of the first two open questions, we introduced basic concepts of cognitive biases and, on the basis of the checklist and framework, assigned potential cognitive biases to each phase of the PMS's implementation process. Once the biases were divided into steps, we re-contacted the managers who confirmed the categorization. Managers, who represented the decision-makers of the PMS at different hierarchical levels, answer questions based on the five-point Likert-type scale on

- probability a certain cognitive distortion, unnamed but descriptive in its effect, happens in a specific phase of PMS's implementation; and
- its eventual degree of negative impact on the whole system.

In accordance with managers, a score ranged from 3 to 5 was previously defined as a critical level and deserving to be signaled. The results, together with a description of biases and their effect on the PMS's implementation, are reported in [Table 2](#).

Accordingly, we found that all scores range between 2.12 (probability of anchoring bias in the KPIs' setting) and 4.00 (impact of disaster neglect in target setting). Standard deviation (SD) is limited to 1.31 (impact of groupthink in performance evaluation) or lower values. In general, the mean of scores attributed to impact of biases (3.29) is higher than the probability they will happen (2.65), which is likely because of reasonable concerns about events, that are harmful by definition, that are faced to be reduced. Thus, the warning levels to observe are different between probabilities and impacts.

First, it is revealed that decision-makers often set a vision and mission that are affected by some personal interests (self-interested bias reported 3.20 in this phase). As perception of self-interested bias may be particularly subconsciously influenced, the authors focused on its eventual impact on the system ([Kahneman et al., 2011](#)), which widely reports significant values throughout the phases. Moreover, to involve company members, managers use stories and ways they emotionally like, but which are quite ineffective on others (affect heuristic at 2.96). It is possible top managers feel almost free to choose the direction to take and then look for a way to align others' motivations, even though a virtuous procedure concerns shared milestones to generate proactive interests throughout the organization.

In view of a mission being declared, managers select CSFs that are often biased by self-interest (2.95). It looks to be logical because of the strict connection between given objectives and key factors to reach them. Nevertheless, individuals do not adhere to objectives built on an old range of information about the competitive environment (2.12). However, respondents perceive the case as very negative (3.64) as these objectives were based on limited information about the market and the general context; in fact, goals are deployed down to lower organizational levels, hence these are continuously tested.

Practitioners' major concerns arise when decision-makers have to draw strategies and plans. Decision-makers at this point frequently adopt a past successful strategy to pursue current critical objectives (saliency bias at 3.68). This phase is usually managed by top managers, who are supposed to have substantial experience and be, at least, partially successful.

On the other hand, the lowest level of practitioners' criticism is noticed when managers set KPIs to measure company activity (2.22 and 2.12). Indeed, indicators are perceived as updated to the current objectives, strategies and competitive environment. Although several kinds of KPIs exist, a consolidated practice has tested and categorized these indicators in financial and non-financial dimensions, and thus possibilities are large but reliably limited.

Setting targets is a crucial task for managers as they should place required levels of performance for others and themselves. Indeed, professionals often consider decisions as

**Table 2.**  
Descriptive statistics

Step	Distortion	Description	Effect	Probability		Impact	
				Mean	SD	Mean	SD
Vision and mission	<i>Self-interested bias</i>	Decision-makers prefer to set a certain outcome linked to their personal interest (financial or non-financial)	Decision-makers have preferences for setting a certain initial outcome because of their own personal interest (financial or non-financial)	3.20	0.65	3.68	0.88
	<i>Affect heuristic</i>	Decision-makers minimize/exaggerate negative/positive outputs of something they emotionally like and vice versa	Decision-makers supposed to involve group members through stories and ways they like, without considering others' emotional drivers	2.96	0.79	3.16	1.16
	<i>Halo effect</i>	Decision-makers consider a person, an organization or an approach successful in a case as successful in another	Decision-makers choose generally successful objectives, instead of suitable ones	2.28	0.94	3.56	0.98
Critical success factors	<i>Self-interested bias</i>	Decision-makers prefer to set a certain outcome linked to their personal interest (financial or non-financial)	Decision-makers have preferences for a certain key factor to choose because of their own personal interest (financial or non-financial)	2.95	1.04	3.28	1.11
	<i>Availability bias</i>	Decision-makers take decisions on the basis of a limited range of data without engaging to find other information to get more	Decision-makers choose the key factors to pursue on the basis of a limited range of information they have about the market and the general context	2.48	1.05	3.64	1.09
	<i>Anchoring bias</i>	Decision-makers take decisions on the basis of an initial range of data without adjusting estimations according to the new information received	Decision-makers choose the key factors to pursue on the basis of an old range of information they have about the market and the general context	2.12	0.88	3.64	1.29
Strategies and plans	<i>Saliency bias</i>	Decision-makers tend to adopt a proposal that is similar to a successful one in the past	Decision-makers, to reach the objectives, adopt past successful strategies instead of basing on current objectives and CSFs	3.68	0.63	3.48	1.24
	<i>Availability bias</i>	Decision-makers take decisions on the basis of a limited range of data without engaging to find other information to get more	Decision-makers choose the KPIs to adopt on the basis of a limited range of information they have about the company objectives, CSFs and plans	2.22	0.88	3.16	1.16
Key performance indicators	<i>Anchoring bias</i>	Decision-makers take decisions on the basis of an initial range of data without adjusting estimations according to the new information received	Decision-makers choose the KPIs to adopt on the basis of an old range of information they have about the company objectives, CSFs and plans	2.12	0.94	3.35	1.24
	<i>Self-interested bias</i>	Decision-makers prefer to set a certain outcome linked to their personal interest (financial or non-financial)	Decision-makers have preferences to select a certain target because of their own personal interest (financial or non-financial)	2.96	1.17	3.32	1.16

