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How can Researchers be Influenced to Comply with Guidelines of Research Data Management?

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ABSTRACT

How come Open Science is a well-shared vision among research communities, while the prerequisite practice of research data management (RDM) is lagging? This research sheds light on RDM adoption in the Dutch context of universities of applied sciences, by studying influencing technological, organizational, and environmental factors using the TOE-framework. A survey was sent out to researchers of universities of applied sciences in the Netherlands. The analyses thereof showed no significant relation between the influencing factors and the intention to comply with the RDM guidelines (p-value of ≤ .10 and a 90% confidence level). Results did show a significant influence of the factor Management Support towards compliance with a p-value of 0.078. This research contributes towards the knowledge on RDM adoption with the new insight that the factors used in this research do not seem to significantly influence RDM adoption in the Dutch context of universities of applied sciences. The research does show that the respondents have a positive attitude in their intention to change, increase or invest time and effort towards RDM compliance. More research is advised to uncover factors that do significantly influence RDM adoption among universities of applied sciences in the Netherland for stakeholders in Open Science and RDM to enhance their strategies.

Keywords: Research Data Management, Open Science, universities of applied sciences (UAS), RDM adoption, TOE-framework.

INTRODUCTION

Open Science (OS) is the common name for the movement for a more open and participatory research practice in which not only publications but also data, software, and other forms of scientific information are shared at the earliest possible stage and made available for reuse, according to the Netherlands Organization for Scientific Research (NWO). To contribute to the OS goals, higher educational institutions have established Research Data Management (RDM) policies and made provisions to be adopted by their researchers. Research data sharing levels are still low (Piwowar, 2011). Studies found that researchers do not use institutional or national standards (Wilms et al., 2020). Although a lot of research is being done on RDM (Perrier et al., 2017), there is still a lack of empirically supported insights into factors that influence RDM compliancy. There is an urgent need for more research (Gend & Zuiderwijk, 2022; Wilms et al., 2020). This research sheds light on RDM adoption in the Dutch context of universities of applied sciences, by studying influencing technological, organizational, and environmental factors, which led to the following research question: *How do organizational, environmental, and technological factors influence the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines of Research Data Management?*

The results and insights of this research are highly relevant for stakeholders and management in universities of applied sciences in the Netherlands, as it offers contributing knowledge to the enhancement of their strategies concerning RDM.

THEORETICAL BACKGROUND AND CONCEPTUAL MODEL

Theoretical background

Research data is defined as factual records such as textual, images, sounds and numerical scores (OECD, 2007). Physical data obtained during research is extracted and has been digitized (European Commission, 2017; Gomez-Diaz & Recio, 2022). The exponential growth in data volume and complexity (Ramachandran et al., 2021) makes science more reliant on complex computational infrastructure. People must all be linked together by high-speed networks, making scholarly innovation and discoveries possible (Ramachandran et al., 2021).

The data involved in the research processes and the mentioned infrastructure need solid management, called Research Data Management (RDM). Cox and Pinfield

(2014) state: "RDM *consists of a number of different activities and processes associated with the data lifecycle, involving the design and creation of data, storage, security, preservation, retrieval, sharing, and reuse, all taking into account technical capabilities, ethical considerations, legal issues and governance frameworks*" (Cox & Pinfield, 2014)(p. 300). For this research, the definition of Cox and Pinfield (2014) is adopted as it is commonly used in research.

In this research, the compliance of researchers to the RDM guidelines of the universities of applied science is defined as the 'researchers' decision to conduct RDM', which is adopted from Wilms et al. (2020). Wilms et al. (2020) studied the adoption of RDM by looking at the intention to comply with RDM at an individual level from a value-based perspective and resulted in the conformation of the positive influence of *reputation* and *switching benefits* as factors in RDM compliance and negative elements such as *perceived switching costs*. Results contradicted the assumption that *increased workload* is a reason to reject RDM, and researchers are strongly influenced by the potential of the *benefits* following a well-defined guided knowledge management process. The expectation of *increased reputation* was also proven to be a driver. Hindering factors were *uncertainty factors* based on the Prospect Theory. The uncertainty factor *loss of control* did have a negative impact. The research of Marlina et al. (2022) offers insight into the full scope of factors concerning RDM readiness on the organizational level by presenting an RDM readiness model (Marlina et al., 2022). Readiness factors in the organization are indicators for achieving its goals. Marlina et al. (2022) concluded that environment is a key dimension of RDM readiness with the factors of *government regulation* and *funder policy*.

