The Relationship Between Research Knowledge and Skills and Manager Performance with Open-mindedness as a Moderator

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Abstract

Investigating the antecedents of manager performance is crucial due to the impact a manager's performance has on their subordinates and overall organisational outcomes. In this study, the competency research knowledge and skills was addressed as a main influencer of manager performance based on the theory behind evidence-based management. In line with this theory, open-mindedness was introduced as a variable expected to moderate the relationship between research knowledge and skills and manager performance. To test these two hypotheses, data from a questionnaire completed by 455 managers was analysed using multiple linear regression. Results of this study showed a positive and significant effect between research knowledge and skills and manager performance, suggesting that this competency leads to higher levels of manager performance. An insignificant result was found for the moderating role of open-mindedness. The implications of these results as well as the limitations of this study and future research recommendations were discussed.

Keywords: evidence-based management, research knowledge and skills, manager performance, open-mindedness, moderation, knowledge-based theory

The Relationship Between Research Knowledge and Skills and Manager Performance with Open-Mindedness as a Moderator

The performance of a manager is crucial to overall organisational outcomes, not only influencing their subordinates but also factors external to the organisation (Bertrand & Schoar, 2003). From a management perspective, researchers see how manager performance increases employee productivity. In addition, the field of occupational health focuses on how manager performance reduces productivity loss due to employee health impairment (Koopmans et al., 2011). Organisational psychologists may comment on the influence of manager performance on employee engagement and extra-role behaviour (Koopmans et al., 2011). Barney (1991) also identified manager performance as a key source of competitive advantage for organisations. Individual differences between managers also explain a significant extent of the heterogeneity in management styles and organisational outcomes (Bertrand & Schoar, 2003). Therefore, identifying the most efficient management style that leads to the most favourable organisational outcomes is crucial. The many pivotal outcomes of manager performance make research of its antecedents substantial.

One variable that can be used to explain manager performance is the competency research knowledge and skills. This includes all the knowledge and skills that are necessary for conducting research, such as searching for and understanding data, assessing its accuracy and being able to apply this to practice (Daouk-Öyry et al., 2020). Previous literature highlights the lack of manager knowledge in research as a constraint to manager performance (Barends et al., 2017; Daouk-Öyry et al., 2020). The influence of the variable research knowledge and skills on manager performance is explained through evidence-based management (EBMgt). The concept of evidence-based management is applied widely in the healthcare sector. Good quality evidence from different sources are used to improve medical recommendations or decisions. Instead of relying solely on personal experience and business

trends, EBMgt highlights the importance of consulting reliable evidence to help professionals make decisions. Therefore, the EBMgt framework should also be applied in organisational situations. EBMgt has been designed to resolve the gap between scientific theory and practice. Managers who possess the competency research knowledge and skills are able to better find, evaluate, and use evidence to steer their management, therefore leading to better manager performance.

In addition, the extent to which research knowledge and skills affects manager performance depends on the level of open-mindedness of the manager (Çemberci et al., 2021; Lin et al., 2022; Mitchell et al., 2012). This determines a manager's ability to be open for discussions with individuals who have differing perspectives as well as a manager's ability to critically reflect on their own reasoning (Lord, 2015; Mitchell et al., 2012). Managers who possess the research knowledge and skills to help their decision making, will improve their manager performance by a greater extent if they are open to evidence from different sources. Therefore, open-mindedness is included as a moderator in this paper. EBMgt is used to explain how open-mindedness influences the relationship between research knowledge and skills and manager performance (Daouk-Öyry et al., 2020).

Current academic papers about the influence of manager competencies such as research knowledge and skills on manager performance are scarce. Literature promoting EBMgt and its influence on performance are mainly based on opinion and anecdotal information (Reay et al., 2009). Sahakian et al. (2021) also highlight a lack of evidence for distal outcomes of manager competencies such as research knowledge and skills. In addition, the research that has been conducted is focused on the healthcare sector, (Barends et al., 2017; Liang et al., 2017; Sahakian et al., 2021; Wright et al., 2015) but is rare in management settings. The focus of EBMgt in hospitals is explained by the rapid amount of healthcare data due to digital transformations of health care systems and storage of medical records

(Sahakian et al., 2021). One academic paper studied the impact of research competencies on work performance of academic librarians in Pakistan (Malik et al., 2022).

By addressing these gaps, this paper contributes both theoretically and practically. Theoretically, the need for empirical studies in the EBMgt field with different contexts is fulfilled. EBMgt shows potential to improve manager performance in firms, instead of solely for medical decision making. By focusing on mainly European organisational managers, this paper contributes to EBMgt in an organisational setting with a management focus. In addition, this paper contributes theoretically regarding the manager competency research knowledge and skills. Currently, there is a lack of research around this specific competency, however, a manager's ability to find and evaluate evidence through research is the base of EBMgt. Finding the best available evidence is the first step to improving manager performance. This study aims to contribute to this gap, with a specific focus on managers and the competencies that they must possess and develop to improve organisational performance.

Moreover, this research has practical implications for organisations as the importance of the manager competency research knowledge and skills is highlighted. Therefore, organisations can address the lack of research knowledge and skills among managers that hinders performance (Barends et al., 2017). This could help organisations shape their hiring process of managers or develop training programs that specifically focus on developing this manager competency (Sahakian et al., 2021). Previous literature highlight that most managers have a positive attitude towards EBMgt but lack the time and research knowledge to engage with the practice (Barends et al., 2017). Therefore, organisations must facilitate managers' use of EBMgt competencies to improve performance through systematic changes at the organisational and individual management level and by creating a supportive climate for developing research knowledge and skills (Liang et al., 2017; Malik et al., 2022). These competencies and EBMgt may propose a solution for managers to keep up with the vastly

and rapidly changing organisational environments, as management practices do not evolve fast enough.

This research paper explores the relationship between research knowledge and skills and manager performance and the moderating effect of open-mindedness on this relationship using previous literature (Barends et al., 2017; Çemberci et al., 2021; Daouk-Öyry et al., 2020; Lin et al., 2022; Mitchell et al., 2012; Sahakian et al., 2021; Zaim et al., 2013) and evidence-based management. The research question that this paper aims to answer is: Is there a relationship between research knowledge and skills and manager performance and to what extent is this relationship moderated by manager open-mindedness?

Theoretical Framework

Research Knowledge and Skills and Manager Performance

Classifying research knowledge and skills as a core manager competency, Daouk-Öyry et al. (2020, p.10) define it as "the knowledge and skills necessary for conducting research". Sub-competencies of this variable therefore include searching for data within the organisation and/or in external literature as well as collecting, understanding, analysing, and applying data to practice. Daouk-Öyry et al. (2020), group research knowledge and skills under the technical dimension, together with general business knowledge, industry knowledge and ethicality. As little research is conducted on the specific competency research knowledge and skills, previous literature used in this paper include variables under the more general term, business knowledge.

Manager performance is evaluated based on the specific skills managers must acquire and behaviours they must show; taking a competency perspective to clearly define the variable. Campbell (1990) defines manager performance as "behaviours or actions that are relevant to the goals of the organisation". This measure of work performance analyses the actions of managers rather than the results of these actions. Koopmans et al. (2011), defined

manager performance as having three dimensions. Firstly, task performance is the degree to which individuals perform the key parts of their job. Contextual performance includes behaviours that support the key aspects of the function and are appropriate to the organisation's environment and context. The third dimension, counterproductive work behaviour, includes actions that hinders performance of the individual and the organisation.

To explain the direct relationship between research knowledge and skills and manager performance, evidence-based management can be applied (Figure 1). EBMgt implies the "explicit, judicious and conscientious use of the best available evidence in management decision-making" (Sackett et al., 1996, p. 71). Therefore, managers are encouraged to use the best-quality evidence from different sources to aid them in decision-making. This theory states that often managers rely heavily on previous experiences or trends instead of consulting data from different sources. Being able to exploit this evidence to aid managers' decision-making and management style creates a competitive advantage for organisations as managers possess more valuable knowledge (Daouk-Öyry et al., 2020). The evidence that managers collect and evaluate can lead to more innovative decision-making (Lin et al., 2019). Therefore, managers who possess EBMgt competencies will have greater manager performance. The foundational elements of the EBMgt framework include Asking, Acquiring, Appraising, Aggregating, Applying and Assessing (Barends et al., 2014; Dawes et al., 2005). Most of these elements overlap with key characteristics of the variable research knowledge and skills. For example, acquiring involves systematically searching for and retrieving evidence and the trustworthiness and relevance of evidence is critically judged through appraising. Moreover, aggregating – assembling the evidence – and applying the evidence into real life practice are also aspects of the definition of research knowledge and skills. Therefore, according to EBMgt, managers who have the competency research

knowledge and skills; encompassing the foundational elements of EBMgt, have greater manager performance as they use the best-available evidence to lead their decision making.