(continued)

Step	Distortion	Description	Effect	Probability		Impact	
				Mean	SD	Mean	SD
	<i>Availability bias</i>	Decision-makers take decisions on the basis of a limited range of data without engaging to find other information to get more	Decision-makers choose the targets to pursue on the basis of a limited range of information they have about the market and the general context	2.64	0.99	3.32	0.97
	<i>Groupthink</i>	Decision-makers choose largely approved options to avoid conflicts	Decision-makers group chooses low targets no to stress each other's work, to avoid conflicts	2.20	1.12	2.88	1.21
	<i>Anchoring bias</i>	Decision-makers take decisions on the basis of an initial range of data without adjusting estimations according to the new information received	Decision-makers choose the targets to pursue on the basis of an old range of information they have about the market and the general context	2.28	0.79	3.28	1.04
	<i>Sunk cost</i>	Decision-makers consider new investments not disregarding past expenditures that do not affect future costs or revenues	Decision-makers underestimate potential targets because they are influenced by past expenditures already absorbed	2.68	1.22	3.04	1.18
	Decision-makers overestimate forecasts because of their optimism	<i>Overconfidence</i>	Decision-makers overestimate forecast relying on an overly optimistic base case	3.36	1.09		
	<i>Disaster neglect</i>	2.60	0.87				
	<i>Loss aversion</i>	Decision-makers do not properly build the worst scenario	Decision-makers do not forecast the pessimistic scenario as negative enough and they will not be prepared for its consequences	2.72	1.02	4.00	0.89
	Decision-makers take risky decisions preferring to avoid losses than desire gains	Decision-makers select more prudent targets because they prefer to avoid losses than desire gains	2.76	0.93	2.80	1.20	
	<i>Self-interested bias</i>	Decision-makers have preferences for positively evaluating a certain individual or group		2.84	1.25	3.20	1.08

(continued)

Table 2.

Cognitive biases

Table 2.

Step	Distortion	Description	Effect	Probability		Impact	
				Mean	SD	Mean	SD
		Decision-makers prefer to set a certain outcome linked to their personal interest (financial or non-financial)	performance because of their own personal interest (financial or non-financial)	2.90	0.88	3.30	0.85
	<i>Affect heuristic</i>	Decision-makers minimize/exaggerate negative/positive outputs of something they emotionally like and vice versa	Decision-makers minimize/exaggerate negative/positive performances of something they emotionally like and vice versa	2.89	0.95	3.34	1.06
	<i>Confirmation bias</i>	Decision-makers focus only on the alternative for which they aim to find confirmation	Decision-makers focus on evaluating only data confirming their initial impressions	2.52	1.12	3.04	1.31
	<i>Groupthink</i>	Decision-makers choose largely approved options to avoid conflicts	Decision-makers' group positively evaluates each other's individual performances, instead of being impartial, to avoid conflicts	2.17	1.23	3.04	1.22
Reward system	<i>Self-interested bias</i>	Decision-makers prefer to set a certain outcome linked to their personal interest (financial or non-financial)	Decision-makers have preferences for a certain reward policy because of their own personal interest (financial or non-financial)	2.60	1.04	3.10	1.17
PMSs change	<i>Availability bias</i>	Decision-makers take decisions on the basis of a limited range of data without engaging to find other information to get more	Decision-makers do not adjust PMS in response to company and context dynamics because of a limited range of information	2.52	1.12	3.09	1.14
	<i>Anchoring bias</i>	Decision-makers take decisions on the basis of an initial range of data without adjusting estimations according to the new information received	Decision-makers do not adjust PMS in response to company and context dynamics because of an old range of information				

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self-interested (self-interested bias had 2.96 in this phase). Nevertheless, targets are generally decided independently (groupthink at 2.20), conscious of the current situation (reduced availability and anchoring biases) and alternatives (low values of probability on sunk cost, disaster neglect and loss aversion). Despite practitioners perceiving balanced targets between pessimistic and optimistic options, they even admit the strongly damaging impact of a scenario that is not negative enough and the effect it might have on the whole system and the organization (disaster neglect scored 4.00). When exceeding minimum liquidity targets, banks might experience a stoppage and this eventuality looks to generate the highest perception of harmfulness.

