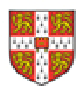
Risk Perceptions, Risk Behaviour and IT Investments

Evidence from healthcare organizations in the United States

Research-in-Progress

Rajiv Kohli
College of William & Mary
Visiting Gillings Fellow, Judge Business School, Cambridge

rajiv.kohli@mason.wm.edu
http://mason.wm.edu/rajiv.kohli



CAMBRIDGE
Judge Business School

Coauthor: Nirup Menon,
George Mason University, and
Instituto de Empresa Business School

Motivation
Business Value of IT

- IT spending in healthcare has continued to rise

- Interest in mechanisms that create firm value
  - Types of IT expenditure
  - Nature of Outcomes: Quality, Efficiency, Risk Management

- The link between IT spending and risk in hospitals is relatively unexplored

Request for your feedback
…a preview

- How do our findings compare with what you would have expected? Any surprises?
- Is there another theoretical framework to frame and explain these findings?
- What other implications do the findings have for research and practice?

Theory: What is Risk?

…the perspective of negative outcomes from medical care

- Cognitive psychology defines risk as the possibility of a negative outcome (March and Shapira, 1987)
- Operations management studies risk as expected failures or defects (Miller et al., 2000)
- Decision Science views risk as variance of an outcome
- Strategy literature views risk as the difference between information required and information possessed (Tushman and Nadler, 1978)

Why should firms bear risk?

- Entrepreneurial activity requires firms to bear risk
- Outsourcing all risks to insurers can lead to 'moral hazard' and be prohibitively expensive

- Middle ground – Coinsurance (Arrow, 1971)
  - Manage risk in-house with better coordination and control
  - Outsource residual risk for unforeseeable circumstances or uncontrollable errors

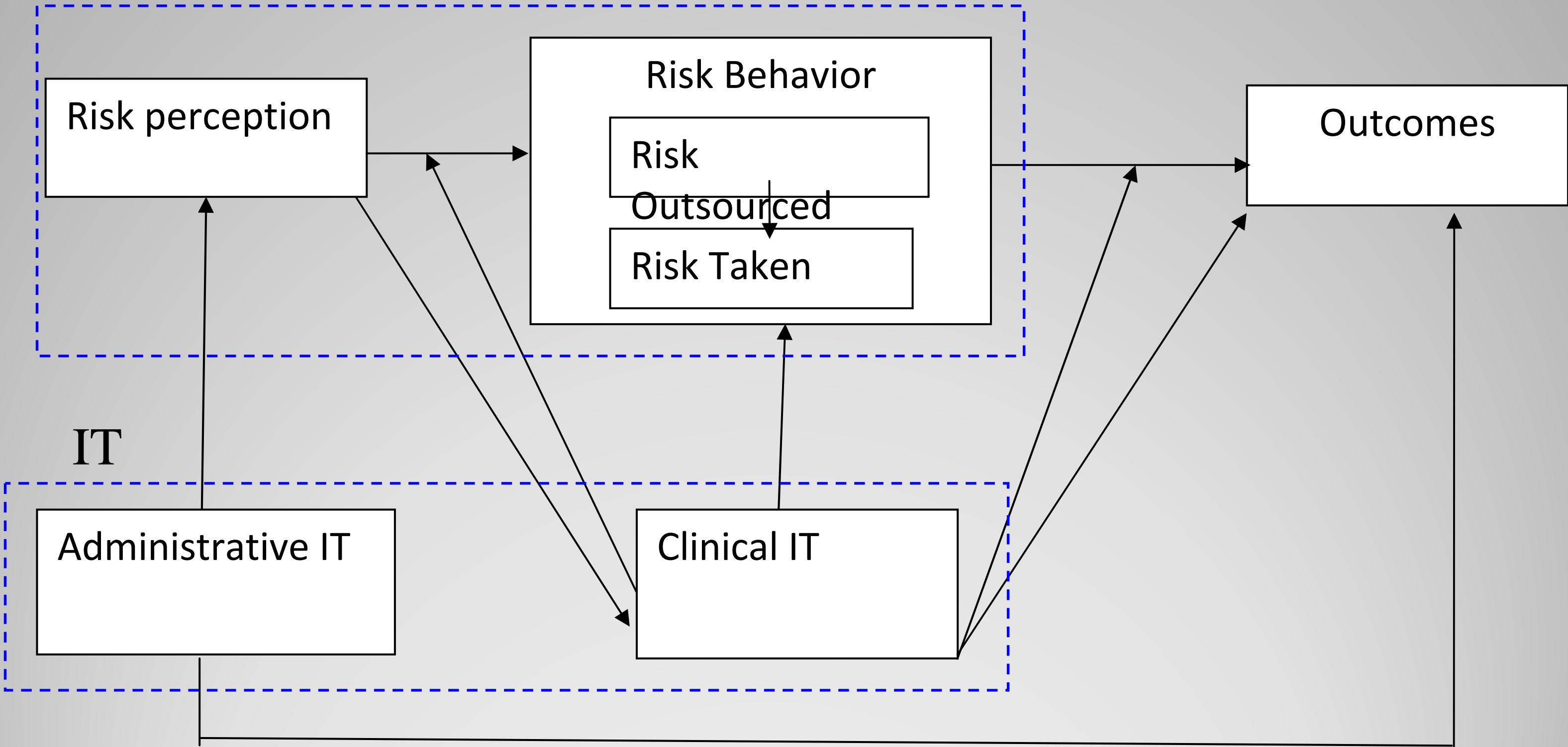
Arrow, Kenneth J., *Essays in the theory of risk-bearing*, Markham Pub. Co., Chicago, 1971