Figure 1

Evidence-Based Management Theory as illustrated by Barends et al. (2014, p.7)

More generally, the knowledge-based theory by Grant (1996) can also be applied to explain the relationship between research knowledge and skills and manager performance. This theory states that knowledge is the key element that drives performance and contributes to positive organisational outcomes. This knowledge is characterised to reside within individuals but can be shared across individuals; the most valuable knowledge is tacit and firm specific. Individuals gain this knowledge by engaging with both internal and external data, from different sources, in line with the principles of EBMgt. Organisations provide the structure for individuals to use and share knowledge, leading to competitive advantage.

Empirical studies provide support for the relationship between competencies such as research knowledge and skills and manager performance. A study by Barends et al. (2017), examined the attitudes and perceived barriers related to evidence-based practice of managers in the health sector. They found that most practitioners have positive attitudes towards

EBMgt practices; a major barrier was limited understanding of scientific research. Therefore, the lack of a manager's competency, such as research knowledge and skills, hinders manager performance as they are unable to properly make evidence-based decisions. Managerial competencies were found to be the most significant factor positively affecting individual performance according to a study conducted by Zaim et al. (2013). Moreover, Malik et al. (2022), conducted an online questionnaire in Pakistan and concluded that research competencies are a positive predictor of work performance. Luo (2011) found that managers who completed a research methods course, to develop their research knowledge and skills, had greater managerial performance. Therefore, EBMgt theory and previous literature discussed are used to formulate the first hypothesis.

Hypothesis 1: Managers that score high on the competency research knowledge and skills will have greater manager performance than managers that score low on the competency.

The Moderating Role of Open-Mindedness

The extent to which the competency of research knowledge and skills leads to better manager performance depends on the level of manager open-mindedness. The variable open-mindedness can be assessed as a personality and a behaviour, with the definition: “being tolerant of divergent views with sensitivity of the possibility of one’s own bias” (Facione et al., 1994, p.4), as it refers to both a tolerant character and tolerant behaviour. By defining open-mindedness as ‘an individual’s open attitude’, Wang et al. (2022, p.2) demonstrate that open-mindedness is a personality trait that inevitably influences an individual’s behaviour patterns. Individuals with an open mind hold a positive attitude towards novel experiences, suggesting that they are more willing to engage and learn (Wang et al., 2022). A study by Mitchell and Boyle (2015) illustrates that teams may have open-mindedness norms, which is described as one’s willingness to openly consider alternative perspectives and to question

one's own views, involving both personality and behavioural aspects. According to Daouk-Öyry et al. (2020), managers with open-mindedness are receptive to information from different stakeholders and are open to change their mind. By critically reflecting on oneself and examining prior beliefs, open-mindedness plays a key role in organisational learning and accelerating the creation of knowledge in an organisation (Çemberci et al., 2021; Lin et al., 2022; Lord, 2015). Moreover, open-mindedness creates an organisational culture that promotes open exchange of information and discussion of ideas (Mitchell et al., 2012).

Open-mindedness is crucial to defy the three main reasons why managers do not tend to engage in evidence-based management, according to Rynes (2012). Firstly, managers may simply be unaware of the evidence provided by literature. A manager that is open-minded to ideas from different sources will come across more evidence. Secondly, managers may not trust the information that is generated by science. By being open-minded, managers are more receptive to ideas that may oppose their own. Thirdly, even when managers are aware of the existence of the evidence and believe the evidence, they may lack the resources and effort to implement their research findings. Having open-mindedness enables managers to think more innovatively (Mitchell & Boyle, 2015), therefore, managers can more easily implement their findings to improve performance.

EBMgt theory suggests that using the best-quality evidence to aid decision-making will increase the likelihood of a favourable outcome (Daouk-Öyry et al., 2020). However, this includes the EBMgt foundational element applying – incorporating the evidence into the decision-making process, which requires open-mindedness. Therefore, open-mindedness behaviour is necessary to overcome managers' distrust with science (Daouk-Öyry et al., 2020). The competency research knowledge and skills exposes managers to the best-available evidence; however, if managers are not open-minded and do not believe the evidence they obtain, they limit their potential to increase performance. Therefore, being open-minded,

strengthens the extent to which research knowledge and skills leads to better manager performance.

The knowledge-based theory by Grant (1996) can also be applied to explain the moderating role of open-mindedness on the relation between research knowledge and skills and manager performance. Knowledge transferring is crucial to facilitate knowledge creation and innovation among employees. Grant (1996) explains that the individual who possesses knowledge and shares this with another individual is regarded as the sender; the individual who gains the knowledge is the receiver. To be able to create valuable knowledge between individuals, the sender is required to share the knowledge and the receiver who learns and applies this knowledge has to be open-minded. Those that have more open-mindedness, are more willing to engage with different sources to collect new evidence and are more willing to listen to the knowledge that is shared. Therefore, knowledge-based theory illustrates the crucial role of open-mindedness.

Numerous studies show the positive consequences of open-mindedness in organisations. Open-mindedness being a key factor in organisational learning, moderates the relationship between research knowledge and skills, which help managers collect reliable and valid evidence, and their overall manager performance (Lin et al., 2022; Lord, 2015). This manager competency accelerates knowledge creation and improves innovation, as managers are open to different opinions within and outside their organisation (Bagherzadeh et al., 2020; Çemberci et al., 2021; Mitchell & Boyle, 2015). Managers that are open to using external knowledge from the competition, who share risks with partners and who engage with their environment to better understand employees' and customer needs, show more innovative performance (Bagherzadeh et al., 2020). Evidence suggests that the variable open-mindedness acts as a moderator in varying relations. In one case, open-mindedness moderates the effect of why religious cues in ads can produce lower product evaluations (Minton, 2019).

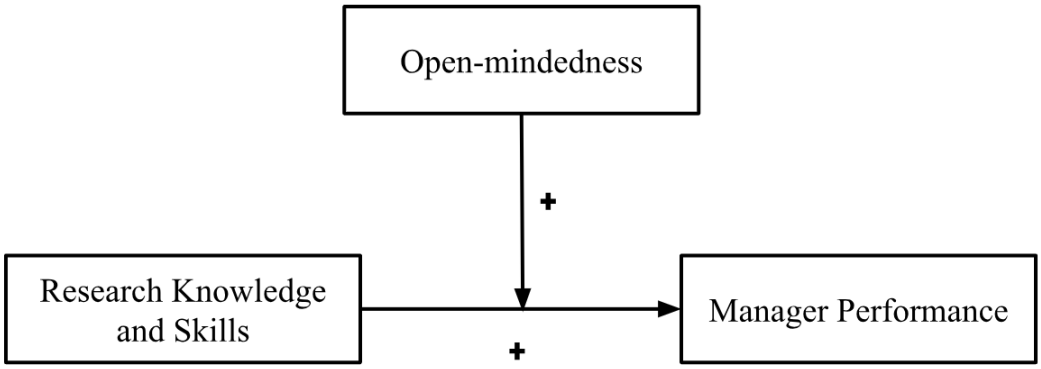
Furthermore, analysis of survey data from 70 healthcare teams shows support that open-mindedness norms positively moderate the relation between professional salience and innovation (Mitchell & Boyle, 2015). Therefore, a similar mechanism is expected in this study, leading to the formulation of this paper's second hypothesis.

Hypothesis 2: Open-mindedness moderates the relationship between research knowledge and skills and manager performance such that the positive relationship between research knowledge and skills and manager performance is stronger for high (vs. low) open-mindedness.

Figure 2 displays the conceptual model based on the two hypotheses formulated in this theoretical framework.

Figure 2

Conceptual Model



Methods

Procedure

A cross-sectional design was used to understand the relationship between research knowledge and skills and manager performance, considering the moderating effect of open-mindedness. The dataset used in this study was collected by Tilburg University master students, who used the questionnaire by Daouk-Öyry et al. (2020), measuring 11 evidence-

based manager competencies and other variables, including those used in this study. The proposal for this research was approved by the Ethics Review Board of Tilburg University before data collection started. An online questionnaire was conducted to collect the data, with four data collection rounds; data from all four rounds are used in this study.

The data was collected between July and October 2023. Convenience and snowball sampling methods were used to select participants through personal networks and professional social media sites. After agreeing to participate, the online questionnaire was sent out per email. Using the Qualtrics platform, the questionnaire was available in both Dutch and English. A cover letter was included, informing participants about their right to withdraw and the purpose of the study; confidentiality and anonymity was assured (Appendix A). Respondents could also send any questions or concerns to an email address provided in the letter.