Managers sometimes evaluate their and others' performances as biased by their own expectations (confirmation bias at 2.84) and emotionally driven (affect heuristic at 2.90). Nonetheless, we hypothesize that biases in performance evaluation are basically informal as decision-makers do not objectively attribute themselves higher unfounded rewards (2.17), which is likely because of difficulty in justifying issues.

Finally, once the PMS's phases are concluded, managers do not appear to be stuck in the past (2.52) or in limited positions (2.60) in view of needed changes imposed by the dynamic context.

In general, the authors notice a frequency trend of those biases unforced by numerical parameters and, in general, when decision-makers have higher managerial discretion (Hambrick and Finkelstein, 1987). Vision, mission, strategies and plans should be shared among members of the organization; nevertheless, these phases are characterized by reduced external controls on those usually in charge: the senior managers. On the contrary, KPIs and rewards are numerically expressed and, usually, addressed by benchmarks, internal agreements, best practices and legal contracts. These definitively look like deterring factors to the thoughts in managers' System 1 (Kahneman, 2011). Environmental instability was revealed as a positive determinant of managerial discretion (Hambrick and Abrahamson, 1995) and, coherently, Finkelstein and Peteraf (2007) concluded that higher uncertainty activities increase managerial discretion by reducing the likelihood and effectiveness of constraints on managerial action (Abatecola and Cristofaro, 2018). Thus KPIs, benchmarks, contracts and all the deterring factors for managerial discretion contemporarily reduce uncertainty of managerial activities and likelihood of arising cognitive biases.

Even in terms of potential negative impact, it seems logical to be concerned about the fundamental stages of a process. Indeed, the most critical biases are those arising in the first, and most strategic, phases of the PMS's implementation as they could consequentially compromise the outcomes of all the next steps. On the other side, no critical impact scores are reported in steps where the performances have already occurred (performance evaluation, target setting and PMS change).

#### 4.2 Thematic analysis

As introduced in Section 3.3, following the discussion of the cognitive biases in terms of probability and impact for organizations that implement a structured PMS, we adopt a thematic analysis approach to analyze the managerial practices and measures that were actually used to manage distortions at a strategic level, as well as the value drivers that were useful to support the integration process and main critical issues in adopting a behavioral strategy oriented to reduce the impact of the cognitive biases on the performance, as shown in Table 3. In this part, qualitative information, gathered in Sections 3–5 of the questionnaire, is processed by means of thematic analysis. The validity of this approach was repeatedly underscored in psychological studies that undertake interviews (Braun and

**Table 3.**  
Key elements in  
integrating  
behavioral strategy  
to reduce cognitive  
biases in the PMS's  
implementation

Theme	Description	Sample of data transcribed	Code generated	Main output
Practices and measures	Approaches and activities actually used by managers to reduce impact of cognitive biases on PMS's implementation	"like in all organisations, I suppose (looking for confirmation nod), relevant decisions start as a kind of democratic debate" (No. 80) "it would be nice to have possibility of, at least partially, address arbitrariness of deans" (No. 7) "performance management team's inclusion should be measured, as everything that matters" (No. 62)	Semi-democratic discussion on key decisions Controlling seniors' discretion Measures of group involvement in key phases	We generated a set of key measures aimed to manage and reduce the biases at a strategic level (see the second pillar of the model shown in <a href="#">Figure 2</a> )
Value drivers	Goal-oriented reasons to take over practices and measures to reduce impact of cognitive biases on PMS's implementation	"in my opinion decisions would be clearer to all participants and mostly to deciders (laughing)" (No. 22) "sharing decisions always cause cascading interest, even newness of the system will generate global curiosity and engagement (optimism)" (No. 102) "for sure general performances would increase through a more weighted PMS" (No. 15) "a new approach like this could make everything more transparent I think [...] even more justifiable and so honest, why not?" (No. 66) "whether this approach does not exist, there must be a reason" (No. 8) "so you know it's hard to convince a senior to control himself as he would not have I suppose reasons to [...] it could look (pause) hard" (No. 37) "it is currently missing a real approach thus it seems everything difficult" (No. 45)	Higher comprehension Top-down engagement  Performance improvement Ethical cues	Potential outcomes are identified, when cognitive biases are addressed in the PMS's implementation (see the third pillar of the model shown in <a href="#">Figure 2</a> )
Main critical issues in adoption a strategy oriented to reduce the impact of the cognitive biases on the performance	Technical, organizational and personal issues met in attempting to reduce impact of cognitive biases on PMS's implementation		Cultural factor Seniors' control aversion  Rarity of managerial tools for seniors' control	Data suggest that the integration need to be addressed by generating a strategic alignment of most critical cognitive biases and act and plan of the strategy (see the connection between second and third pillar in the model shown in <a href="#">Figure 2</a> )

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Clarke, 2006). To have a clear picture of the interviews held, transcribed data, codes and themes, the authors draw a table below of the thematic analysis performed.

