VU VRIJE UNIVERSITEIT AMSTERDAM

Building adaptive capacity: The role of advanced analytics in risk management

Evelyn Braumann
Aleksandra Klein
Arthur Posch

Siegen, October 2022

Background of this study

MANAGEMENT | STRATEGY |

STRATEGIC RISK IN THE NEW NORMAL

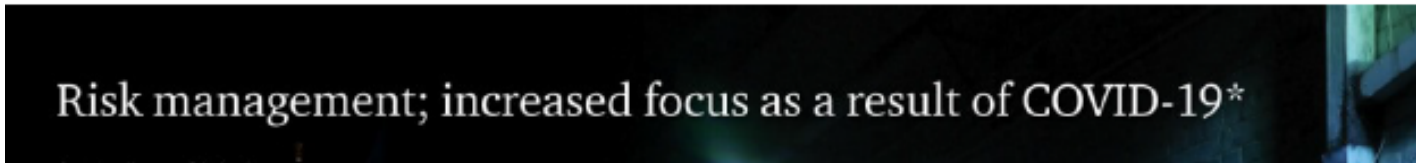
BY HARSHINI SIRIWARDANE, PH.D., CMA; ELLA MAE MATSUMURA, PH.D.; AND SRIDHAR RAMAMOORTI, PH.D., CPA, CIA, CFE, CGFM

December 1, 2021

Gartner, 2020

As the COVID-19 pandemic continues, CFOs have ramped up adoption of technology related to automation, data analytics, and risk management.

Strategic Finance, 2022



PWC, 2021

Organizations must understand the strategic and business (emerging) risks that organizations face today if they are to help them maintain operational resilience in today's fast-changing complex environment.

ACCA, 2021

"Implementing business intelligence (BI) and data & analytics (D&A) means shifting from tactical data delivery to strategically filtering and extracting value from financial and operational data, then converting it to meaningful information that supports business decisions."

KPMG, 2015

The relevance of adaptive capacity for today's organizations

Adaptive capacity is…

- A major facet of **organizational resilience** (Friedman et al. 2016)
- the ability to adjust and respond to **external changes and turbulence** in its respective industry (Carmeli & Scheaffer 2008, Staber & Sydow 2002)
- promoted by certain **tangible** and **intangible assets** including **risk management strategies** and strong **organizational values** (Williams et al. 2017, Luthans & Youssef 2007, Youssef & Luthans 2005)
- a related concept to dynamic capability (Zahra & George 2002, Teece, Pisano, & Shuen, 1997)

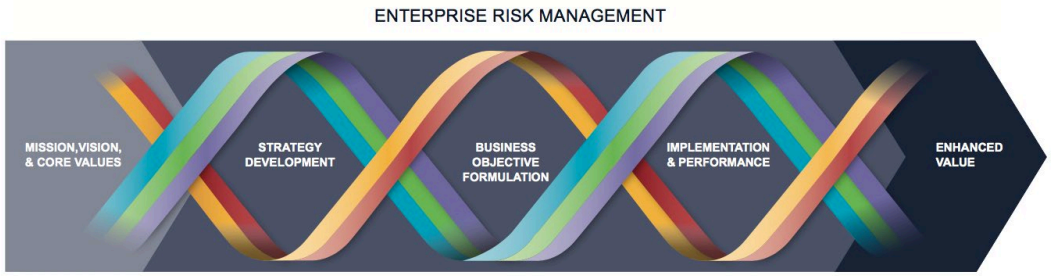
The role of advanced analytics in risk management

- Advanced analytical tools can support risk management in providing information for **decision making and control** (Rikhardsson & Yigitbasioglu 2018, Jullens 2020, PWC 2021)
  - Improving **predictability** and accuracy of forecasts
  - Increased **information content** of data used for risk identification and assessment
  - Integration into planning scenarios (**strategic planning** as platform)
  - Reducing **compliance** burden (e.g., predictive monitoring systems)
  - Efficient customer, vendor, third-party screening
  - Supporting supply chain integrity

*Advanced analytics procedures include the **use of advanced methods, such as big data and predictive analytics, data/text mining, machine learning, simulations**, etc., for the purpose of **analyzing structured and unstructured data** to gain better and deeper insights into the **future performance***