Sample

The sample used in this study consisted of a total of 455 managers that have held a managerial position for at least two years. 41.1% of the participants were female managers and 58.7% male managers, the remaining 0.2% indicated rather not to say. Table 1 shows the demographic characteristics of the sample, based on the control variables used in this study.

Most of the managers have a master's as the highest education level completed (34.7%), second highest is university of applied science (31%), then bachelor's degree (19.3%). Nearly 60% of the participants are aged between 31 and 55 years, about 15% are 30 years old or younger and the remaining 23% are aged above 56 years. The split between whether managers work in the white-collar or blue-collar sector is fairly equal, with 58.2% of managers working in a white-collar sector and 40.7% of the managers working in blue collar sectors. The remaining percentages were missing values.

Table 1

Demographic characteristics of the sample

Control Variables		Frequency	Percent	Mean	Std. Deviation
Education	University of applied science	141	31.00	0.31	0.46
	Bachelor	88	19.30	0.20	0.40
	Master	158	34.70	0.35	0.48
	High school	23	5.10	0.05	0.22
	Intermediate vocational education	21	4.60	0.05	0.21
	Other, please specify:	20	4.40	0.04	0.21
Age	Under 30 years	71	15.60	0.16	0.37
	Between 31 and 55	267	58.70	0.60	0.49
	Above 56	105	23.10	0.24	0.43
Sector	White collar	265	58.20	0.59	0.49
	Blue collar	185	40.70	0.41	0.49

Note. *N=455*

Measures

The variables used in this study were tested for construct validity through Principal Component Analysis (PCA). The following guidelines were used to verify the validity and reliability of the already crafted subscale: the Kaiser-Meyer-Olkin analysis of sampling adequacy should be higher than .06 and Bartlett's test of sphericity significant ($p < .05$) (Pallant, 2013). Components were chosen based on the criteria, eigenvalue > 1, and the results of a scree plot. To evaluate the reliability of the scales, COTAN guidelines for less important decisions at an individual level were used, in which Cronbach's $\alpha < 0.7$ represents "insufficient", $0.7 <$ Cronbach's $\alpha < 0.8$ represents "sufficient", and a Cronbach's $\alpha > 0.8$ represents "good" reliability (Evers et al., 2010).

Research Knowledge and Skills

To measure the independent variable research knowledge and skills, items 1 to 18 of the questionnaire adapted from Daouk-Öyry et al. (2020) were used (Appendix B). These

items have a quantitative measurement level and have a 5-point scale ranging from "completely disagree" (1) to "completely agree" (5). An example of an item is: "I know how to identify themes in qualitative data". Items six and seven from the questionnaire are reverse items that had to be re-coded. The possible range of the scale scores is 1-5, with 1 being managers that score low on the competency research knowledge and skills and 5 being managers that score highly on this competency. PCA indicated an extraction of five components, which explained 61.27% of the total variance in the variable research knowledge and skills. The first component extracted with an eigenvalue of 5.77 explained 32.07% of the total variance explained. Scale reliability was great ($\alpha = .859$). The relevant SPSS tables can be found in Appendix C.

Manager Performance

Thirteen items were used from the data set to measure the variable manager performance (Appendix B). These were taken from a scale created by Koopmans et al. (2011). The items have a quantitative measurement level and have a 5-point scale ranging from "seldom" (0) to "always" (4). An example of an item is: "I was able to perform my work well with minimal time and effort". The possible range of the scores is 1-5, with 1 being managers scoring low on individual performance and 5 being high individual performance. PCA indicated an extraction of three components, which explained 61.11% of the total variance in the variable manager performance. The first component extracted with an eigenvalue of 4.95 explained 38.04% of the total variance explained. Scale reliability was great ($\alpha = .861$). The relevant SPSS tables can be found in Appendix C.

Open-mindedness

The moderating variable open-mindedness was measured using items 116 to 133 from the questionnaire (Appendix B). These items have a quantitative measurement level and have a 5-point scale ranging from "completely disagree" (1) to "completely agree" (5). An

example item is: “I am open to hearing new ideas from employees”. Item 126 and 127 from the questionnaire are reverse items that need to be re-coded. The possible range of the scale scores is 1-5, with 1 being managers that score low on open-mindedness and 5 being managers that score highly on open-mindedness. PCA indicated an extraction of four components, which explained 57.85% of the total variance in the variable open-mindedness. The first component extracted with an eigenvalue of 5.77 explained 32.07% of the total variance explained. Scale reliability was great ($\alpha = .835$). The relevant SPSS tables can be found in Appendix C.

Control Variables

Age (under 30 years, between 31-55 years and above 56 years), education level (University of applied science, Bachelor, Master, High school, Intermediate vocational education) and the sector of employment (white collar or blue collar) are included in the regression analysis as control variables. For the variables age and sector, new categories were coded, based on which dummy variables were created. Previous literature provides evidence that manager performance is influenced by demographic characteristics such as age and education (Barends et al. 2017; Feyrer 2009; Kodama & Li, 2018; Sahakian et al., 2021). Feyrer (2009) states that changes in age composition influences performance; Kodama and Li (2018), state that sales increase with age until 40s, after which performance declines. Findings by Barends et al. (2017), suggest that attitudes towards evidence-based management are associated with education. Kodama and Li (2018) found that an increase in education by one year is associated with 21% higher sales. Moreover, Sahakian et al. (2021), state that education level is important for applying EBMgt, as well as contextual factors. Baba and HakenZadeh (2012) also state that evidence use by managers is influenced by contextual factors such as industry. Therefore, these three variables are chosen to be controlled for.

Data Analysis

A missing values analysis was conducted to check for data errors, using frequency tables for each variable. Research knowledge and skills had 2% missing values, manager performance had 21.8% missing values and open-mindedness had 16.7% missing values. These were excluded from the analysis.

To test the hypotheses, a standard multiple regression analysis with three models was conducted. This first model tested Hypothesis 1, including research knowledge and skills as an independent variable. Model 2 included the variables research knowledge and skills and open-mindedness. Model 3 tested Hypothesis 2, including research knowledge and skills, open-mindedness, the interaction term, and the control variables age, education, and industry.

Dummy variables were created for the control variables; the reference categories excluded from the analysis were those with a master's degree, participants under the age of 31 and blue collar workers. The variables research knowledge and skills and manager performance were centred prior to the regression analysis. Both variables were re-coded by subtracting their mean from the variable. This was done to reduce multicollinearity; enhancing the statistical power of the moderation effect as well as reducing the chance of inflated standard errors (Kraemer & Blasey, 2004). Centering variables also makes the interpretation of the intercept more meaningful, as the intercept now represents the expected value of manager performance when research knowledge and skills and open-mindedness are at their mean.

Before conducting any analysis, several assumptions were tested. Multicollinearity was checked by calculating the correlation between research knowledge and skills and manager performance and by looking at the Variance Inflation Factor (VIF). Histograms were generated to show whether all three variables were normally distributed, as well as the residuals. In addition, the scatter plot was generated to look for a linear relationship between

research knowledge and skills and manager performance with no extreme outliers. Homoscedasticity was also checked, by seeing if points were equally distributed along both the x-axis and y-axis. All relevant SPSS tables can be found in Appendix D. Using the formula N > 50 + 8m by Tabachnick and Fidell (2019), where m = number of independent variables, it was concluded that the sample size of 455 participants is good.

Results

Descriptive Statistics

Table 2 shows the means, standard deviations, and correlations of all variables, excluding the control variables. The correlation matrix shows a positive correlation between the variables manager performance and research knowledge and skills (r = .477, p < .001). The moderating variable open-mindedness is positively correlated with manager performance (r = .521, p < .001) and research knowledge and skills (r = .430, p < .001). None of the control variables were included in Table 2, as these consisted of categorical variables.

Table 2

Descriptives and Correlations (N=455)

	Mean	Std. Deviation	1	2	3
1. Manager Performance	48.28	7.52039	1		
2. Research Knowledge Skills	62.96	7.76572	.477**	1	
3. Open-Mindedness	60.13	6.38604	.521**	.430**	1

Note. ** p < .01 two-tailed, * p < .05 two-tailed

Hypothesis testing

Two hypotheses were tested in this study. Prior to the analysis, the assumptions of linear regression were checked; relevant SPSS tables can be found in Appendix D (Pallant, 2013). The histogram showed the normal distribution of residuals. The normal predicted probability plot indicated that the residuals are normally distributed. The assumption of

homoscedasticity was met as the scatterplot showed points equally distributed along both the x-axis and the y-axis. Moreover, multicollinearity was checked by calculating the correlation between the independent variable, research knowledge and skills and managers performance, which was at an acceptable level (r = .258). The VIF values shown in the coefficients table were also at an acceptable level (VIF < 5).