*Practices and measures.* The interviews coded as in Table 3, with regard to practices and measures, provide insight on how managers, in addressing the integration process, adopt potential solutions, implemented or not, to reduce cognitive biases highlighted previously. Nearly all the respondents (91%) agreed on absence of specific measures to reduce biases and heuristics during the PMS's implementation. First, an observation from the interviews highlights that this is a critical point, because it exists a lack of structured approaches and measures aimed to manage the cognitive biases at a strategic level. As noted by the respondent (No. 6) "no indicators, as well as formal or informal numerical parameters, were used to face this issue." Nevertheless, the majority of them supposed to have some positive effects on "contrasting individuals' distortion by means of a group discussion" (No. 14), based on "generic and unformalized democratic principles" (No. 24). Regarding the practices described, managers confirmed their effectiveness only when "hierarchical effect is not direct" (No. 49), thus, phases in which managerial discretion is lower. Indeed, the interviews further suggest that "democratic levers matter in group discussion but, whether top-ranked managers have the possibility to impose the line, they usually do" (No. 70).

Despite this observation, the authors have no statistical evidence to state that ineffective practices lead to biases or vice versa. We conclude that managerial discretion is associated with a higher likelihood and impact of cognitive distortions on the PMS's implementation and, in the meantime, with lower degrees to reduce this issue. It seems logical to hear out participants who propose to face the problem by implementing objective measures even where managerial discretion is higher, namely, in the first steps of the PMS's implementation. For Question 30, specific indicators focused on strategic alignment and larger inclusion was even proposed, such as "weighted members' agreement on that objective" (No. 14) or "members' motivation on a goal-strategy combination" (No. 30). Finally, managers hope for a "more involved" (No. 12), not necessarily democratic, team of performance management.

*Value drivers.* Analysis of the data generated by managers showed that reducing cognitive distortions in the PMS's implementation depends on several organizational factors. First, the cultural dimension assumed by the organization is essential to fulfil this process. Managers suggested that organizations "do not undertake actions without a clear tangible or at least intangible advantage" (No. 17); the interviews also highlight that "in absence of a continuous improvement mind, the organizations repeat mandatory actions or undertake ones which already gave proved outcomes" (No. 33).

Thus, it is necessary to prepare, through a top-down learning procedure, all members to integrate a context where biases may be "monitored and controlled" (No. 44). A full integration will not be achieved until the cultural change happened. This process has to demonstrate its value through involving internal and external factors. In this context, our analysis could impact the sensitivity of all the organization's members and, consequently, top managers. In particular, some internal drivers connected to "ethical cues," such as "transparency" (No. 1), "motivation" (No. 13), "long-term orientation" (No. 27) and "management commitment" (No. 70), are required to support the acceptance of the integration process.

Nevertheless, considering its complexity, the integration should be based on a "combination of organizational and performance drivers" (No. 5). Many respondents emphasized the potential positive results on the performance by reducing cognitive biases associated to the PMS's implementation in small and medium enterprises (SMEs), and strategic and operational levels here are very close.

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Managers suppose that solutions, mainly expressed in terms of measures discussed in Section 3 of the questionnaire, most likely because of being proposed by themselves, may positively affect the PMS, and the organization as a whole, in several directions. Mainly noticed were the strategic advantages gained in parallel with comprehension and inclusion, witnessed by answers similar to the following: “an imminent rise in comprehension of general objectives and linked strategies which, in contrast, usually appear vaguely decided in a small group of self-interested senior managers” (No. 23).

Therefore, as middle and junior managers better understand shared directions, a cascading effect positively addresses the whole organization through a top-down engagement to the operational levels. This will probably provide improved outcomes in terms of organizational and economic performances.

