

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).



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 ²	0.0831	0.0919
ΔR ²		.0088

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



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 it is created through the fusion of technology and business processes which takes at least 5 to 7 years to generate. (Weill and Broadbendt 2000; and Bharadawaj 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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