Hypothesis 1 states that managers' research knowledge and skills have a positive effect on manager performance. Table 3 shows that there is a significant positive relationship between research knowledge and skills and manager performance in Model 1 (β = .48, t = 10.01, and p < .001). Hypothesis 1 is therefore supported. Model 2 also shows that there is a significant positive relationship between open-mindedness and manager performance (β = .38, t = 7.91, and p < .001). Both Model 1 and Model 2 have a significant model fit.

Table 3

Results of Multiple Regression

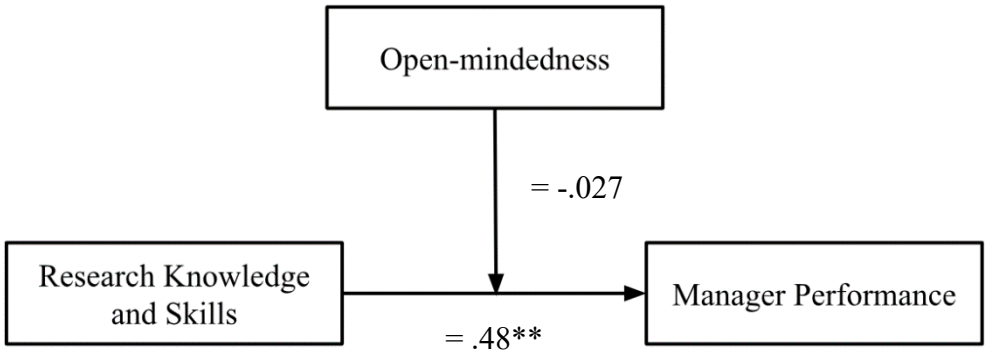
Model		Unstandardised Coefficients		Standardised Coefficients			Model Fit
		B	Std. Error	Beta	t	Sig.	$R^2\Delta$
1	(Constant)	48.05	.36		133.5	<.001	.230**
	Research skills	.47	.05	.48	10.01	<.001	
2	(Constant)	48.09	.33		145.4	<.001	.121**
	Research skills	.31	.05	.32	6.52	<.001	
	Open-mindedness	.46	.06	.38	7.91	<.001	
3	(Constant)	48.31	1.10		44.02	<.001	.026
	Research skills	.32	.05	.33	6.48	<.001	
	Open-mindedness	.47	.06	.40	7.70	<.001	
	RKS_OM	-.00	.00	-.03	-.57	.568	
	University of applied science	.42	.80	.03	.53	.597	
	Bachelor	.47	.96	.02	.49	.624	
	High school	2.48	2.08	.05	1.19	.234	
	Intermediate vocational education	2.56	1.71	.07	1.50	.135	
	Other education	-3.05	1.77	-.08	-1.72	.086	
	Age 31 - 55	-1.04	1.01	-.07	-1.03	.304	
	Age above 56	-1.90	1.14	-.11	-1.67	.096	
	White collar sector	1.07	.69	.07	1.55	.122	

Dependent Variable: Manager Performance
** p < .01 two-tailed, * p < .05 two-tailed

Hypothesis 2 states that open-mindedness moderates the relationship between research knowledge and skills and manager performance. A manager that has higher levels of open-mindedness performs better than a manager who shows lower levels of open-mindedness. Table 3 shows that the interaction term of research knowledge and skills and open-mindedness was not significant (β = -.03, *t* =-.57, and *p* = .568). Hypothesis 2 is therefore not supported. None of the control variables have a significant effect on the dependent variable manager performance. The model fit for Model 3 was also not significant. The results are summarised in Figure 3.

Figure 3

Conceptual Model with Standardised Regression Coefficients



Discussion

Evidence-based management stands for the use of the best available evidence to aid decision-making, instead of solely relying on previous personal experience or management trends. Despite the rise of EBMgt in the medical sector, the use of EBMgt in other sectors specially for managing teams is scarce, as is the evidence that certain EBMgt competencies improve manager performance (Daouk-Öyry et al., 2020; Sahakian et al., 2021). Therefore, this study aimed to explore the relationship between the competency research knowledge and skills and manager performance. In addition, this paper looked at the moderating effect of open-mindedness on this relationship. The research question this paper aimed to answer was:

Is there a relationship between research knowledge and skills and manager performance and to what extent is this relationship moderated by manager open-mindedness?

Two hypotheses were formulated based on previous literature (Barends et al., 2017; Çemberci et al., 2021; Daouk-Öyry et al., 2020; Lin et al., 2022; Mitchell et al., 2012; Sahakian et al., 2021; Zaim et al., 2013) and evidence-based management theory. The first hypothesis expected a significant positive relationship between managers' research knowledge and skills and manager performance. This hypothesis was confirmed by the results of the study; the regression analysis showed a highly significant, positive relation between research knowledge and skills and manager performance. This is explained by the theory behind EBMgt, suggesting that the competency research knowledge and skills encompasses the foundational elements, asking, acquiring, appraising, aggregating, applying, and assessing (Barends et al., 2014; Dawes et al., 2005), which lead to greater manager performance. Managers have the skill to use the best-available evidence from different stakeholders instead of solely relying on their previous experience or management trends. These findings are in line with those from Malik et al. (2022), who found that research competencies are a positive predictor of work performance in Pakistan. The results also align with the findings from Luo (2011), who found positive effects on managerial performance for managers who completed a research methods course.

The second hypothesis expected a significant moderating effect of open-mindedness on the relationship between research knowledge and skills and manager performance. It was expected that the positive relationship between research knowledge and skills and manager performance would be stronger for high (vs. low) open-mindedness. This hypothesis was not confirmed by the results of the study; the regression analysis showed a negative and insignificant relation between the interaction term and manager performance. The variable open-mindedness on its own did have a positive and significant relation with manager

performance. These findings therefore show that although no evidence was found that open-mindedness moderates the effect of research knowledge and skills on manager performance, open-mindedness does have a direct effect on manager performance.

Previous literature discuss the positive direct effect of open-mindedness on manager performance, which this study found evidence for (Al-Abrrow et al., 2021; Hernández-Mogollon et al., 2010; Perin et al., 2016). The questionnaire study by Al-Abrrow et al. (2021), has 400 respondents; their results show open-mindedness to have a direct, positive relation to performance, specifically in workforces with diverse cultural backgrounds. Open-mindedness and a managers' acceptance of new information contributes to the creativity of managers, which leads to better performance (Al-Abrrow et al., 2021). The generation of innovative ideas allows companies to be flexible to new trends and demands of customers, improving a managers' ability to adapt new knowledge to their work and enhancing performance (Hernández-Mogollon et al., 2010; Perin et al., 2016).

Despite all the assumptions of a multiple regression analysis being met, there are methodological explanations for the insignificant result of the moderating effect of open-mindedness. The quantitative experimental design of a questionnaire may lead to measurement errors due to incorrect coding or faulty entry of responses (Biemer, 2010). In addition, the lengthy questionnaire used for the data collection may lead to respondent fatigue which lowers data quality. Respondents may also misunderstand questions or provide socially desirable answers, leading to inaccurate data (Biemer, 2010). The convenience and snowball sampling methods used to select participants may also lead to biases and an unrepresentative sample. These methodological limitations may have caused this study's inability to find statistically significant evidence for the moderation hypothesis.

In addition, the moderating effect of open-mindedness for the relationship between research knowledge and skills and manager performance may exist only in combination with

other variables. Previous empirical evidence provides support that open-mindedness has a positive effect on, among other things, organisational group learning capacity (Lord, 2015). In addition, studies highlight the relation between open-mindedness and creativity (Al-Abrrow et al., 2021; Cohen, 2014). By including other variables in the model, such as group learning capacity and creativity of managers, results may show a significant moderating effect.

Limitations

In addition to the methodological limitations mentioned above, the use of a cross-sectional design limits the respondents to filling out the questionnaire at only one point in time. Therefore, responses could be influenced by specific circumstances that occurred that day, reducing the reliability of the results (Biemer, 2010). The items used from the measurement of performance by Koopman et al. (2014) were not focused on managers. Despite the sample consisting only of managers, crucial questions regarding a manager's tasks and roles were not included when measuring performance. Therefore, measurement validity may be reduced. In addition, despite the sample including managers from different sectors, most of the participants are Dutch, therefore the study may lack representativeness. Specifically for EBMgt, the context of the organisations is crucial to determine its effects. Therefore, the generalisability of this study may be low.