*Main critical issues in adopting a strategy oriented to reduce the impact of the cognitive biases on the performance.* Despite management commitment and efforts, reducing cognitive biases in the PMS's implementation still remains a major challenge for decision-makers. Several issues emerged from the interviews. In particular, the last section of the questionnaire (from Question number 35 to 38) hosts professionals' perceptions on difficulties in integrating desirable measures and practices to reduce managers' distortions in implementing a PMS. The results reported in Section 4 are aligned with those emerging here; criticalities, in adopting a strategy oriented to reduce the impact of the cognitive biases on the performance, are essentially concentrated on “senior managers' resistance to have their decisions monitored and definitively evaluated” (No. 28). The PMS's implementation steps that have weaker distortive effects are characterized by lower managerial discretion because of deterring factors such as “benchmarks” (No. 31), “internal agreements” (Nos. 44 and 51), “best practices” (Nos. 45, 51, 54 and 66), and “legal contracts” (no. 17). Nevertheless, managerial discretion is even the main criticality met, as confirmed by practitioners' answers such as: “senior managers suppose to already have a technical background that allows them to prevent distortions to be monitored” (No. 68).

Respondents affirm that this resistance is originally because of the cultural factor, but they suppose that, as it normally happened with the progress of managerial science, proper development and explanation of technical tools, nowadays it is nearly inexistent in their organization, and could address the criticalities reported. Indeed, one respondent directly states that “cultural resistance has been repeatedly undermined by innovations, never say never” (No. 71).

In the case of any organizational change, the cultural factor seems to be, at the same time, the main driver and the biggest obstacle to the realization (Hristov *et al.*, 2021a). Therefore, it is crucial to show strong evidence of the benefits linked to higher control of the fundamental steps of the PMS's implementation process.

## 5. Theoretical development

In line with our findings, Figure 2 presents a model developed by synthesizing the key results of the semi-structured interviews in this study, aiming to provide a clear view of the main drivers in integrating cognitive biases at a strategic level, by suggesting how to reduce them in a PMS's implementation. In the last round (third) of interviews, we showed the model we generated to the managers and discussed its potential for a company's performance. All changes and modifications suggested in this phase were considered to improve its effectiveness.

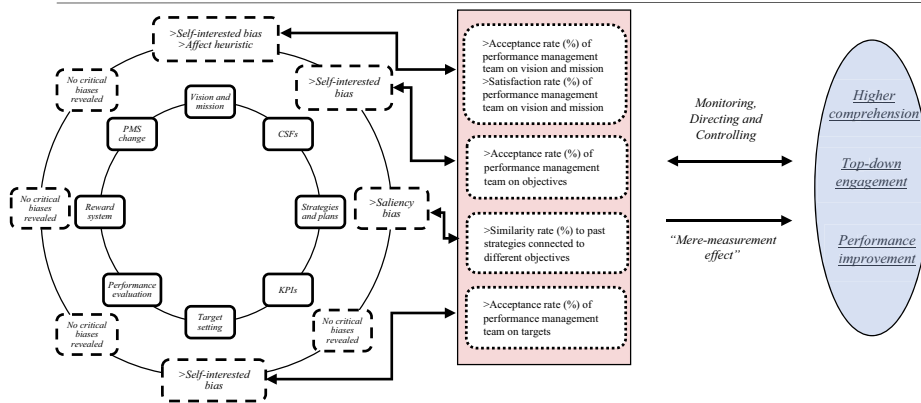
Coherently with our findings, the framework is based on three main pillars: the link between critical managers' cognitive biases and the PMS's implementation steps; the adoption of a strategic alignment process into an early stage of the PMS's implementation



Link between critical managers' cognitive biases and the PMS's implementation steps

Behavioral strategy integration in an early stage of the PMS's implementation based on the measures proposed to reduce specific biases

Potential outcomes generated by the strategic alignment



**Figure 2.** Strategic integration of behavioral strategy to reduce cognitive biases

based on the measures suggested to reduce specific biases; and the potential positive outcomes because of the adoption of such measures.

Given that the interview data have suggested to develop a KPI system to reduce cognitive biases' impact in specific phases of the PMS's implementation, all measures, as specifically discussed with the managers, were designated to monitor and manage cognitive biases at a strategic level. Moreover, the links between first and second pillars of our model are presented by the double-headed arrows (Claus and Tangpong, 2019), because the KPIs cover the double role, as a tool to integrate cognitive biases analysis in an early stage of the PMS's implementation (define and plan), and as a measurement system to assess performances concerning current level of biases, providing useful feedback to support the reformulation of the PMS' cycle (Hristov et al., 2021b). Accordingly, we have added a small step to facilitate the cognitive biases analysis in managerial practices. The KPI system presented below can be considered as a starting point that requires practical application in future studies. About the link between the second and third pillar, it was discussed with managers that measures are aimed at generating a strategic alignment, monitoring, eventually controlling and directing the whole process of the behavioral strategy implementation to obtain desired outcomes (Kaplan and Norton, 2001). In addition, the relation could be even recursive because outcomes provide feedbacks about the effectiveness on the KPI system adopted (Koontz, 1958). Differently, the connection between second and third pillars guided by the "mere-measurement effect," and illustrated by the lower arrow, is unidirectional as the measures' existence alone influences outcomes for a behavioral postulate provided by Thaler and Sunstein (2008).

