

Technology Vulnerability and Organizational Risk Propensity: The Moderating Role of Technical and Political Information

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Research Questions

- **Does vulnerability shape organizational risk propensity (ORP)?**
- **Does information availability influence the relationship between vulnerability and organizational risk propensity (ORP)?**

Vulnerability is defined as potential harm organization can experience because it is **unable to respond to challenges and adverse events**

(Berkes, 2007; Bijker, 2006; McEntire, 2008; B. L. Turner et al., 2003; Wackers & Kérte, 2003)

Organizational Risk Propensity (ORP) is organizational tendency to **undertake new efforts to address shortcomings or solve problems in different ways**

(Sitkin & Weingart, 1995)

Top managers shape ORP as they perceive and interpret challenges and opportunities

(Kim, 2010)

Public organizations are increasingly experiencing **unanticipated or unpredictable events**

(Arjen Boin & Lodge, 2016; Berkes, 2007; Bijker, 2006; Comfort et al., 2012; Tierney, 2014)

Organizations can overcome its instability through **innovative solutions or risk taking**

Access to information about the **environment** and **organizational capacity** enables top managers to encourage risk taking in organizations to reduce **vulnerability**

(Bozeman & Kingsley, 1998; Damanpour & Schneider, 2006; Shapira, 1995)

Hypotheses

H1: Organizations that are more technologically vulnerable will have lower ORP

- Vulnerability implies **lower technical capacity and fewer slack resources** to address challenges and protect from failure and risk (Bourgeois, 1981; Nohria & Gulati, 1996)
- In less vulnerable organizations, top managers create an **organizational culture** that supports creativity and risk-taking behavior (Prajogo & Ahmed, 2006)

Access to information as moderator

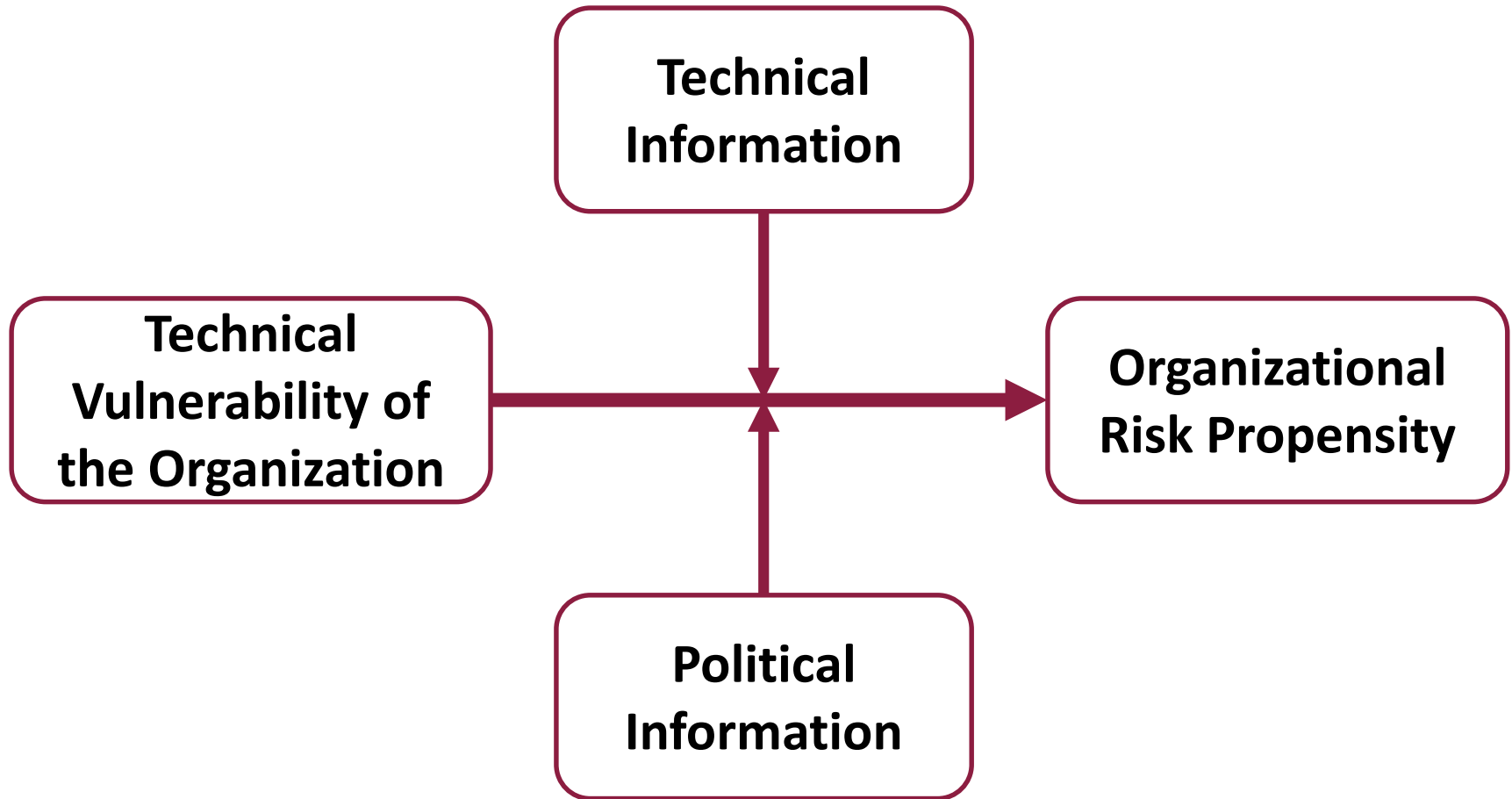
- **Information reduces uncertainty yet activation of information depends on context** (Daft & Lengel, 1986)
- **Top managers mix available information with their perceptions of organizational context**
- **More information motivates top managers to take action and correct organizational culture**
 - Technical information shapes top manager's behavior and decisions (Maxwell, 2003)
 - Political information encourages top managers to strategically harness limited resource (Daft & Lengel, 1986; Schwenk, 1988)