Conceptual model

For the theoretical foundation of this research, several adoption theories were looked at. Oliveira and Martins (2011) performed a literature review of theories for adoption models at the organization level used in information systems literature. The majority of empirical studies stem from the Diffusion of Innovation (DOI) theory (Rogers, 1962) and the TOE framework (Tornatzky & Fleischer, 1990). Oliveira and Martins (2011) conclude that the TOE framework is better able to explain intra-firm innovation adoption. The TOE framework is described in Tornatzky and Fleicher's book *The Processes of Technological Innovation* (Tornatzky & Fleischer, 1990), and describes how the organization's context influences the adoption and implementation of a technological innovation.

The TOE framework is widely employed because of its flexibility and practical analytical framework (Haneem et al., 2019). The TOE framework therefore gives

foundation to a holistic approach to this study. The TOE framework only identifies the 3 dimensions without determining the factors within each dimension, which are left for the researchers to determine. The technology dimension consists of 'the utilization of various types of technology to facilitate, improve, and reinforce RDM' (Marlina et al., 2022). The technology factor *Perceived benefits* is adopted from Wilms et al. (2020), who found that the potential benefits (*perceived value*) of an innovation or system make a strong positive contribution to the (perceived) value of RDM (Wilms et al., 2020). It is therefore hypothesized that:

H1 *Perceived benefits* positively influence the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

Cox (2017) states that the technology factor complexity regarding RDM, is not just a technical factor but also relates to the interinstitutional need for collaboration to grow support capabilities using technology. The factor *Complexity* negatively influences RDM according to Haneem et al. (2019). It is therefore hypothesized that:

H2 *Complexity* negatively influences the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

There is mistrust when it comes to recording, preserving, and sharing research data (Wilms et al., 2020). Jang et al. (2016) state that perceived trust is an individual's faith in others, or a system and their study showed it has a positive influence on attitudes toward using healthcare services. It is therefore hypothesized that:

H3 *Trust* positively influences the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

The Organizational dimension is summarized as the characteristics and resources of an organization, including the personnel linking structure, communication process, organization demographics, and the characteristics of personnel within the organization (Ahmadi et al., 2017; Baker, 2012; Tornatzky & Fleischer, 1990). The organizational structure includes the need for employees to know their roles and responsibilities (Al-araibi et al., 2019; Marlina & Purwandari, 2019). This is also in line with Wilms et al. (2020) finding that researchers are strongly influenced by the potential of the *benefits* following a well-defined guided knowledge management process. It is therefore hypothesized that:

H4 *Structure* positively influences the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

Haneem et al. (2019) used the TOE framework to study master data management adoption by local government organizations and found that the factor *management support* in the organization dimension has influenced the adoption. It is therefore hypothesized that:

H5 *Management support* positively influences the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

Shamim (2019) adds *organizational culture* as an organizational factor within this dimension, which refers to the set of norms, and values of one's organization that define the core organizational identity (Shamim et al., 2019). In this study, it was the most influential positive factor in the big-data decision- making capabilities.
It is therefore hypothesized that:

H6 *Organizational culture* positively influences the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

The environment dimension refers to the arena in which the organization conducts its business and the external factors for adopting an innovation
(Baker, 2012; Tornatzky & Fleischer, 1990). Marlina et al. (2022) propose *government regulations* and *funder policy* as RDM environmental factors that play an important role in the RDM context. It is therefore hypothesized that:

H7 *Government regulation* positively influences the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

Higman and Pinfield (2015) conclude that the data-sharing condition, although also present in institutional RDM policies, is mainly driven by the funder's policy (Higman & Pinfield, 2015). It is therefore hypothesized that:

H8 *Funder policy* positively influences the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines on Research Data Management.