*Link between critical managers' cognitive biases and the PMS's implementation steps.* The first pillar describes the systematic steps, in non-dashed rectangles, to implement a PMS (internal cycle) and, in the meantime, for each step of the PMS process, the most critical cognitive biases (dashed rectangles along the external cycle) are signaled and interpreted, mainly based on the probability of observing distortions in association with a relevant level of impact on the whole system. We focused on the cognitive biases, throughout all the phases of the PMS implementation, with a score assigned from minimum 3 (rounding up to the first decimal place, for example, 2.95 is included), retained most critical. It contextually

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offers a clear view on the field to work on, and the main drivers, to integrate a behavioral strategy into the procedure. These steps are fundamental in our analysis as they represent time and space to reveal the occurrence of biases. The self-interested bias, saliency bias and affect heuristics were reported as those most critical biases among others and are typically revealed in the first phases of the PMS's implementation. Some rectangles of the external circle do not report relative biases as they did not assume alarming values (score assigned was less than 3). Theory and practice converge to reveal the occurrence in the PMS steps where individuals, usually senior managers, have a higher degree of managerial discretion because of the lack of objective measures that act as deterring factors such as benchmarks, internal agreements, best practices and legal contracts. The lack of these elements contributes to generate a higher uncertainty environment where cognitive biases favorably grow.

*Behavioral strategy integration in an early stage of the PMS's implementation based on the measures proposed to reduce specific biases.* The interviews coded provide insights about the need to develop specific measures aimed to reduce the biases outlined. We analyzed the issues emerged and listed similarities and differences between each code assigned according to variables of interest (Table 3). Accordingly, this led us to propose specific measures, to be practically implemented by managers, as highlighted in the red square of the model. These measures emerge from interpretation of practitioners' suggestions in response to theory-driven questions. Self-interested biases of senior managers in different steps may be faced by the same kind of measures as the phenomenon one. The acceptance rate measures, by means of internal voting, how much the members of the performance management team agree on a certain vision, mission, rank of objectives and series of targets. To check whether senior managers profitably involved and motivated team members, the affect heuristic may eventually be addressed through an internal structured questionnaire to measure satisfaction rate. The similarity rate between past and present strategies, referring to different objectives, could express the risk of a saliency bias.

The interviews further suggest that each organization may associate a numerical threshold to measures agreed to monitor the relative results and, in the case of a negative response, intervene to undistort the PMS's implementation. Meanwhile, a substitutive and/or complementary effect on reducing cognitive biases may be played by a "nudge" (Hansen and Jespersen, 2013), specifically named as "mere-measurement effect," as shown by the lower arrow. The latter states that the simple existence of a measure on a certain individual's intention is able to change his/her subsequent behavior in a desired perspective (Thaler and Sunstein, 2008). All measures need to be integrated at an early stage (plan and define) of the PMS's implementation to generate a strategic alignment and transmission levers that may hopefully guide practitioners to positive outcomes.

*Potential outcomes generated by the strategic alignment.* The model clearly highlights, as a third pillar in the blue oval, the potential advantages of adopting the set of measures in response to the probable existence of cognitive biases as a third pillar. Whether hierarchically lower members are asked to take a position on a certain matter, they increase the level of understanding and upper decision-makers tend to engage them more. Thus, the general degree of comprehension among individuals is improved and, as a consequence, a top-down process of member-to-member involvement could start. It finally results in an improved organizational performance which, often, will be even measured by economic parameters. In a shining future, our behavioral strategy proposition will direct the PMS's implementation, being conscious of issues and relative solutions provided. In the meantime, a comparison between actions taken and consequent changes in the original field of the PMS's implementation steps will work as an ex post controlling procedure.

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## 6. Theoretical and managerial implications

The framework outlined in this research paves the way for future studies on behavioral strategy, by providing guidance for managers and academics to explore the key value drivers around the link between critical managers' cognitive biases and the PMS's implementation.

The research findings, and their interpretation, provide theoretical contribution, supported by the managerial practices, on the most "critical" cognitive biases, and their interpretation, at a strategic level, contributing to extend the results advanced by [Kahneman \(2011\)](#) and [Cristofaro \(2017\)](#), in a PMS's implementation context. Once critical cognitive biases are convincingly prioritized and contextualized, future approaches will keep trying to figure them out. To find validations and hints, several attempts, with different aims, have already addressed biases to improve organizational and individual performances relying on models ([Neck and Manz, 1992](#); [D'Intino et al., 2007](#)), third-party intervention ([Caputo, 2016](#)), theories ([Cristofaro, 2020](#)) and "nudges" ([Thaler and Sunstein, 2008](#)). In this direction, our theoretical framework may be confirmed, modified according to the cases considered or even revised to develop a new one.

