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# THE IMPACT OF IT INVESTMENT ON SAFETY PERFORMANCE: THEORY AND EVIDENCE FROM THE TRUCKING INDUSTRY

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# Safety performance is an important firm performance variable

- **Regulation:** Federal and state government regulation. (Corsi and Fanara 1988)
- **Loss of Life:** Negative consequences to the firm if it is involved in safety incidents.
- **Corporate Image:** The firm will have difficulty recruiting employees and/or attracting customers because of the poor corporate image of the firm.
- Thus, there will be major social, legal, and economic consequences to the firm if the firm doesn't manage its safety performance.

*In this study, we define safety in terms of the firm's "attempt to minimize the probability of injury to life or damage to property during a given period of time" (Mejza and Corsi 1999).*



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# Purpose of Research

- To theoretically develop and empirically test a model of IT resources as a driver of safety management performance.
- We adopt the resource based view (RBV) of the firm to examine how IT resources can improve the safety performance of the firm. (Bharadwaj 2000; Sanathanam and Hartono 2003; Zhu and Kraemer 2002; & Mata, Fuerst, and Barney 1995).
- We develop three hypotheses to show that there is a theoretical link between IT resources and safety performance.
- We collect secondary data and develop a OLS regression model to empirically test our 3 hypotheses.



# Background

- **Physical IT resources:** (Bharadwaj 2000)
  - Examples include: hardware, network technologies, & shared services (ERP applications, email, and videoconferencing services).
  - Enable the firm to improve performance by:
    - Monitoring the external market for new business opportunities.
    - Sharing knowledge-based resources among the diverse parts of the organization.
- **Human IT resources:** (Bharadwaj 2000)
  - Binds the firm's IT infrastructure with its business processes.
  - Examples include: managerial IT personnel, programmers, & system administrators.
  - Enable the firm to improve performance by:
    - Rapidly responding to changes in the business environment.
    - Quickly make decisions to respond to unsafe or dangerous workplace conditions.
- **Growth in IT resources:** (Sambamurthy 2000 and 2003; and Zhu and Kraemer 2001)
  - Firms need to constantly renew and invest in state-of-the-art IT resources in order to improve firm performance.



# Research Method

- **Sample**
  - Selected U.S. trucking industry for our study primarily because of the importance of IT investment and safety performance to the firms in this industry. (Corsi and Fanara 1988)
- **Measurement of Variables**
  - **DV:**
    - **CRASH-SCORE:** firms crash scores from January 2002 to February 2004. (Corsi, Fanara, and Jarrell 1988; Corsi and Fanara 1988; Daicoff 1988; and Rose 1992)
  - **IV:**
    - **PHYSICAL-IT:** total number of PCs in the firm divided by the number of employees in a firm in 2002 (Breshnahan et al. 2002; Zhu and Kraemer 2002)
    - **HUMAN-IT:** the number of programmers in the firm divided by the number of employees in a firm in 2002
    - **HUMAN-IT-GROW:** HUMAN-IT in 2003 – HUMAN-IT in 2002
    - **PHYSICAL-IT-GROW:** PHYSICAL-IT in 2003 – PHYSICAL-IT in 2002
  - **CV:**
    - **POWERU** -- the number of power-units in the organization (e.g., trucks, tractors, etc) in 2004.
    - **DRIVER** – the number of violations by the drivers in the organization in 2004
    - **VEHICLE** – the number of violations by the vehicles in the organization in 2004



# Model Results

Dependent Variable: Crash-Score

Independent Variable	1st Model Estimated Coefficients	2nd Model Estimated Coefficients
PHYSICAL-IT	-6.805 ** (3.382)	-6.432 * (3.560)
HUMAN-IT	-252.980 ** (116.383)	-372.969 *** (133.343)
PHYSICAL-IT-GROW	-	-2.197 (5.266)
HUMAN-IT-GROW	-	-332.374 * (176.836)
DRIVER	.197 *** (.048)	.198 *** (.048)
POWERU	.016 *** (.005)	.018 *** (.005)
VEHICLE	.040 (.060)	.036 (.060)
N	436	436
R <sup>2</sup>	0.0831	0.0919
ΔR <sup>2</sup>		.0088

\* p < .10    \*\* p < .05    \*\*\* p < .01



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# Discussion

- **Physical IT resources are used to:**
  - Store and provide job-related injuries and response information (Palvia, Perkins, and Zeltmann 1992).
  - Reduce risk or uncertainty that is faced in highly unsafe maritime situations by coordinating vessel traffic near ports (Le Blanc and Kozar 1990)
  - Coordinate communication practices among emergency management response teams (Grabowksi and Roberts 1999)
- **Human IT resources are used to:**
  - Build and implement IT resources which are used to minimize safety risk include remote tracking and decision-support systems technologies. (Le Blanc and Kozar 1990; and Roberts and Bea 1990)
  - Manage the policies, architectures, planning, design, construction, and operations necessary for a viable IT infrastructure. (Weill and Broadbent 2000)







# Discussion

- **Growth in IT resources:**
  - IT investments often have an extremely limited shelf-life. (Ang and Slaughter 2000)
  - Development of a flexible IT infrastructure is a long-term endeavor that must be codified over time. (Katz 1974; Mata et al 1995; and Keen 1993)
  - The firm's IT infrastructure is created through the fusion of technology and business processes which takes at least 5 to 7 years to generate. (Weill and Broadbent 2000; and Bharadwaj 2001)





## Conclusion

- We have built a model positing that investment in higher levels of information technology will likely increase the safety performance of the firm.
- We have also provided theoretical arguments involving the contextual variables of physical IT resources and human IT resources.
- Empirical evidence based on the trucking industry largely supports our model.
- In conducting this research we have shed light on the nexus between IT and safety.





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