In summary this study's research the conceptual model *perceived benefits, complexity, perceived trust* are identified as technological factors. *Structure, management support* and *organizational culture* constitute organizational factors. *Government regulation* and *funder policy* represent environmental factors.

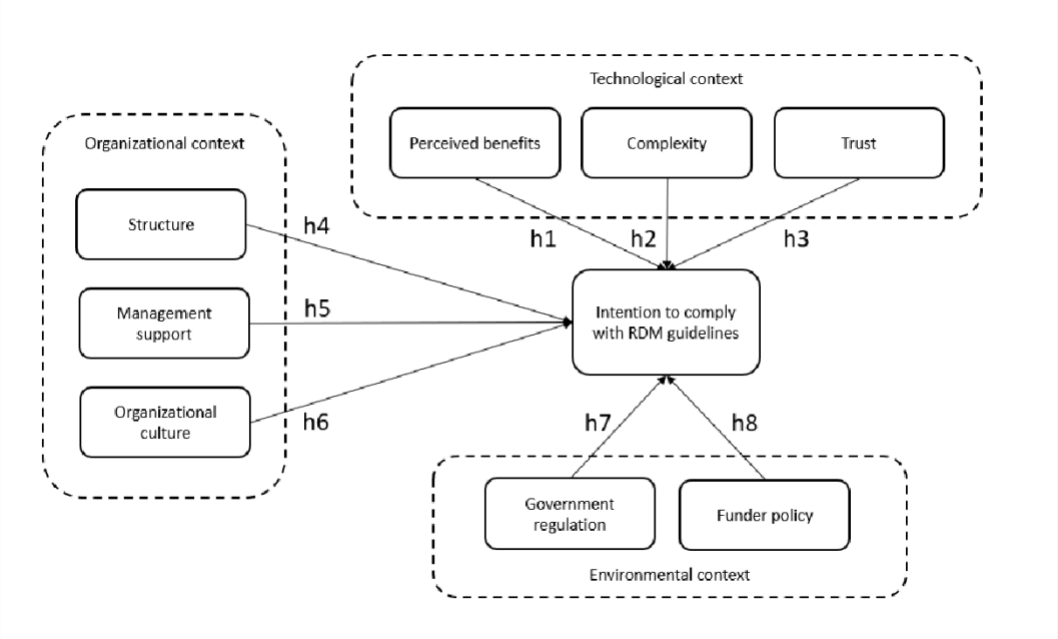

Figure 1. Conceptual model and hypotheses of this research

Research Approach

The approach for this research consisted of a literature review in which concepts and known research on RDM adoption were discovered. These insights were used to establish factors that are known to exert influence. Based on previous research and insights, hypotheses were drawn up. The next step was performing a quantative data-gathering with the use of a survey among a sample of the target population of this research. The survey was a joined data gathering effort between this research and value-based research regarding Open Access Publishing. The last 27 questions of the total of 55 questions, were used for this research. These 27 questions used a seven-point Likert scale for answering (Likert, 1932). This 7-point Likert scale consisted of semantic differential statements to capture levels of agreement, ranging from Strongly disagree to Strongly agree. The survey was published in Dutch and English. The survey questions were based on or derived from previous research and literature, see Appendix A for more detail.

Based on data from the Dutch network of associated Universities of Applied Sciences (Vereniging Hogescholen), the population size was established at 6488 researchers that were employed at universities of applied sciences in the Netherlands in the year (reference year 2020). This research used a random sample with a p-value of $\leq .10$ and therefore a 90% confidence level.

