

Homework 1

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Research Interests with relevant citations

I am a PhD student in Operations Management (O.M.). I am in the second year of the program. Hence, my interests are still taking shape. However, I have immersed myself in understanding the role of digital transformation in the context of supply chain management. Adoption of disruptive technologies such as cloud and robotic process automation have the capability to bring tremendous agility in the way organizations operate. Several examples where organizations have transformed their business processes due to cloud and automation can be found. For example, Netflix revolutionized the streaming industry using an on-demand streaming service that has a customized recommendation system ([Jain and Hazra 2019](#)). This is made possible by the confluence of on-demand computing offered by the cloud and the tremendous improvements in implementing automation solutions in real-time.

So where does supply chain management come into the picture? There are several interesting contexts where it does. For example, looking at the success of firms that have implemented disruptive technologies such as cloud and automation, many others are tempted to do so. Even traditional industries such as manufacturing do not want to be left behind. However, not all organizations are "agile" enough to implement these techniques. To continue with the manufacturing context, several manufacturers started using computer-numerically controlled (C.N.C.) machines back in the 1990's. The enterprise resource planning (E.R.P.) systems that connects these machines together is sitting on top of a huge amount of data that has not been put to productive use. Predictive maintenance, where algorithms can be trained to predict machine failures using the process level data such as machine vibrations, machine energy consumption patterns, job quality etc. is very much in the real of possibility today. However, many manufacturers do not have the necessary infrastructure, trained manpower and market research capabilities to handle such a digital transformation. They have typically relied on technology vendors to manage and maintain their E.R.P. systems. ([Leonard-Barton 1988](#), [Fichman and Kemerer 1997](#)).

In my research, I wish to disentangle the supply chain challenges brought about by the adoption of emerging technologies. Right now, I have three broad questions in mind:

- Technology outsourcing has been a prominent business model for many organizations to manage their non-core technology operations. Vendor selection, incentive design, intellectual property protection etc. are some of the common aspects studied from an O.M. context?

How are they affected due to the emergence of disruptive technologies in the supply chains? For example, cost used to be the selection criteria for most of technology outsourcing (Chiesa et al. 2000). Has the discussion on vendor selection now shifted to vendor capabilities?

- Implementing digital transformation solutions is done with enhancing performance in mind. But, are firms better of in implementing digital transformation through "legacy" vendors with whom they have a historical relationships, or utilizing the capabilities of niche vendors?
- At the micro-foundations of organizations trying to implment digital transformation are the capabilities of its workforce. Has the move towards cloud and automation aided in managerial decision making, or is it still status-quo? For example, Cui et al. 2018 find that incorporating social media information via machine learning methods enhances the accuracy of demand forecasts. However, this particular study was done in a very particular context. Major questions about the generalizability of such insights hinders firms from changing their business processes. The question therefore is under what conditions is it fruitful to implement trasformative solutions without putting undue pressures on the managers and affeceting their decision making?

Equation modelling skills question

I use stochastic frontier analysis to model the firm innovation. The equation used to do so is the following:

$$\ln(Innovation_{it}) = \beta_0^T + \beta_1^T \ln(R\&DStock_{it}) + \beta_2^T \ln(PatentStock_{it}) + \sum_{j=1}^{j=t-1} Sales_{ij} + \epsilon_{it}^T - \eta_{it}^T \quad (1)$$

where:

$Innovation_{it}$ = Ouput of firm i's R&D effort in year t

$R\&DStock_{it}$ = R&D Expenditure of firm i in year t

$PatentStock_{it}$ = Number of Patents filed by firm i in year t

$Sales_{ij}$ = Sales of firm i in year j

ϵ_{it}^T = Error term for firm i in year j

η_{it}^T = The efficiency term for firm i in year j

Including a figure

FIGURE 1: The Horseshoe at University of South Carolina



References

- Chiesa, V., R. Manzini, T. Federico. 2000. Selectin sourcing strategies or technological innovation: An empirical case study. *International Journal of Operations and Production Management* **20**(9) 1017–1037.
- Cui, R., G. Santiago, A. Moreno, D.J. Zhang. 2018. The operational value of social media information. *Production and Operations Management* **27**(10) 1749–1769.
- Fichman, R.G., C.F. Kemerer. 1997. The assimilation of software process innovation: An organizational learning perspective. *Management Science* **43**(10) 1345–1363.
- Jain, T., J. Hazra. 2019. Hybrid cloud computing investment strategies. *Production and Operations Management* **28**(1) 1272–1284.
- Leonard-Barton, D. 1988. Implementation as mutual adaptation of technology and organization. *Research Policy* **17**(5) 251–267.