Integrating risk information into strategic planning

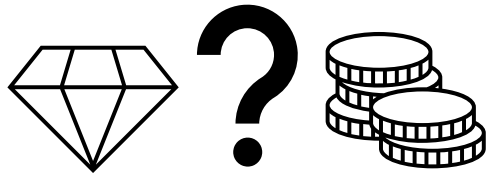
- Standard setters and practitioners emphasize the **importance of integrating risk information into strategy** (COSO 2017, Viscelli et al. 2017, Frigo & Anderson 2011)
- **Risk-based information** should be supportive in how to respond to emerging (strategic) risks and opportunities (Sax & Anderson 2019)
- Risk management can benefit from **timely and relevant data**



The interdependence of advanced analytics in RM and strategic integration

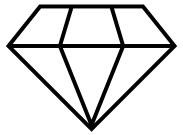
- *Strategy integration of risk information* and *advanced analytics in risk management* are both about **reducing uncertainty** and **enhancing the understanding** of the business environment

- Strategy integration of risk management is a **difficult endeavor** (Widener 2007, Viscelli et al., 2017)
- Promised **benefits** from advanced analytics are **not always achieved**
- **Limited understanding of …**
  - how to derive the value (Mazzei & Noble 2017, Côrte-Real et al. 2017)
  - the ***costs*** associated with its use (Cappa et al. 2021)
  - unintended consequences (Rana et al. 2021)

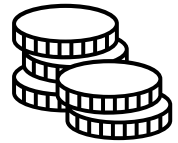


RQ: Are advanced analytics in risk management and strategy integration complements or substitutes with respect to adaptive capacity?

The joint benefits and cost of the interdependence



- AA techniques can be **applied to planning scenarios** → *alternative risk information* (Mathrani & Mathrani 2013, Bronzo et al. 2013)
- Supports **monitoring** the changing risk profile and allows timely actions (Madni & Jackson, 2009)
- More objective and **less judgmental understanding** of these risks through targeted use of advanced analytics output (e.g., risk policies, tolerances)



- **Competition** for **management attention** and managerial processing capability (Widener 2007)
- Management preference to rely on their **experience** and **intuition** instead of advanced analytics tools → *algorithm aversion* (McAfee & Brynjolfsson 2012)
- Struggles with **embedding risk-related output** from advanced analytics into strategic processes (Rikhardsson & Yigitbasioglu 2018, Rana et al. 2020) → *information obesity, slowing down decision-making*

The role of top management in setting an advanced analytics strategy

- Many organizations fail to benefit from advanced analytics due to the **lack of a clear vision and strategy** for advanced analytics (Fleming et al. 2018)
- The strategic role of top management in **alleviating the joint cost**:
  - **direction and strategic focus** to the output generated by advanced analytics in risk management (Grover et al. 2018) → *strategic alignment, reduction of information obesity*
  - **clear signal** that advanced analytics is a **top management priority** that is worthy of being heard in the strategy process (Tallon 2008) → *addressing algorithm aversion, management attention*

H1: Advanced analytics in risk management, strategy integration of risk management and advanced analytics strategy are complements with respect to adaptive capacity.

VU

Data Collection

Online-Questionnaire

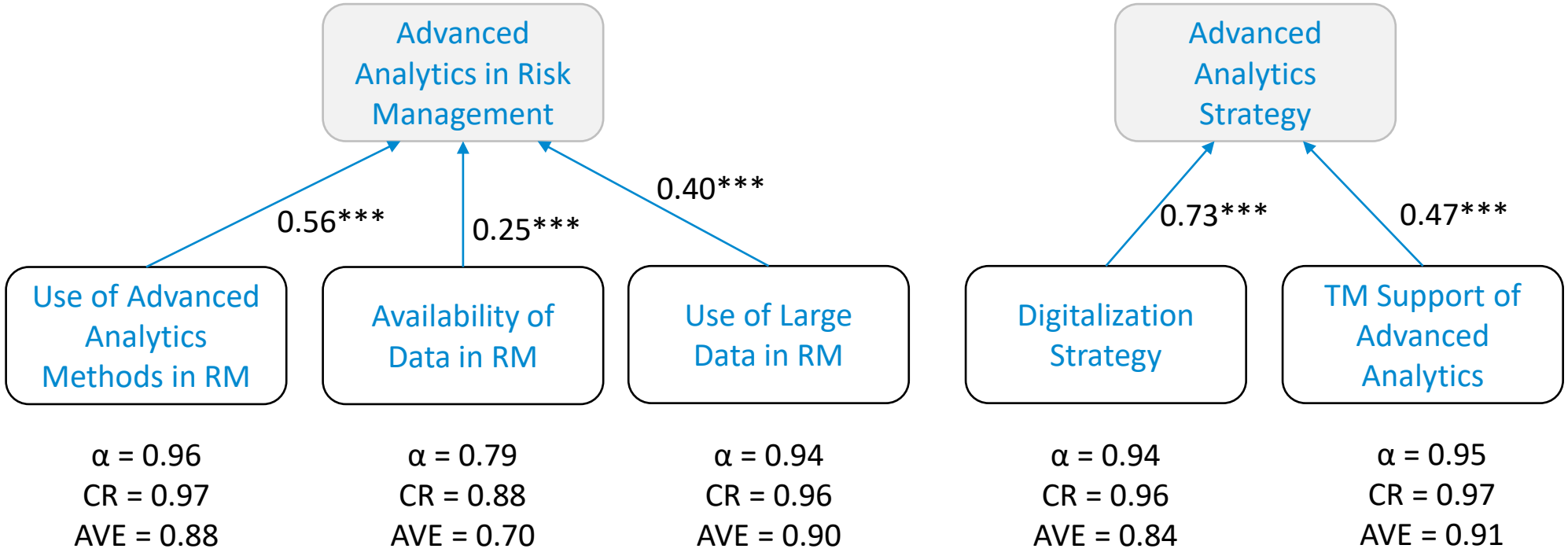
- **ca. 24 questions (≈100 items)**
  - Risk management
  - Impact of the Covid-19 Pandemic/Crisis Management
  - Digitalization and Advanced Analytics in Risk Management
  - Firm characteristics
- **Mostly 7-point Likert scale**, but also some categorical scales
- Reviewed by several practitioners and academics
- Response time ≈ 15min