The calculated threshold for the sample size to comply to this level is 262 respondents. The method of non-probability convenience sampling was used, due to practical obstacles to approach respondents for participation. The decision was made to gather all publicly available personal e-mail addresses of professors and associate professors and to personally invite them to participate. They were also requested to forward the invitation in their research team and professional network. A total of 764 unique e-mail addresses were gathered, to which the invitation to participate was sent. Directly after sending the invite to participate a blocking error in the Dutch survey was discovered and fixed. After 8 days a reminder was set, to increase since the number of respondents, which was 27 at that point.
To increase the response a new approach was adopted by openly publishing the request for participation through professional networks and platforms, such as LinkedIn.

Data Analysis

The data was analyzed in SPSS to report respondents' statistics and indicator frequencies, mean (*M*), and standard deviations (*SD*). Next, Partial Least Squares based Structural Equation Modelling (PLS- SEM) was performed using SmartPLS version 4. PLS-SEM analysis is recommended when the sample size is small, which was the case in this research (Hair et al., 2019).

Before looking at the cause-effect relationships via path modelling with latent variables, internal consistency were looked at (Hair et al., 2019). In reflective measurement models, this is done by evaluating the following measures: reflective indicator loadings, internal consistency reliability by using composite reliability, Cronbach's alpha, convergent validity using the average variance extracted (AVE) and discriminant validity using heterotrait-monotrait (HTMT) (Hair et al., 2019). In evaluating the PLS- SEM results the next step was to assess the structural model. This included the coefficient of determination measured by R-square (R^2), and the statistical significance and relevance of the path coefficients (Hair et al., 2019). Last step was the evaluation of the statistical significance and relevance of the path coefficients, meaning the relationships amongst study factors. This led to the evaluation of the hypotheses.

RESULTS

In total 109 respondents started filling out the survey and 62 respondents completed the RDM-survey questions. This represents 23.67% of the calculated sample size of 262 respondents and 0.95% of the total population of 6488 people. The margin of error is 10.22% which means that the confidence level of the sample size, which was set to 90%, just fell short and was not met.

The gender distribution of respondents was 40.3% female (N=25), 56.5% male (N=35), and 3.2% other/prefer not to say (N=2). The age distribution of respondents states a mean age of 50.62 years with a standard deviation (*SD*) of 10.626 (N=60). The language chosen for filling out the survey was 30.65% English (N=19) and 69.35% Dutch (N=43). Table 1 shows the mean (*M*) and standard deviation (*SD*) of the results of the factors.

Table 1 Results of the survey; mean (M) and standard deviation (SD)

Factors	**Mean (*M*)**	**Std.dev. (*SD*)**
Structure	4.94	1.298
Management support	4.46	1.236
Organizational culture	4.90	1.239
Perceived benefits	4.00	1.250
Complexity	4.05	1.420
Perceived trust	5.22	1.224
Government regulation	4.27	0.896
Funder policy	4.65	1.249
Intention to comply with RDM guidelines	4.91	1.237

Before looking at the cause-effect relationships via path modelling with latent variables, internal consistency was to be looked at (Hair et al., 2019). For this, the reflective indicator loadings were calculated through Standard Bootstrapping in

PLS-SEM. Results led to the conclusion that 3 indicators of the factor 'Trust' (PT_1, PT_2, PT_3), were unreliable. The factor *Trust* was therefore not included in the model structure analyses in the structural model assessment.

Next the internal consistency reliability was looked at by calculating Cronbach's alpha, rho_a, rho_c and average variance extracted (AVE). See results in table 2.