The limitations of the EBMgt framework and the variables used in this study should also be addressed. Many criticise EBMgt for totally disregarding instincts, feelings, and intuition; assuming individuals are very rational beings (Hulpke & Fronmueller, 2021). In addition, managers' ability to be flexible in their decision-making instead of solely focusing on the collection and analysis of data also plays a role. This study did not include these factors that may have an effect on manager performance.

Recommendations for Future Research

Conducting future research around EBMgt and the specific manager competency of research knowledge and skills can combat some of the limitations mentioned. Firstly, using a longitudinal design, where respondents answer the same questionnaire at multiple different points in time, will increase the reliability of the findings. Moreover, to improve validity, a more suitable measure of performance can be included in the questionnaire, to measure specific manager roles and tasks.

Other ways to improve this study may be to include open-mindedness in combination with organisational group learning to investigate whether the effect between these two is able to moderate the relationship between research knowledge and skills and manager performance (Lord, 2015). In addition, specifying a group level of analysis may produce differing results. The competency research knowledge and skills is focused on managers at an individual level and how this affects individual performance. However, open-mindedness is often seen as a trait that produces favourable outcomes for groups. Lin et al. (2022), found that relationships within groups are strengthened by open-mindedness of the group, which in turn had a positive mediating effect on the relationship between competitor intelligence and product innovation. Furthermore, a study by Mitchell et al. (2012), found evidence that open-mindedness provides a context that facilitates discussion of diverse perspectives in teams. Therefore, the level of open-mindedness of a single manager may not have the same effects as when measuring the open-mindedness of a group. Repeating this study by looking at the moderating effect of open-mindedness of a team may produce significant results.

Lastly, to counter the criticism surrounding the limited view of EBMgt, future research could include a manager's intuition in decision-making, to see its overall effects of performance when combined with EBMgt competencies. In practice, heterogeneity in management processes occurs due to differing manager styles (Bertrand & Schoar, 2003).

Therefore, future research should also include differing managerial conditions to see how these circumstances influence the use and effectiveness of EBMgt.

Theoretical and Practical Implications

The theoretical implication of this study is its contribution to the evidence-based management literature. With promising results of EBMgt studies conducted in the health sector, it is important to conduct empirical studies in other fields, illustrating the potential of EBMgt in organisations and its effect on performance. The findings show support for the positive relationship between manager performance and a manager EBMgt competency, namely research knowledge and skills. By focusing on managers from different sectors mainly in the Netherlands, the research gap is reduced. Managers specifically, have a crucial role in the organisation to facilitate performance through evidence-based decision making as they steer their team; this study highlights their importance. The competency research knowledge and skills is also pivotal, as a manager's ability to find and evaluate evidence can be seen as the base of EBMgt theory. Moreover, the identification of research knowledge and skills being an antecedent of manager performance is in accordance with the knowledge-based theory by Grant (1996), stating that knowledge creation and knowledge transfer, stemming from research, can lead to better performance.

The practical implications are based on the results of this study and of insights gathered from two interviews, the summaries of which can be found in Appendix E. In general, the supportive findings of EBMgt illustrates to organisations the importance of using research to facilitate decision-making. Promoting managers' research knowledge and skills, presents a way to decrease cognitive and information processing limits that make managers prone to biases; reducing the quality of the decision made (Barends et al., 2014). Therefore, organisations should choose to facilitate the use of EBMgt by managers. This involves a proactive approach to create a supportive culture and organisational structure that gives

managers the opportunity to develop and apply their research knowledge and skills (Daouk-Öyry et al., 2020). One way to do this, mentioned in interview 1, is to create a culture of cross-validation. The company that interviewee 1 works at recognises that different employees can bring different insights, therefore, they strive to involve as many people in their decision-making process as is practically possible. This involves for example, peer-programming, where managers give data analysis tasks to two employees who simultaneously work on the problem. Interviewee 1 states that it is important to give each other enough time to work through the problem and to correctly collect, analyse and interpret data for decision-making.

In interview 2, another method to facilitate EBMgt was mentioned. At the start of new projects, their team will have a training session in which all members deep dive into the contents of the topic at hand and they rely on the different levels of experience and expertise that different team members bring. Moreover, they rely on EBMgt for HR topics such as compensation and benefits; turnover rates; executive policies; promotion policies; engagement surveys, as they collect, analyse, and compare anonymised benchmark data from similar companies within their sector to their internal data. Recently, the company had to make a decision regarding the salary level of a position that had a priority to be filled. This involved using internal data to look at company policies but also external data to evaluate what salary similar organisations in their sector were providing.

As mentioned in interview 2, conducting EBMgt decisions involves a lot of time and money to request reports, analyse the data or cooperate with universities to externally engage in research. Therefore, it is crucial to consider whether developing managers' research knowledge and skills is applicable to the organisation according to its context and its goals. Based on the results from this study, organisations could rely on EBMgt competencies to make selection decisions during their requirement process, or organisations can choose to

develop training programs for their managers (Sahakian et al., 2021). One way to do this is by providing a research methods course (Luo, 2011). However, both interviewee 1 and 2 mentioned the importance of considering personal differences regarding an incline for hard skills and numerical data vs soft skills. The use of research knowledge and skills and its effectiveness may differ per manager due to their personality. In addition, Dutch managers may run into barriers such as struggling to understand the literature, as many research articles are written in English. Interviewee 2 therefore suggests initiating the training first with employees that are inclined to enjoy the training and are interested in improving their research skills. Perhaps, from their enthusiasm an organisation can attract more employees to also complete the training; through which an evidence-orientated team can be developed.

Interviewee 1 also highlights the importance of being able to translate numerical data into a language that is understood by people not involved in the analysing process and who are more feeling-based. Through this managers can convince sceptical colleagues that data that is found and analysed can be used in a decision-making process. This skill is crucial for managers who develop their research knowledge and skill competency and who adopt EBMgt practices.

Conclusion

The growing popularity of evidence-based management and its potential to improve organisational outcomes prompted this study. Managers and their performance influence subordinates and overall organisational performance, however there is a lot of homogeneity in management styles. Following a multiple regression analysis, a significant effect was found for the relationship between research knowledge and skills and manager performance. This result highlights the importance of developing the manager competency to generate greater organisational outcomes. This study did not provide evidence for the moderating role of open-mindedness. However, advice was provided for future research to be able to

contribute to EBMgt literature and to find a significant effect for the moderating role of open-mindedness. Following the implications of the results, this study provides a better understanding of the importance of evidence-based management and the effect of the manager competency research knowledge and skills to improve performance.

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Appendix A

Consent Letter for Data Collection

This letter is an invitation to participate in our Human Resources Studies master thesis research on "Evidence-based Management Competencies" at Tilburg University School of Social and Behavioral Science. The aim of this letter is to provide you with further information about the structure of the research, and how your participation could help us conduct the research. In today's data-driven world, Evidence-based Management is one approach that can help managers make use of data. This approach involves collecting data from different sources, assessing its reliability, and using reliable data to make decisions. The aim of this study is to 1) develop a questionnaire to measure the competencies managers need to practice Evidence-based Management and 2) investigate the link between the Evidence-based Management competencies and personality and performance.

We are inviting you to participate in the study because you are a manager. As part of the study, we will ask you to complete an anonymous online survey in either Dutch or English Language, based on your preference. The survey will include questions about the competencies you need in order to practice Evidence-based Management, your personality, your psychological resources, your behavior at work, and the behavior of your team/subordinates. There are no wrong responses to these questions. We would like you to complete the survey by specifying the response that you find most suitable, without including other people's opinion. Your responses will be processed using statistical analysis software called SPSS. Two types of statistical analysis will be used (factor analysis and process macro) to analyze your responses to achieve the study aims. Your participation in this research is entirely voluntary and you have the option to withdraw from the study at any time without any consequences and without providing a reason. Moreover, you have the right to demand access to and rectification, cancellation, erasure, restriction, and objection to the

processing of your personal data. To thank you for your participation, after your completion of the survey, you will be invited to a practitioner-oriented seminar about Evidence-based Management hosted by Drs. Brigitte Kroon and Tina Sahakian. To receive an invitation for this seminar, an online link will be available at the end of the questionnaire. After clicking on this link, if you would like to participate in the seminar, you are able to sign up for it by leaving your email address.