In addition, research findings provide managers with cognitive information about their and others' role in the decision-making process of the PMS's implementation. In particular, practitioners can become familiar with frequent biases affecting individuals' System 1 ([Kahneman, 2011](#)), and the potential negative impact, even by means of practical examples. This seems relevant because, as mentioned in the introduction to this paper, the role of cognitive psychology in performance management practice has not been affirmed yet. Moreover, thanks to opinions of experienced respondents, who were properly processed, the targeted audience of senior managers is invited to reconsider and reweight this critical role in the first phases of the process.

The framework provides the management of organizations with numerous specific contents. The implementation of a PMS includes differentiated moments of the process, and it clearly reminds the structured steps as phases of the analysis. Managers may recontextualize their own and others' tasks in the view of a new conscious approach to the practice. Measures, which are aimed to be the main solutions to the proposal, may effectively help the organization in developing an undistorted PMS's implementation. In practice, each organization, according to its needs, may establish a numerical value of such measures to consider that piece of the process that is relatively free of the cognitive biases' effect. In addition, simply keeping in managers' mind the existence of the measures, in absence of thresholds, might represent that mere-measurement effect to make the PMS's implementation better, even without direct intervention. The framework proposed also shows potential outcomes of its adoption; thus, managers clearly realize the drivers of the new tool that acts as motivational factors. Consequentially, as the drivers culminate in final improvement of organizational and economic performances, the newness of the framework proposed may represent a strategic advantage on competitors.

Finally, we even processed potential criticalities managers encounter in integrating the approach to reduce biases. Thus, practitioners are already prepared for issues to countervail by means of the drivers, as previously discussed.

## 7. Conclusions and limitations of the research

Considering authoritative studies, we tested the [Kahneman et al. \(2011\)](#) checklist's biases associated to specific moments of the PMS's implementation. Additional biases and heuristics, existing in cognitive psychology literature, could play a relevant role in influencing managers' decision-making processes. A long series of rare effects should not be

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ignored as they could overturn the PMS's implementation, such as mental disorders, beliefs, spirituality as well as creating dominant coalitions (Ackers Preston, 1997). Also, the PMS's steps may not be exhaustive in describing all the strategic phases when a decision must be taken among alternatives across all existing organizations.

In this paper, we considered general observations without distinguishing between organizational structures, such as functional or divisional, which change hierarchical relationships and redesign managers' interactions with scheme and group processes (Olson *et al.*, 2007). Similarly, some kinds of organizations implement performance management tools to manage relations with external actors, and thus cognitive biases may emerge in the supplier–buyer relationships (Tangpong *et al.*, 2015).

Our contribution may definitively represent a brick in the wall of the complete taxonomy of all managers' distortions and related effects in the performance management discipline. The limits signaled above will long offer space to widen the theoretical ground to perform qualitative research on the field. Distinguished conclusions may arise from case studies and surveys on single companies or categorized groups of them.

Pure cognitive biases, discussed in this paper, could explain, or be explained by, affective states such as happiness, sadness, fear or anger that strongly influence the decision-making process. In addition, next empirical analyses may exploit validated biases to discover new statistical correlations with managers' sociodemographic features (Hambrick and Mason, 1984) and personality types (Hough and Ogilvie, 2005; Jennings and Disney, 2006). Our results signal heavier and more harmful cognitive biases when managers' discretion increases. Behavioral studies have constantly analyzed CEOs' and managers' power in different nations and industries (Crossland and Hambrick, 2007; Hambrick and Quigley, 2014) as well as the effects on organizational and performance outcomes (Adams *et al.*, 2005; Li and Tang, 2010). In this context, research on managerial discretion may be addressed to figure out performance management issues.

Given that the interviewees provided evaluations on experiences they personally collected, neutrality on recognizing own and others' biases (e.g. self-interested, attribution, overconfidence, availability, anchoring) during interviews cannot be assured. Among others, the attribution bias could have played a major influence as participants might have attributed particular unrealistic behaviors to their colleagues' right to find confirmation of their own social vision of the world. However, the interviewers interpreted the qualitative data given by practitioners without warranty of subjectivity. Therefore, a practical implementation of the theoretical model is required.

In addition, we surveyed Italian managers only. A different nationality of participants would highlight diversities and/or similarities, with respect to ours, and new observations may be drawn. An international sample, as well, could revise, confirm or generalize the results obtained. Relevant surveys on decision-making processes have highlighted different findings motivated by cultural drivers (Mann, 1998; Müller *et al.*, 2009). Moreover, by interviewing managers with at least five years' experience, the evaluations reported in the questionnaire may be influenced by their role at the upper hierarchical levels of the organizations. For instance, self-interested biases at the initial phases of the PMS's implementation could be underestimated by senior managers who, according to our research, are those most affected.