Table 2. Results of the internal consistency reliability

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Complexity	0.863	0.886	0.915	0.783
Funder policy	0.920	-2.944	0.825	0.618
Government Regulation	0.735	0.665	0.834	0.627
Management Support	0.840	0.902	0.902	0.756
Organizational Culture	0.847	0.880	0.906	0.762
Perceived Benefits	0.949	-6.508	0.778	0.550
Perceived Trust	0.935	-6.267	0.742	0.503
Structure	0.830	1.273	0.883	0.719
Intention to comply	0.917	0.936	0.947	0.857

It is concluded that the composite reliability rho_c ranges from satisfactory to good and does not exceed the threshold of 0.95 (Hair et al., 2019). The values show satisfactory results for Cronbach's alpha, which assumes the same thresholds as the composite reliability rho_c. The results for rho_a in this study showed far out-of-range levels. Explanations can be errors in calculations, data input mistakes, or other issues with the analysis. Since none of these mistakes were found, it is more likely that the explanation lies in the small sample size. Since Cronbach's alpha and the liberal composite reliability rho_c are satisfactory, the decision is made to ignore the rho_a results. An AVE value of 0.50 or higher is considered acceptable (Hair et al., 2019). It is concluded that the convergent validity is acceptable. The discriminant validity was measured next, by the heterotrait- monotrait (HTMT) ratio of the correlations. See table 3.

Table 3. Discriminant validity - Heterotrait-monotrait ratio (HTMT) - Matrix (SmartPLS4)

	Complexity	Funder policy	Government	Intention to comply	Management Support	Organizational Culture	Perceived Benefits	Perceived Trust	Structure
Complexity									
Funder policy	0.091								
Government Regulation	0.261	0.362							
Intention to comply	0.147	0.079	0.197						
Management Support	0.129	0.354	0.311	0.403					
Organizational Culture	0.147	0.255	0.243	0.214	0.713				
Perceived Benefits	0.116	0.060	0.068	0.061	0.102	0.098			
Perceived Trust	0.084	0.151	0.331	0.079	0.514	0.562	0.105		
Structure	0.270	0.215	0.208	0.239	0.704	0.578	0.244	0.656	

In evaluating the structural model, the first step is to examine the collinearity statistics to make sure it does not bias the regression results. For this the Variance Inflation Factor (VIF) values were calculated. Values between 3 and 5 have possible collinearity issues. If VIF is ≥ 5 there are probable collinearity issues and items must be removed (Hair et al., 2019). Based on the outcomes the decision was made to remove PB_3 in the evaluation of the statistical significance and relevance of the path coefficients. Indicators PT_1, PT_2 and PT_3 (factor *Trust*) were already designated for removal by the measurement model analysis. The coefficient of determination is measured by R squared (R^2) and has a value of 0.234. It is concluded that the explanatory power is considered weak, since R^2 values of 0.75, 0.50 and 0.25 can be considered substantial, moderate and weak (Hair et al., 2019). Finally, the evaluation of the statistical significance and relevance of the path coefficients was done, see results in figure 2.