The timeframe for completing the questionnaire is approximately thirty minutes. Apart from time constraints, there are no further risks in filling the online questionnaire. Accordingly, this research has been approved by the Ethics Review Board of Tilburg University School of Social and Behavioral sciences. The privacy of your information is very important and all the collected data will be maintained reliably and anonymously, and will be used only for educational and research purposes. You may request to receive a report of the results of the research study. An online link will be available at the end of the questionnaire, in this link you can provide your email address where the results will be sent once the study is completed. For any further questions or complaints about this research, please contact Dr. Tina Sahakian via email at T.Sahakian@tilburguniversity.edu or the Ethical Research Board directly at ERB@tilburguniversity.edu.

This research is addressed to managers who work in Europe or Americas. By completing and submitting the survey, you state your consent to participate in the research. Please note that this consent is valid for the period of six months, and the data will be processed and stored by Tilburg University. The collected data will be stored for a period of ten years and it will be used only for the purpose of this research. Thank you for considering participating in this research and for your time spending conducting it.

Appendix B

Items from the Questionnaire

Main variables

On the following pages you will find a series of statements about you. Please read each statement and decide how much you agree or disagree with that statement.

Answer categories:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Research Knowledge and Skills

Sub-Comp.	No.	EBMgt Competency Questionnaire Items 20210604
Knowledge in Searching for and Understanding Data	1	I know how to search for scientific articles
	2	I know how to search for data in my department to solve operational or other managerial problems
	3	I review the literature on topics relevant to my work
	4	I search for scientific articles to help me solve work problems
	5	I search for data within the organization to help me solve work problems
	6	I have difficulty understanding scientific articles ***(R)***
	7	I have difficulty understanding the internal data gathered in my department/organization ***(R)***
Knowledge in collecting data	8	I know how to collect data to solve a work problem, if this data doesn't exist already
	9	I can identify the information I need to collect to solve a work problem
	10	I collect data from different sources to solve problems at work
Knowledge in analysing data	11	I know how to analyse data to answer a managerial question
	12	I can use simple statistics (e.g., correlation, t-test etc.)
	13	I know how to use existing computer software to analyze data such as Microsoft Excel or other software
	14	I understand the results of statistical analyses
	15	I know how to present results visually (e.g. using graphs) in a meaningful way
	16	I know how to analyze qualitative data such as from interviews or customer reviews
	17	I know how to identify themes in qualitative
	18	I can aggregate numeric and qualitative data about a problem to get a better understanding of it

Open-Mindedness

Openness to Input	116	I consider employees' input in my decision making
	117	I consider different opinions about work-related issues
	118	I am open to hearing new ideas from employees
	119	I am attentive to new opportunities to improve work processes presented by employees

	120	I seek advice from subordinates concerning work decisions or problems
	121	I reconsider decisions on the basis of recommendations by those who report to me
Openness to Change One's Mind	122	I would be open to changing my mind even after making a decision if someone convinces me otherwise
	123	I consider changing work practices when there is evidence for better ways of doing things
	124	When I've made an important decision, I can change it if it involves an advantage
	125	It's easy for me to change my mind when I realize that I am wrong
	126	Uncertainty stops me from solving problems at work ***(R)***
	127	I worry if the results of data I collect are uncertain ***(R)***
	128	I can make decisions when the data is ambiguous
	129	In uncertain situations at work, I develop different way of doing something or finding information to help me through
	130	At work, I reduce negative emotions (e.g., fear) to help me deal with uncertain situations
	131	When uncertainty arises at work, I minimize my frustration so I can deal with it best
	132	I make decisions based on the data I collect, even if the data contradicts my expectations
	133	I change my decision if the data points me in a different direction

Manager Performance

	0 Seldom	1 Rarely	2 Occasionally	3 Very Frequently	4 Always
In the past three months….					
I managed to plan my work so that it was done on time.					
My planning was optimal.					
I kept in mind the results that I had to achieve in my work.					
I was able to separate main issues from side issues at work.					
I was able to perform my work well with minimal time and effort.					
I took on extra responsibilities.					
I started new tasks myself, when my old ones were finished.					
I took on challenging work tasks, when available.					

I worked at keeping my job knowledge up-to-date.					
I worked at keeping my job skills up-to-date.					
I came up with creative solutions to new problems.					
I kept looking for new challenges in my job.					
I actively participated in work meetings.					

Control variable - Age

What is your year of birth?

Control variable - Education

What is the highest degree or level of education you have completed?

Answer options: University of applied science; Bachelor; Master; High school; Intermediate vocational education; Other, please specify:

Control variable - Sector

What sector do you work in?

Answer options: Accountancy, banking and finance; Business, consulting, management; Charity and voluntary work; Creative arts and design; Energy and utilities; Engineering and manufacturing; Environment and agriculture; Healthcare; Hospitality and events management; Information technology; Law; Law enforcement, security, cybersecurity; Leisure, sport, tourism; marketing, advertising and PR; Media and internet; Property and construction; Public services and administration; recruitment and HR; Retail; Sales; Science and pharmaceuticals; Social care; Education and training; Transport and logistics; Other, please specify.

Appendix C

SPSS Tables – Component Analysis and Reliability Analysis

Below are the SPSS tables created for each variable from a principal component analysis, including the scree plot and the results of the KMO and Bartlett's test of sphericity. The results of a reliability analysis are also included. Starting with Research Knowledge and Skills then Manager Performance and finally, Open-mindedness.

Table C1

Component analysis research knowledge and skills

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.773	32.072	32.072	5.773	32.072	32.072
2	1.677	9.317	41.388	1.677	9.317	41.388
3	1.344	7.468	48.856	1.344	7.468	48.856
4	1.215	6.749	55.605	1.215	6.749	55.605
5	1.019	5.662	61.267	1.019	5.662	61.267
6	.841	4.673	65.940			
7	.798	4.435	70.375			
8	.728	4.045	74.420			
9	.663	3.682	78.101			
10	.604	3.358	81.460			
11	.542	3.014	84.473			
12	.497	2.760	87.233			
13	.449	2.496	89.729			
14	.429	2.381	92.111			
15	.427	2.373	94.483			
16	.368	2.044	96.528			
17	.338	1.877	98.405			
18	.287	1.595	100.000			

Extraction Method: Principal Component Analysis.

Table C2

Scree plot research knowledge and skills

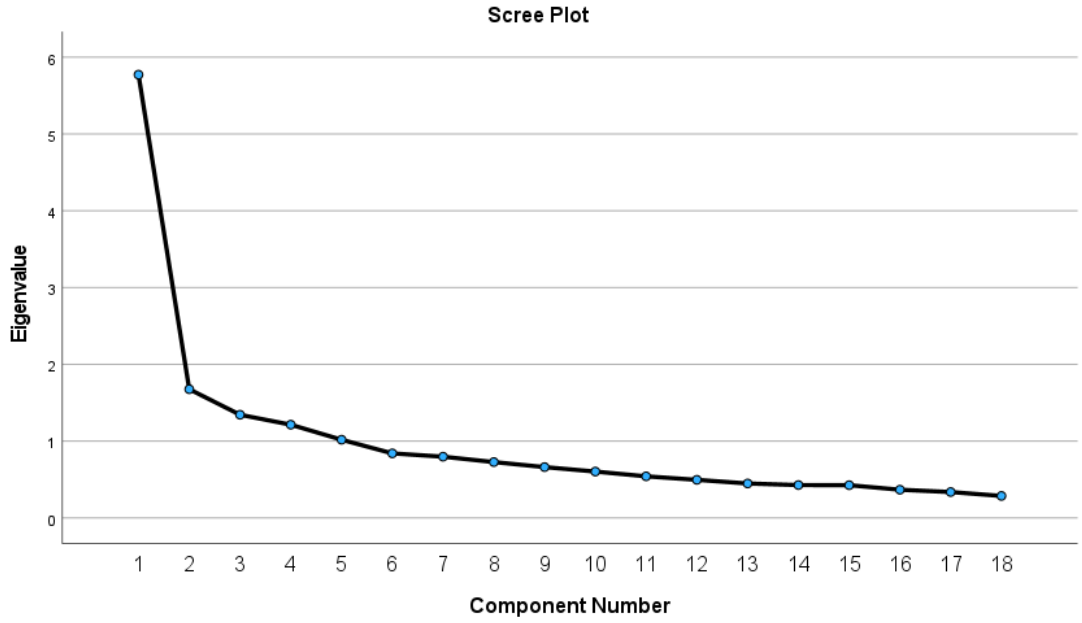

Table C3

KMO and Barlett's Test research knowledge and skills

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.861
Bartlett's Test of Sphericity	Approx. Chi-Square	2619.800
	df	153
	Sig.	<.001

Table C4

Reliability research knowledge and skills

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.859	.868	18

Table C5

Component Analysis manager performance

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.946	38.044	38.044	4.946	38.044	38.044
2	1.624	12.491	50.535	1.624	12.491	50.535
3	1.376	10.581	61.117	1.376	10.581	61.117
4	.813	6.253	67.370			
5	.674	5.183	72.553			
6	.659	5.071	77.624			
7	.582	4.474	82.098			
8	.503	3.872	85.970			
9	.485	3.728	89.698			
10	.402	3.093	92.791			
11	.370	2.846	95.637			
12	.336	2.583	98.220			
13	.231	1.780	100.000			

Extraction Method: Principal Component Analysis.