#### Note

1. An online database containing financial, personal and commercial information on over 500,000 joint-stock and financial companies in Italy.

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## Appendix Questionnaire used for interviewing professionals

Section 1 – Overview on cognitive biases and classification			
<p>1. What do you mean as "cognitive biases"?</p> <p>2. According to the checklist of biases, how would you coherently attribute them to the steps of Performance Management System (PMS)?</p>			
Section 2 – Probability and impact of biases			
<p><i>The individual is asked to read the text of the event and, on the basis of the experiences collected during the entire career, indicate: the probability of the event occurring and its eventual harmfulness on the whole performance management system. The range of attributable values goes from 1 (minimum of probability and impact) to 5 (maximum of probability and impact), considering a score ranged from 3 to 5 as a critical level.</i></p>			
Phase	Event	Probability	Impact
Vision and mission	3. Decision makers have preferences for setting a certain initial outcome because of their own personal interest (financial or non-financial)		
	4. Decision makers suppose to involve group members through stories and ways they like, without considering others' emotional drivers		
	5. Decision makers choose generally successful objectives, instead of suitable ones		
Critical Success Factors (CSFs)	6. Decision makers have preferences for certain CSFs to choose because of their own personal interest (financial or non-financial)		
	7. Decision makers choose the CSFs to pursue on the basis of a limited range of information they have about the market and the general context		
	8. Decision makers choose the CSFs to pursue on the basis of an old range of information they have about the market and the general context		
Strategies and plans	9. Decision makers, to reach the objectives, adopt past successful strategies instead of basing on current objectives and CSFs		
Key Performance Indicators (KPIs)	10. Decision makers choose the KPIs to adopt on the basis of a limited range of information they have about the company objectives, CSFs and plans		
	11. Decision makers choose the KPIs to adopt on the basis of an old range of information they have about the company objectives, CSFs and plans		
Target setting	12. Decision makers have preferences to select a certain target because of their own personal interest (financial or non-financial)		
	13. Decision makers choose the targets to pursue on the basis of a limited range of information they have about the market and the general context		
	14. Decision makers' group chooses low targets no to stress each other's work, to avoid conflicts		
	15. Decision makers choose the targets to pursue on the basis of an old range of information they have about the market and the general context		
	16. Decision makers underestimate potential targets because they are influenced by past expenditures already absorbed		
	17. Decision makers overestimate forecasts because of their optimism		
	18. Decision makers do not forecast the pessimistic scenario as negative enough and they will not be prepared for its consequences		
Performance evaluation	19. Decision makers select more prudent targets because they prefer to avoid losses than desire gains		
	20. Decision makers have preferences for positively evaluating a certain individual or group performance because of their own personal interest (financial or non-financial)		
	21. Decision makers minimize/exaggerate negative/positive performances of something they emotionally like and vice versa		
	22. Decision makers focus on evaluating only data confirming their initial impressions		
Reward system	23. Decision makers' group positively evaluates each other's individual performances, instead of being impartial, to avoid conflicts		
	24. Decision makers have preferences for a certain reward policy because of their own personal interest (financial or non-financial)		
Performance Management System (PMS) change	25. Decision makers do not adjust PMS (Performance Management System) in response to company and context dynamics because of a limited range of information		
	26. Decision makers do not adjust PMS in response to company and context dynamics because of an old range of information		
Section 3 – Practices and measures			
<p>27. Have you ever been involved in activities to reduce cognitive biases?</p> <p>28. Based on experience, how do managers usually reduce cognitive biases?</p> <p>29. Do you think practices and measures integrated are effective in reducing cognitive biases?</p> <p>30. Would you suggest new practices and measures to reduce biases?</p>			
Section 4 – Value drivers			
<p>31. What are value drivers connected to the implementation of practices and measures in the PMS?</p> <p>32. What are collateral positive effects on the rest of the organization connected to the implementation of practices and measures in the PMS?</p> <p>33. Would you actively participate in team activities to reduce each other's cognitive biases in performance management practice?</p> <p>34. In general, do you think it is justifiable to open a new stream of literature to address cognitive biases in performance management practice?</p>			
Section 5 – Integration criticalities			
<p>35. Are there criticalities in integrating practices and measures to reduce cognitive biases?</p> <p>36. What are the main criticalities in implementing practices and measures to reduce cognitive biases?</p> <p>37. Do you think these criticalities are due to technical or human factors?</p> <p>38. Do you think, in a long-term perspective, practices and measures to reduce cognitive biases are weaker than criticalities associated to them?</p>			