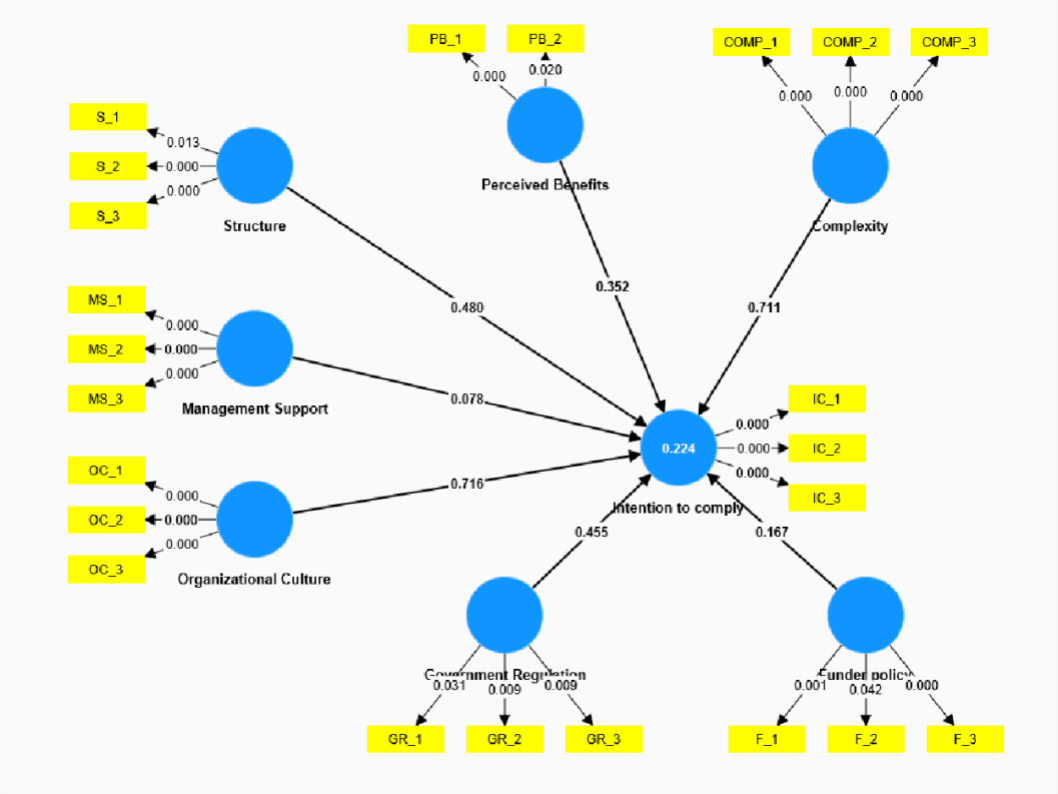

Figure 2. Path coefficients (PLS-SEM bootstrapping in SmartPLS version 4)

In table 4 the path coefficients per hypotheses are presented.

Table 4. Path coefficients per hypotheses (PLS-SEM bootstrapping in SmartPLS version 4)

		Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
H1	Perceived Benefits -> Intention to comply	0.163	0.077	0.175	0.931	0.352
H2	Complexity -> Intention to comply	-0.058	-0.046	0.156	0.371	0.711
H4	Structure -> Intention to comply	0.140	0.139	0.198	0.707	0.480
H5	Management Support -> Intention to comply	0.325	0.319	0.184	1.762	0.078
H6	Organizational Culture -> Intention to comply	-0.071	-0.048	0.196	0.364	0.716
H7	Government Regulation -> Intention to comply	0.142	0.165	0.190	0.746	0.455
H8	Funder policy -> Intention to comply	-0.205	-0.135	0.148	1.382	0.167

The results of the path coefficients show that only hypothesis 5 is found to be significant, since this study set the p-value of $\leq .10$ and a 90% confidence level.

DISCUSSION AND CONCLUSION

The results of this study showed that only the factor Management Support has a significant influence on the intention to comply with RDM in the context of researchers at universities of applied sciences. In reflection on these results, one can question whether the TOE framework and the chosen factors are a good fit. The factor *Perceived benefits* and their survey questions were adopted from Wilms et al. (2020) in which the three survey questions contained the words 'Changing to the new way...'. This can come across as if the respondent is yet to start with the innovation. Perhaps this operationalization of the factor *Perceived benefits* by adopting this from Wilms et al. (2020) was not the best choice for this research. One can also question the decision to use this factor. Since it is adopted from the

Social Exchange Theory, it places a value-based factor at the individual level in this dimension, whereas the TOE framework is used for research explaining adoption on the organization level. The TOE framework does not prohibit the use of a value-based factor since the framework does not provide a fixed set of factors. The factor *Complexity* which was expected to have a negative influence (Haneem et al., 2019). One can argue that the respondents did not find RDM complex. Whether this is due to the tech savviness of the respondents or if they are working in an institution equipped with well-functioning RDM services and support, it is not known. Based on the measurement model analysis, the factor *Trust* was removed from the structural model assessment. It is therefore recommended to operationalize this factor differently in further research to avoid removal.