Hypotheses

H2: Top managers with technical information will positively moderate the relationship between vulnerability and ORP

H3: Top managers with political information will positively moderate the relationship between vulnerability and ORP

Model



Data

- **Pooled data from three national surveys of top managers in US local government: 2012, 2014, 2018**
- **500 US cities**, populations from 25,000 to 250,000
- **Five departments:** Police, Finance, Parks & Recreation, Community development, Mayor's office
- **Response rate: 30%~36%**

Dependent Variable

Organizational Risk Propensity

- **5-point Likert scale with 4 items**
- **We ask:**
 - Reward for innovative solutions
 - Organizational commitment to innovation
 - Organizational culture: innovative and risk-taking
 - Employee's characteristics: risk taking
- **Cronbach's alpha > 0.8 for all three years**

Independent Variable

Technical Vulnerability

- 5-point Likert scale with 4 items
- We ask:
 - Ill-equipped to manage online security and privacy?
 - Lack of software to improve efficiency?
 - Mismatch in department need and technology?
 - Unable to monitor, control and use of data?
- Cronbach's alpha > 0.8 for all three years

Independent Variables

Technical Information

- Summative scale from 0 to 5
- Yes/No/Don't Know on five types of events
 - Unintended electronic disclosure of information
 - Unauthorized disclosure to media, politicians, citizens
 - Attempted security breach

Political Information

- Dummy variable (1=Know)
- We ask:
 - Legal requirement to include citizen input in policy making

Control Variables

- **City characteristics** (forms of government, population)
- **Organizational characteristics** (routineness, centralization, participation)
- **Department characteristics** (type, size)
- **Individual characteristics** (salary, education)
- **Dummy year variables**

Method

Cross-sectional Pooled Regression Model with clustered robust standard errors by city

Organizational Risk Propensity =

f (Technical vulnerability, Technical information,
Technical vulnerability*Technical information,
Controls)