Data collection

Sample

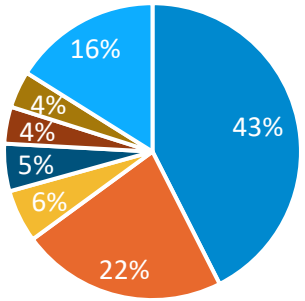
- **174 responses from largest Austrian organizations**
- Response rate: 16.6%, target population: 1048 organizations
- Risk management leader as target person
- Administered by WU Vienna in cooperation with the Austrian Controller Institute
- **Time period: Aug-Oct 2020**
- Anonymous survey, but possible to identify the individual respondent

Variable Measurement



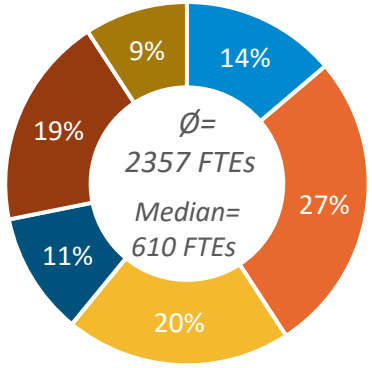
Sample

Industry (NACE)



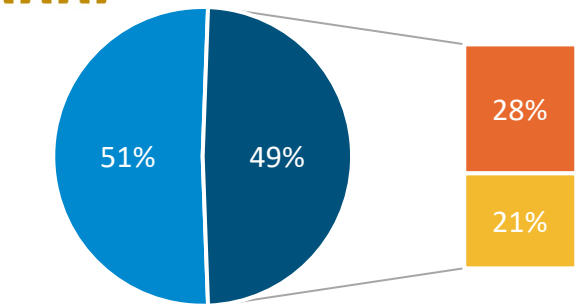
- Manufacturing
- Wholesale and retail trade; repair…
- Construction
- Human health and social work activities
- Transportation and storage
- Admin. & support service act-s
- Other

Firm size (FTEs)



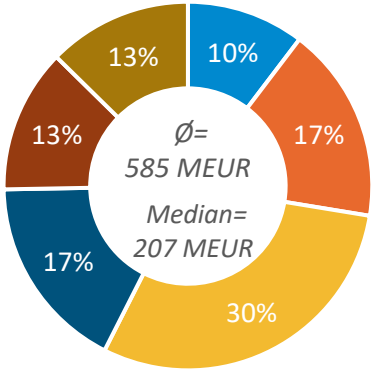
- <250 FTEs
- 250-499 FTEs
- 500-999 FTEs
- 1000-1499 FTEs
- 1500-4999 FTEs
- >5000 FTEs