This research adopted the factors *Government Regulation*, *Funder Policy*, *Structure*, M*anagement Support* from Marlina et al. (2022), including their operationalizations thereof. These factors are all conditions for RDM readiness according to Marlina et al. (2022). This research did not find a significant influence of these factors in connection with RDM compliance, with the exception of the factor *Management support.* The thought arises that adopting factors based on the RDM readiness insights, is not all a good fit for this research. The research by Shamim et al. (2019), led to a significant level of influence of *Culture* as an organizational factor on big data decision-making capabilities and was adopted for this research. *Culture* is also one of the RDM readiness factors as stated by Marlina et al. (2022). In this research, *Culture* was not of significant influence on RDM compliance, therefore this factor does not seem to be a good fit for this research.

The assumption that the TOE framework itself is fit for this research, but the factors and operationalization thereof may not, can be supported by the conclusion of Oliveira and Martin (2011) who state that in the same context a specific theoretical model can have different factors. They based this on empirical studies that combine the TOE framework with DOI theory and the Institutional Theory (Scott, 2005). The conclusion can be drawn that this research cannot answer the research question "How do organizational, environmental, and technological factors influence the decision of researchers in universities of applied sciences in the Netherlands to comply with guidelines of Research Data Management?".

THEORETICAL AND PRACTICAL IMPLICATIONS

The theoretical contribution of this research towards the knowledge of the TOE framework lies in the application of the framework in this research context which, to our knowledge, has not been applied before. This research adds to the theoretical knowledge that the choice of factors within the TOE Framework matters. Although the factors are context-dependent, the use and the operationalization of factors based on RDM readiness do not demonstrate an adequate fit in predicting RDM compliance.

The practical recommendations are somewhat limited. It delivered a snapshot of the extent to which the participating researchers of applied sciences in the Netherlands agree with the survey questions. It also delivered information on how to improve the research in factors that influence RDM adoption. The fact that this research found that only Management Support influences RDM adoption, is of importance to the management of universities of applied sciences. The amount of effort improving or counteracting these factors can be evaluated and reconsidered. It is advised that *management support* can be reinforced and strengthened as it showed a significant positive influence on RDM adoption.

For future research it is recommended that other factors need to be considered. It is advised to thoroughly pretest a survey to improve the operationalization of items. Other research methods, such as interviews, can also be employed for a better fit of words and phrases used. Preferably other means of engaging respondents must be applied to increase the response.

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APPENDIX A: RDM SURVEY QUESTIONS

Dependent variable		
Intention to comply with RDM guidelines		
IC_1	English: I intend to increase the new way of managing research data in the foreseeable future. Dutch: Ik ben van plan om de nieuwe manier van het beheren van onderzoeksgegevens in de nabije toekomst uit te breiden.	Adopted from (Wilms et al., 2020)
IC_2	English: I intend to invest my time and effort in the new way of managing research data. Dutch: Ik ben van plan om mijn tijd en moeite te investeren in de nieuwe manier om onderzoeksgegevens te beheren.	
IC_3	English: I intend to switch from my current way of managing research data to the new way of managing research data. Dutch: Ik ben van plan over te stappen van mijn huidige manier van onderzoeksgegevens beheren naar de nieuwe manier van onderzoeksgegevens beheren.	

Organizational factor: Structure		
S_1	English: The organization has employees who have a role as data managers Dutch: De organisatie heeft medewerkers die een rol hebben als gegevensbeheerder.	Based on (Marlina et al., 2022)
S_2	English: Responsibilities concerning research data management are clearly defined Dutch: Verantwoordelijkheden met betrekking tot het beheer van onderzoeksgegevens zijn duidelijk gedefinieerd.	
S_3	English: The organization follows the systematic procedures for research data management Dutch: De organisatie volgt de systematische procedures voor het beheer van onderzoeksgegevens.	