Components of Risk
Based upon Sitkin and Pablo (1992)

- Risk Perception is the managerial discernment of risk inherent in a situation
  - *Complication Estimate*
  - *Mortality Estimate*
- Risk Behavior is the actions taken in response to risk perception
  - Manage Risk in-house (Risk taken) - *Case Mix*
  - Outsourced Risk – *Insurance Premium* and *Loss incurred*

Sitkin, S. B., & Pablo, A. L. 1992. Reconceptualizing the determinants of risk behavior. *Academy of Management Review*, 17: 9-39

Basic Framework



Hospital Outcomes as Quality

[Quality is].. the realization of an outcome of a process that is being controlled for risk, also called ‘realized risk’ (McNamara and Bromiley, 1999)

- Greater the reduction in variance of outcomes, the higher the quality
- Quality measures useful to hospitals
  - Actual Mortality
  - Actual Complications

McNamara, G., and Bromiley, P. (1999), "Risk and return in organizational decision making", *Academy of Management Journal, Vol. 42 No.3, pp.330-9*

IT's Role in Managing Risk and Quality

- IT mitigates errors of omission and commission through better monitoring (Wiseman and Catanach, 1997)
- Errors of commission (e.g. potential drug interactions, allergies) are reduced by providing information at the point of care (Zarling, Piontek and Kohli, 1999)
- As the errors are reduced, risk is lowered and quality is higher (Piontek, Kohli, Conlon, Ellis, Jablonski and Kini, *forthcoming*)

Wiseman, R. M. & Catanach, Jr. A. H. (1997). A longitudinal disaggregation of operational risk under changing regulatory conditions: Evidence from the savings and loan industry. *Academy of Management Journal*, *49(4):* 799-830

The Empirical Study
Data and Sources

- Healthcare setting
  - 47 hospitals in the US state of Washington
  - Dataset from 1998 to 2006 includes capital expenses for each department for each hospital and malpractice insurance premium for each hospital (source: State of Washington)
- Demographics (e.g. case-mix) for each hospital (source: Thompson Reuters' Solucient database)
- Actual and Estimated mortality and complications for each hospital for each year (source: The Delta Group)

Empirical Model

Risk Perception
- Complication Estimate
- Mortality Estimate

Risk Behavior

Outsourced Risk
- Insurance Premium
- Loss Insured

Risk Taken
- Case Mix

Control Variable
- Medical Labor

Outcome
- Length of Stay
- Complications
- Mortality

Administrative IT

Clinical IT

	Table 1. Summary of Hypotheses
Hypothesis	**Description**
H1	Administrative information systems are positively associated with risk perception (estimates of adverse events, complication and mortality)
H2	Risk perception (estimates of adverse events, complications and mortality) is positively associated with clinical information systems.
H3 A-B	3A. Clinical information systems are positively associated with in-house risk behavior (case-mix) 3B. Clinical information systems are negatively associated with outsourced risk (insurance premium and loss insured).
H4 A-B	4A. Clinical information systems moderate the effect of risk perception (estimates of complications and mortality) on outsourced risk (insurance premium and loss insured) 4B. Clinical information systems moderate the effect of risk perception (estimates of complications and mortality) on in-house risk (case-mix)
H5	Clinical information systems are negatively associated with adverse events (complications and mortality)
H6	Clinical information systems affect the impact of risk behavior on adverse events (complications and mortality)

Results:

Supported Hypotheses and other Significant Findings

Risk Perception
- Complication Estimate
- Mortality Estimate

C.E.→INS:-1.1
C.E.→Loss:-2.3

ME→CaseMx:0.15

[H4A]
C.E.→INS:4.9
C.E.→Loss:7.8

Risk Behavior

Outsourced Risk
- Insurance Premium
- Loss Insured

INS→CaseMx: -0.02
Loss→CaseMx: 0.013

Risk Taken
- Case Mix

Control Variable
- Medical Labor

Outcomes
- Length of Stay
- Complications
- Mortality

[H1]
→ C.E.: 4.07
→ M.E.: 0.13

Administrative IT

[H2]
M.E.→CIT: 0.07

[H3A]
CaseMx: 4.2

[H6]
Compl: -62.6

[H5]
Compl: 74.6

Clinical IT

Table 3. Parameters Estimates for Two Stage Least Squares Technique

Parameter	*COMPEST*	*MORTEST*	*CLINIT*	*INSN*	*LOSS*	*CASEMX*	*COMPACT*	*MORTACT*	*LOS*
Intercept	4.387***	1.910***	-0.282***	65.75*	123.42*	-1.066*	-7.139	3.681***	0.993*
	(1.08)	(0.39)	(0.06)	(34.22)	(53.59)	(0.50)	(7.3)	(1.05)	(0.39)
Direct Effects of Main Variables									
administrative information systems	4.077***	0.132*					-0.327	-0.077	0.096
	(0.55)	(0.05)					(1.12)	(0.13)	(0.06)
CLINIT				-99.76	-170.30	4.229*	74.63*	-4.446	-1.054
				(191.3)	(301.5)	(2.03)	(33.8)	(4.13)	(1.74)
COMPEST			-0.0006	-1.178**	-2.302***	0.009			
			(0.0009)	(0.383)	(0.587)	(0.006)			
MORTEST			0.065***	-4.819	-9.752	0.152*			
			(0.01)	(6.12)	(9.71)	(0.07)			
INSN						-0.020			
						(0.01)			
LOSS						0.013			
						(0.009)			
CASEMX							7.514	-1.599	-0.299
							(7.2)	(0.89)	(0.37)
Interaction Effects of Clinical Information Systems									
CLINIT× COMPEST				4.933*	7.842*	-0.039			
				(2.27)	(3.60)	(0.02)			
MORTEST× CLINIT				-6.839	-7.167	-0.586			
				(29.3)	(45.6)	(0.32)			
CASEMX× CLINIT							-62.64*	5.371	0.264
							(27.7)	(3.53)	(1.43)
Control Variables									
MEDSLN							1.960***	0.079	0.214***
							(0.49)	(0.05)	(0.02)
Lag of dependent variable	0.552***	0.595***	0.834***	0.485***	0.408***	1.046***	0.473***	0.454***	0.570***
	(0.04)	(0.07)	(0.06)	(0.07)	(0.07)	(0.04)	(0.05)	(0.05)	(0.05)

*p<0.05; ** p<0.01; *** p<0.001.

Key Findings

Shed light on hospitals' approach to managing risk

- Administrative Information Systems (AIS)
  - have a positive and significant impact in forming risk perceptions (risk discovery)
- Clinical Information Systems (CIS)
  - Have positive and significant impact on risk taken
    With increased CIS, can hospitals take on more risk?
  - Have positive impact on complications
    Do CIS identify possible cases with complications instead of early discharge?
    Do CIS lead to more errors?
  - Moderate the impact of risk perception on risk behavior; and (-) risk taken and complications
- Greater risk discovery leads to higher investment in CIS

Other Findings

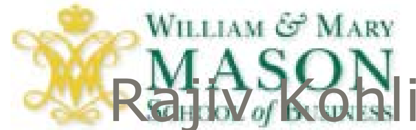
- Hospitals' Estimate of Complications (perception) affects outsourced risk but not in-house risk (behavior)
- Hospitals' Estimate of Mortality (perception) influences in-house risk but not outsourced risk (behavior)
- Outsourced risk influences hospitals' ability to take on in-house risk
- Length-of-Stay does not appear to be significantly influenced by IT or by risk behavior
- *Better management of risk, with IT support, lowers adverse events*

Request for your feedback

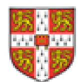
- How do our findings compare with what you would have expected? Any surprises?
- Are there other theoretical frameworks to frame and explain these findings?
- What other implications do the findings have for research and practice?

Thank you…

Please forward comments to:



Rajiv Kohli
rajiv.kohli@mason.wm.edu
http://mason.wm.edu/rajiv.kohli



CAMBRIDGE
Judge Business School