Table C6

Scree plot manager performance

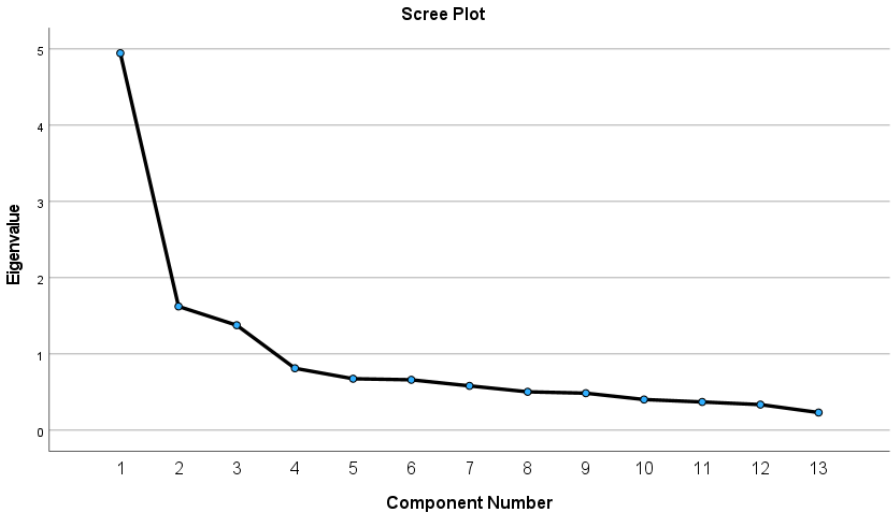

Table C7

KMO and Bartlett's Test manager performance

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.856
Bartlett's Test of Sphericity	Approx. Chi-Square	1759.424
	df	78
	Sig.	<.001

Table C8

Reliability manager performance

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.862	.863	13

Table C9

Factor analysis open-mindedness

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.775	30.396	30.396	5.775	30.396	30.396
2	1.938	10.202	40.598	1.938	10.202	40.598
3	1.507	7.930	48.528	1.507	7.930	48.528
4	1.265	6.659	55.187	1.265	6.659	55.187
5	.975	5.132	60.319			
6	.933	4.913	65.231			
7	.841	4.426	69.658			
8	.746	3.929	73.586			
9	.732	3.854	77.441			
10	.655	3.447	80.888			
11	.531	2.797	83.684			
12	.513	2.698	86.382			
13	.491	2.582	88.964			
14	.444	2.338	91.301			
15	.428	2.252	93.553			
16	.361	1.901	95.454			
17	.328	1.727	97.181			
18	.297	1.563	98.744			
19	.239	1.256	100.000			

Extraction Method: Principal Component Analysis.

Table C10

Scree plot open-mindedness

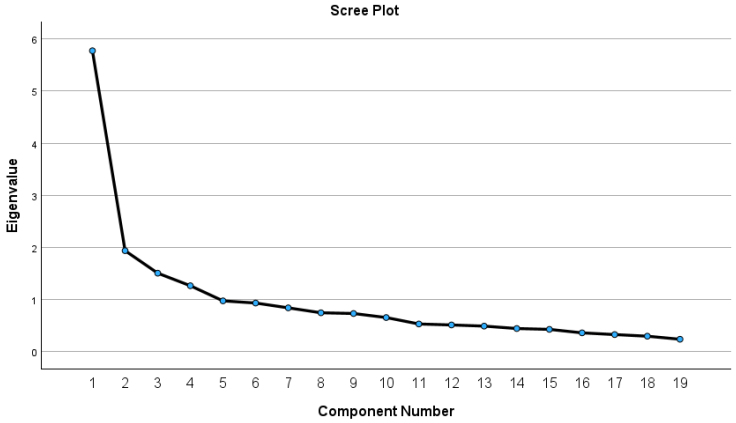

Table C11

KMO and Bartlett's Test open-mindedness

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.863
Bartlett's Test of Sphericity	Approx. Chi-Square	2479.857
	df	171
	Sig.	<.001