Organizational factor: Management support		
MS_1	English: Management in my organization is highly interested in using research data management Dutch: Het management in mijn organisatie is zeer geïnteresseerd in het gebruik van onderzoeksgegevensbeheer.	Based on (Marlina et al., 2022)
MS_2	English: Management in my organization is aware of the benefits of research data management Dutch: Het management in mijn organisatie is zich bewust van de voordelen van het beheer van onderzoeksgegevens.	
MS_3	English: Management in my organization has allocated adequate financial and human resources for the development and operation of research data management Dutch: Het management in mijn organisatie heeft voldoende financiële en personele middelen vrijgemaakt voor de ontwikkeling en het beheer van onderzoeksgegevens.	
Organizational factor: Organizational culture		
OC_1	English: Research data management is part of our organizational routine Dutch: Het beheer van onderzoeksgegevens maakt deel uit van onze organisatorische routine.	Based on (Shamim et al., 2019)
OC_2	English: Research data management is strongly encouraged in our organization. Dutch: Het beheer van onderzoeksgegevens wordt sterk aangemoedigd in onze organisatie.	
OC_3	English: We consider research data management a tangible asset Dutch: We beschouwen het beheer van onderzoeksgegevens als een tastbaar bezit.	

Technological factor: Perceived benefits		
PB_1	English: Changing to the new way of managing research data would enhance my effectiveness on the job more than working in the current way Dutch: Overstappen op de nieuwe manier van onderzoeksgegevens beheren zou mijn effectiviteit op het werk meer verbeteren dan werken op de huidige manier.	Adopted from (Wilms et al., 2020)
PB_2	English: Changing to the new way of managing research data would enable me to accomplish relevant tasks more quickly than working in the current way. Dutch: Door over te stappen op de nieuwe manier om onderzoeksgegevens te beheren, zou ik relevante taken sneller kunnen uitvoeren dan wanneer ik op de huidige manier zou werken.	
PB_3	English: Changing to the new way of managing research data would increase my productivity more than working in the current way. Dutch: Overstappen op de nieuwe manier van onderzoeksgegevens beheren zou mijn productiviteit meer verhogen dan werken op de huidige manier.	
Technological factor: Complexity		
COMP_1	English: Integrating research data management in my current work practices is very difficult Dutch: Het integreren van het beheer van onderzoeksgegevens in mijn huidige werk is erg moeilijk.	Based on (Haneem et al., 2019)
COMP_2	English: The skills required to use research data management are too complex. Dutch: De vaardigheden die nodig zijn om onderzoeksgegevens te beheren zijn te complex.	
COMP_3	English: The use of research data management is very challenging Dutch: Het beheer van onderzoeksgegevens is een grote uitdaging.	

Technological factor: Perceived trust		
PT_1	English: I trust the research data management of our organization Dutch: Ik heb vertrouwen in het beheer van onderzoeksgegevens door onze organisatie.	Based on (Jang et al., 2016)
PT_2	English: The research data management of our organization is secure Dutch: Het beheer van onderzoeksgegevens van onze organisatie is veilig.	
PT_3	English: I have faith in the research data management of our organization Dutch: Ik vertrouw op het beheer van onderzoeksgegevens van onze organisatie.	
Environmental factor: Government regulation		
GR_1	English: Government has commitment to encourage research data management Dutch: De overheid heeft de bereidheid en wil om het beheer van onderzoeksgegevens stimuleren.	Based on (Marlina et al., 2022)
GR_2	English: Government has an adequate integrated national system to strengthen the preservation and accessibility of research data Dutch: De overheid heeft een adequaat geïntegreerd nationaal systeem om de bewaring en toegankelijkheid van onderzoeksgegevens te versterken.	
GR_3	English: Government adequately developed national regulations to maintain the preservation of research data Dutch: De overheid heeft adequate landelijke regelgeving ontwikkeld om het bewaren van onderzoeksgegevens te handhaven.	

Environmental factor: Funder policy		
F_1	English: Funders have policy in place to sustain the preservation of research data Dutch: Financiers hebben beleid om het bewaren van onderzoeksgegevens te ondersteunen.	Based on (Marlina et al., 2022)
F_2	English: Funders have policy in place to reinforce data reuse Dutch: Financiers hebben beleid om hergebruik van gegevens te stimuleren.	
F_3	English: Funders have policy in place to establish data sharing Dutch: Financiers hebben beleid om het delen van gegevens vast te leggen.	