Subsidiary



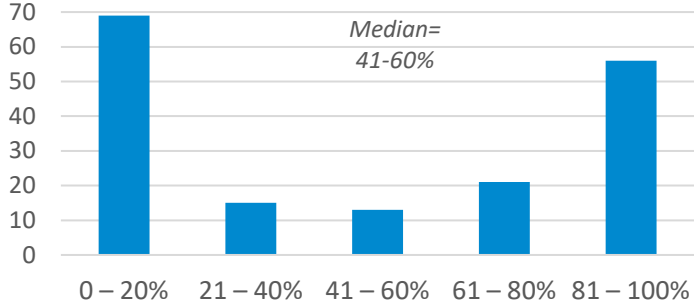
- No
- Yes, foreign parent
- Yes, local parent

Firm size (OPREV)



- <50 MEUR
- 50-100 MEUR
- 100-250 MEUR
- 250-500 MEUR
- 500-1000 MEUR
- >1000 MEUR

Sales abroad



Research Design

- Payoff-function approach (Grabner & Moers, 2013)
- Regression specification for RQ:

$$ADCAP = \beta_0 + \beta_1 AA\_RM + \beta_2 STRAT\_IN + \beta_3 AA\_STRAT + \boldsymbol{\beta_4 AA\_RM*STRAT\_IN} + \beta_5 PROC\_DIG + \beta_6 EXPLORATION + \beta_7 EXPLOITATION + \beta_{8\text{-}11} FOREIGN\_SALES + \beta_{12} FIRM\_SIZE + \beta_{13} IMP\_COV\_19 + \beta_{14} PEU + \beta_{15} TRADE + \beta_{16} CONSTRUCTION + \beta_{17} OTHER\_INDUSTRIES + \varepsilon_{ADCAP}$$

- Regression specification for H1:

$$ADCAP = \beta_0 + \beta_1 AA\_RM + \beta_2 STRAT\_IN + \beta_3 AA\_STRAT + \boldsymbol{\beta_4 AA\_RM*STRAT\_IN} + \boldsymbol{\beta_5 AA\_RM*AA\_STRAT} + \boldsymbol{\beta_6 STRAT\_IN*AA\_STRAT} + \boldsymbol{\beta_7 AA\_RM*STRAT\_IN*AA\_STRAT} + \beta_8 PROC\_DIG + \beta_9 EXPLORATION + \beta_{10} EXPLOITATION + \beta_{11\text{-}14} FOREIGN\_SALES + \beta_{15} FIRM\_SIZE + \beta_{16} IMP\_COV\_19 + \beta_{17} PEU + \beta_{18} TRADE + \beta_{19} CONSTRUCTION + \beta_{20} OTHER\_INDUSTRIES + \varepsilon_{ADCAP}$$

- Variables involved in interaction terms **mean-centered**
- **Robustness checks**
  - Including context control-practice interactions to make payoff function more robust
  - Bootstrapped standard errors (2,000 repetitions) (Masschelein & Moers 2020)

Results

		Model 1 **Adaptive Capacity**		*Model 2* **Adaptive Capacity**
Intercept		1.739*		1.961**
		(0.939)		(0.950)
Advanced_Analytics_in_RM		0.110		0.026
		(0.110)		(0.121)
Strategy_Integration		-0.016		-0.086
		(0.089)		(0.094)
Advanced_Analytics_Strategy		0.037		0.010
		(0.113)		(0.116)
Advanced_Analytics_in_RM * Strategy_Integration	**RQ**	**-0.207****		**-0.242****
		(0.079)		**(0.097)**
Advanced_Analytics_in_RM * Advanced_Analytics_Strategy				0.025
				(0.117)
Strategy_Integration * Advanced_Analytics_Strategy				0.017
				(0.095)
Advanced_Analytics_in_RM * Strategy_Integration * Advanced_Analytics_Strategy			**H1**	**0.170****
				(0.079)
Control Variables		*Yes*		*Yes*
R^2		0.3347		0.3669
N		174		174

Conclusion and Contributions

- Taking a **complementarity approach** (Grabner, & Moers, 2013):
  - We discuss the **benefits and costs** driven by the joint use of strategy integration of risk information and advanced analytics for risk management purposes regarding adaptive capacity
  - We show that an advanced analytics strategy helps **constrain the costs** associated with joint use of the two risk management choices

- Contribution to the literature on:
  - **Crisis management** and resilience (Williams et al. 2017, Jullens 2020, Van der Stede 2011, Hardy et al. 2020)
  - The link between **risk management and strategy** to create value (Braumann 2018, Viscelli et al. 2017, COSO, 2017, Frigo & Anderson 2011, Ittner & Michels 2017, Sax & Anderson 2019)
  - One of the first studies to tackle risk management and adaptive capacity in a context of **non-financial firms**

Thanks for your attention!