Table C12

Reliability open-mindedness

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.835	.855	18

Appendix D

SPSS Tables – Checking Multiple Regression Assumptions

Table D1

Normality of residuals

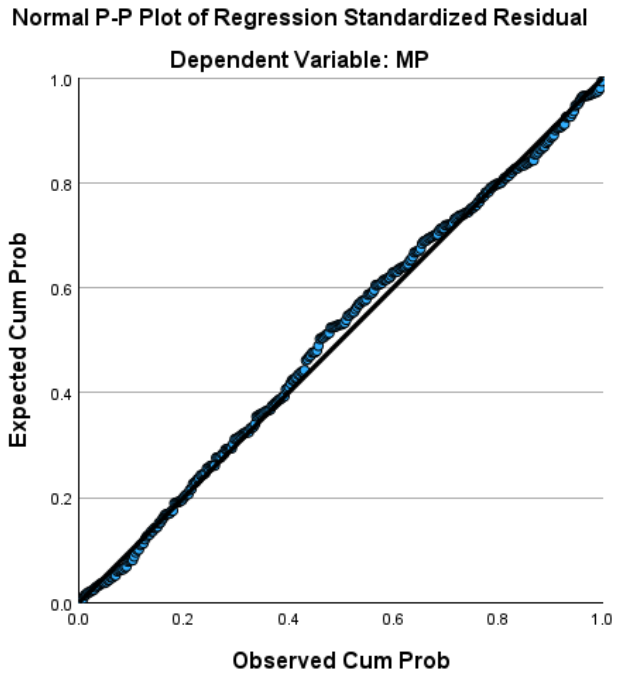

Table D2

Homoscedasticity

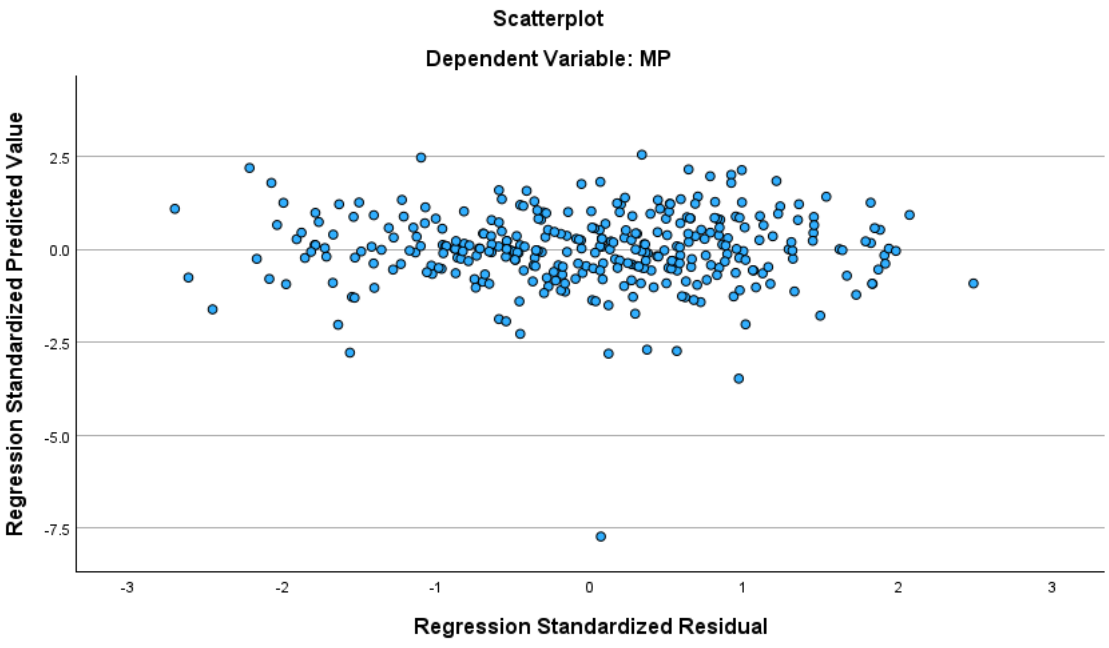

Table D3

Histogram – normal distribution

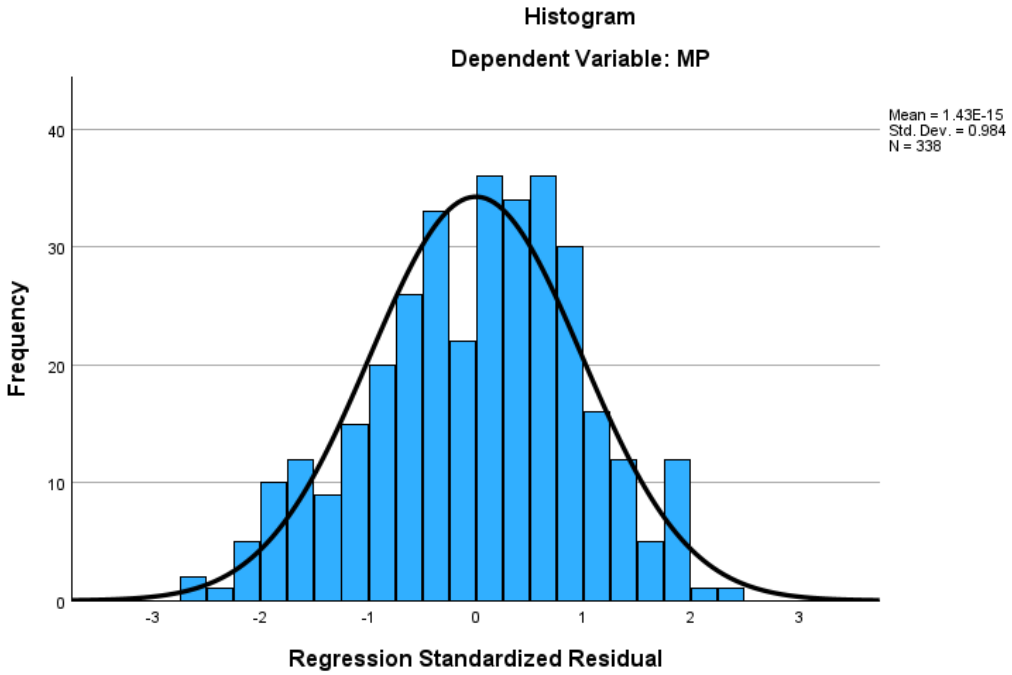

Table D4

Multicollinearity using VIF values

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	48.045	.360		133.523	<.001		
	RKS_c	.469	.047	.479	10.007	<.001	1.000	1.000
2	(Constant)	48.091	.331		145.357	<.001		
	RKS_c	.310	.048	.317	6.522	<.001	.821	1.217
	OM_c	.458	.058	.384	7.910	<.001	.821	1.217
3	(Constant)	48.310	1.097		44.021	<.001		
	RKS_c	.319	.049	.325	6.479	<.001	.758	1.319
	OM_c	.471	.061	.395	7.697	<.001	.726	1.377
	RKS_OM_c	-.002	.003	-.027	-.572	.568	.876	1.142
	Education=University of applied science	.422	.798	.026	.529	.597	.769	1.300
	Education=Bachelor	.469	.956	.024	.490	.624	.786	1.273
	Education=High school	2.484	2.083	.053	1.193	.234	.957	1.045
	Education=Intermediate vocational education	2.558	1.707	.070	1.499	.135	.871	1.148
	Education=Other, please specify:	-3.051	1.771	-.078	-1.723	.086	.928	1.078
	NewAge=31-55	-1.038	1.009	-.068	-1.029	.304	.442	2.263
	NewAge=56+	-1.901	1.139	-.110	-1.669	.096	.441	2.268
	NewSector=white collar	1.069	.690	.070	1.549	.122	.938	1.066

a. Dependent Variable: MP

Appendix E

Interview Summaries

Interview 1

Manager working at BlackRock

BlackRock is the biggest asset management company of the world. The interviewee's team specifically works on data quality – EPF related data. Exchange traded funds are like mutual funds – shares from multiple companies can be added into one EPF. Therefore, individuals invest a very small amount of money into many different companies. The company has 80 different data providers, who send data on a daily base, through a platform called Aeon. The manager's team must ensure that all the data that goes into Aeon is of the right quality. People make financial decisions based on this data, so data quality must be correct. With all the data coming in daily, it is not an easy decision to choose what to check and what not to check. The interviewee's team conducts a lot of analysis before making a management decision. This involves a lot of investigations, before concluding what is important enough or a big enough problem to investigate more. This is also because they have too few people to do all the work that needs to be done.

The interview process of BlackRock includes a difficult number capability test, so individuals are hired that have a certain level of numeric intelligence and who have the knowledge to work with tools like Python. BlackRock also has a lot of internal training programs.

BlackRock has a cross-validation culture, the focus lies on bringing everyone on board. This is because they realise that different types of people have different insights – for example some individuals are more emotion based and some rely on strict numerical data. The interviewee also needs to consider how they approach different people with problems. BlackRock has a multilayer structure; the first layer are the people that work with numbers

who conduct most of the research then is an extraction layer at an emotional level to make sure that management can be on board with the decisions made at a working level. The interviewee also chooses to distribute the same task to two people; in programming terms this is called peer-programming. Two people are simultaneously developing the same code – this ensures cross-validation already during the creating process.

Clashes between intuition and the results from data occur at BlackRock – the interviewee specifically mentions their boss as they describe the boss as a feeling-based person. Often their initial ideas are not backed-up with data, which sometimes leads to issues. Then the interviewee and their team do the number crunching and translate the results into a language that their boss can understand to help convince. The charts and numbers need to be turned into a story. This is something that the interviewee struggled with at the beginning because they are used to always starting with analysing the data and basing decisions off this. Often things in the world are based on emotion, just the numbers are not enough you need a story. This is how you can get more people to use EBMgt.

There is a skill issue, as often those individuals with the skills to work with numbers struggle to translate this into a story and often decisions are based off emotion and not of the facts. At the end of the day, you need to have the story to convince people. This is often the role of the middle management. Moreover, the interviewee thinks it's important to give their colleagues time to go over their decisions and data analysis, so they are able to go through the process themselves.

Interview 2

HR manager working at Covestro

Covestro is a German chemical company, the interviewee is the HR manager of the Dutch locations. When a project starts, like an onboarding scheme or employee screening, the interviewee's team start with a training session – front and loading, during which their team

deep dives into the topics content. This includes research also specifically analysis of similar companies in their external environment and analysis of internal processes. With the five people in their team, you have about 60 years of experience counted together and some individuals have more knowledge on certain topics then others do. Running processes are set and these are often not changed, so not much continuous analysis is done for these processes as that has already been done when the process was created, except if they want to create a change.

In general, when looking at HR Business partners you can quickly see the different level of expertise on different topics. But some prefer to work with the hard side, more technological and numerical focus, whereas there are others that prefer the softer side. It is the interviewee's role as the manager to ensure that there is a good balance between the two. The interviewee also aims to put people in positions that they are strong in, to get the most out of the team's abilities. You can train and develop talents, but a strain can occur if you put the wrong people with a particular way of thinking in the wrong positions, especially if the employees are older, because then you need to change their personality.

When looking at providing a research knowledge and skills training for managers, the interviewee suggests to first start with employees that are inclined to enjoy it and are interested in it. From this enthusiasm you can attract other colleagues to also complete the training. Also next to open-mindedness, employees need a certain level of intelligence to be able to apply the evidence they come across into their work or decision-making. Very simply, often research articles in the HR sphere are in English, Dutch managers may struggle with that.

The use of EBMgt and whether this is practical also really depends on the organisational context. For a company like Covestro it can work very well because it is a corporate that has a lot of access to data but also because employees in higher positions are

academically inclined. The company also collaborates with universities to collect data. This also costs money, to for example request reports. You need to look if it fits with the organisations and whether the organisation would like to improve and develop. It also needs to fit with the organisational goal.

For compensation and benefits, academic literature and research evidence is used a lot. Specifically for organisations that conduct compensation and benefits analysis, like Hays. They are big in the market and have access to a lot of benchmark data. Now at Covestro they need to find a replacement for one of their managers higher up at one of their Dutch locations. This includes defining salary levels for this position, but as it is crucial that the position is filled fast, other managers contacted the interviewee to make sure that the salary level they choose is up to standards and comparable to other similar organisations. So, you need internal knowledge, internal data about the set levels of salaries and external data about salary levels that other companies provide. Anonymised benchmark data - compared to the sector – is often used for HR topics such as turnover rates, executive policies, promotion policies and engagement surveys. Often Covestro also hires consultants that have expertise to direct a change.