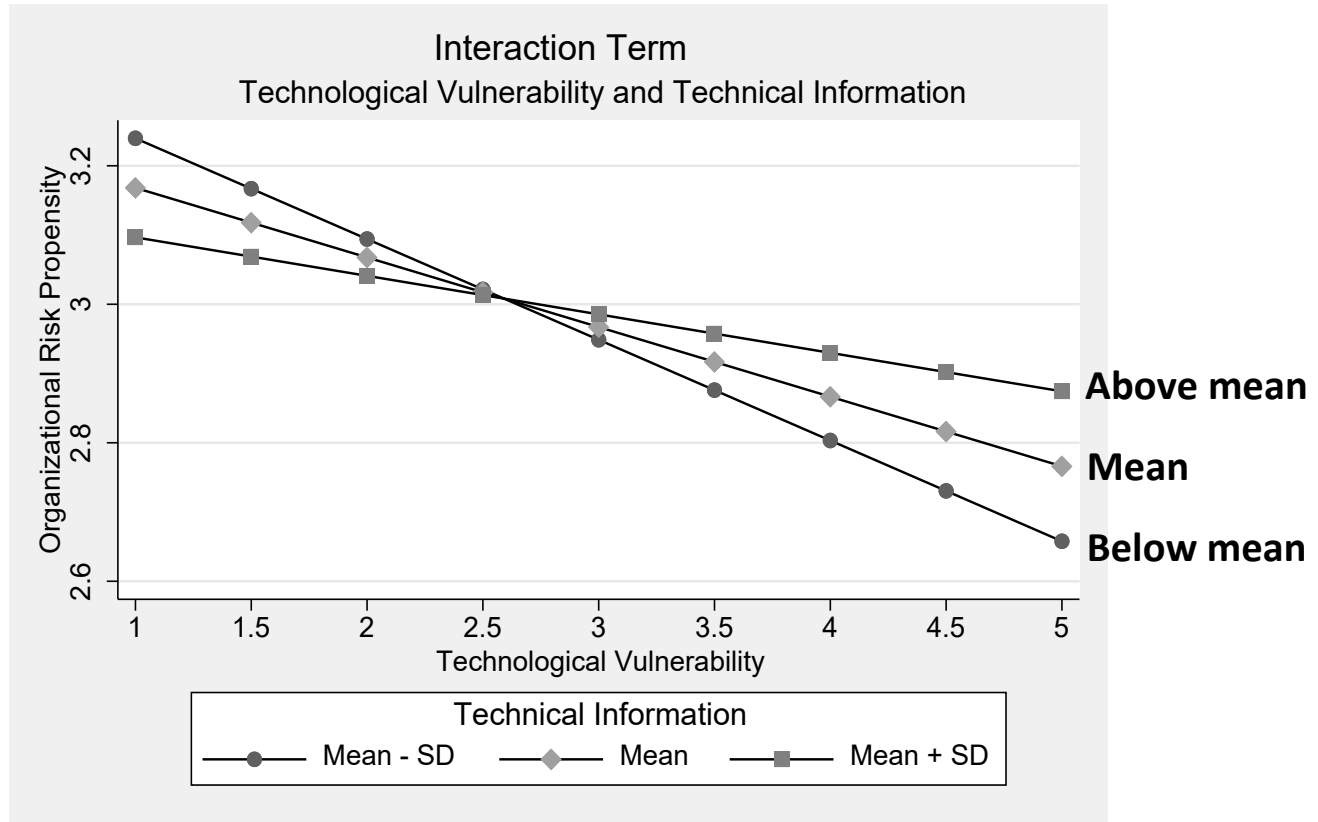
Organizational Risk Propensity =

f (Technical vulnerability, Political information,
Technical vulnerability*Political information,
Controls)

Results

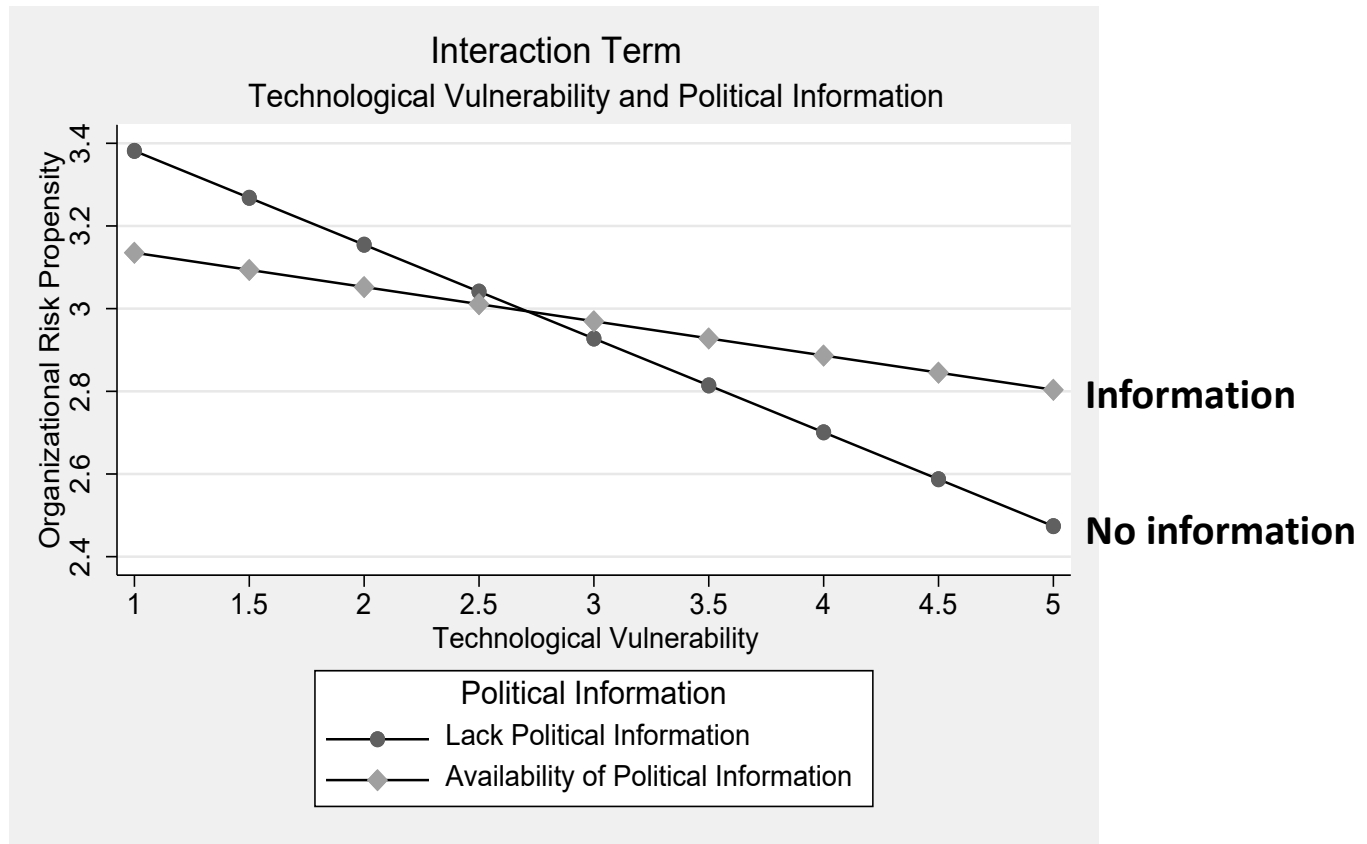
Organizational Risk Propensity	
Technical vulnerability of the organization	- ***
Technical information	- ***
Technical vulnerability* Technical information	+ *
Political Information	
Technical vulnerability* Political information	+ **

Moderation: Technical Information



With **more information on technical incidents**, technical vulnerability **less** influence ORP

Moderation: Political Information



With **access to information on political constraints**, technical vulnerability **less** influence ORP

Conclusion

- **Organizational risk propensity** is encouraged only in certain contexts
- **Investment in technical capacity** matters to increase ORP
- **Access to information** moderates the impact of vulnerability

Thank you!

Q&A

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Dependent Variable

Organizational Risk Propensity

Please indicate your level of agreement or disagreement with each of the following statements

(Likert scale from 1 = Strongly disagree to 5 = Strongly agree):

- Employees in this organization are rewarded for developing innovative solutions to problems.
- This organization has a strong commitment to innovation. People who develop innovative solutions to problems are rewarded.
- This organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.
- Most employees in this organization are not afraid to take risks.

(Cronbach's alpha > 0.8 in each year)

Independent Variable

Technical Vulnerability

Please indicate your level of agreement or disagreement with each of the following statements

(Likert scale from 1 = Strongly disagree to 5 = Strongly agree):

- My agency is ill-equipped to manage important questions about online security and privacy.
- Management lacks software applications that would make work more efficient.
- There is a mismatch between our department's needs and what technology can provide.
- My agency is too busy to effectively monitor, control, and use the data we collect.

(Cronbach's alpha > 0.8 in each year)

Independent Variable

Technical Information

Q: During the last 12 months, has your organization experienced any of the following?

(Yes, No, I don't know):

- Unintended or accidental electronic disclosure of organization information
- Unauthorized disclosure of information to media
- Unauthorized disclosure of information to politicians or other key public officials
- Unauthorized disclosure of information to citizens or other community groups
- An attempted security breach in which an external organization sought to access your electronic files or data

Independent Variable

Political Information

Q: Is your organization legally required to include citizen input in policy-making activities?

(Yes, No, I don't know)

Control Variables

- **City characteristics** (forms of government, population)
- **Organizational characteristics** (routineness, centralization, participation)
- **Department characteristics** (type, size)
- **Individual characteristics** (salary, education)
- **Dummy year variables**

Descriptive Statistics

Variable	Obs	Mean	SD	Min	Max
ORP	2034	2.98	0.79	1.00	5.00
Technological Vulnerability	2124	2.70	0.79	1.00	5.00
Technical Information	2083	3.83	1.77	0.00	5.00
Political Information	2196	0.10	0.30	0.00	1.00
Routineness	2020	2.85	0.81	1.00	5.00
Centralization	2034	2.92	0.77	1.00	5.00
Civic Society Participation	2198	3.03	0.80	0.00	5.00
Governmental Participation	2172	2.71	1.05	0.00	5.00
City Actor Participation	2199	3.42	1.29	0.00	5.00
Parks and Recreation	2260	0.24	0.42	0.00	1.00
Finance	2260	0.17	0.37	0.00	1.00
Community Development	2260	0.20	0.40	0.00	1.00
Police	2260	0.23	0.42	0.00	1.00
Population (log)	2259	11.16	0.66	10.13	12.43
Department Size (log)	2001	143.50	635.08	0.00	18400.00
Salary	1978	4.03	1.05	1.00	5.00
Master	1977	0.46	0.50	0.00	1.00
Form of Government	2260	0.27	0.44	0.00	1.00
2014	2260	0.35	0.48	0.00	1.00
2018	2260	0.28	0.45	0.00	1.00

Full model

	B	SE	
(Intercept)	5.14	0.29	***
Vulnerability	-0.22	0.06	***
Technical information	-0.01	0.01	
Political information	0.00	0.04	
Vulnerability *	0.03	0.02	+
Technical information			
Vulnerability *	0.13	0.08	+
Political information			
Adj. R squared	0.380		
N	1835		

Types of Information

	Model 1				Model 2			
	B	SE	P-value		B	SE	P-value	
Independent variables								
Technological Vulnerability	-0.10	0.03	0.00	***	-0.11	0.03	0.00	***
Political Information - Constraints					0.02	0.04	0.70	
Lack of Political Information					0.01	0.06	0.88	
Technical Information - Negative Event	0.00	0.02	0.95					
Interaction terms								
Negative Event * Vulnerability	0.00	0.02	0.89					
Constraints * Vulnerability					0.05	0.04	0.18	
Lack of Political Information * Vulnerability					-0.12	0.07	0.10	*

Limitation & Contribution

- Drawbacks of survey data
- Other types of information
- Pooled three national surveys
- Theoretical extension on the impact of vulnerability on risk perception
- Importance of dissemination of information