

Development of a Framework to Assess the Impact of Information and Communication Technology (ICT) Deployment in Supply Chain Management (SCM)

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Abstract

Rapid technology advances and dynamic market forces have altered the business landscape as also fundamentally altered existing business models. Information and Communication Technology (ICT) usage and deployment have opened the doors for enterprises to compete in any marketplace. ICT tools are great enablers, enhancers, levelers, and facilitators of enterprise operations. While most researchers and industry practitioners are unanimous about the fact that ICT positively impacts Supply Chain Management (SCM) performance and improves supply chain capabilities, there is evidently an identified gap in terms of assessment and measurement of these ICT benefits and capabilities in SCM. This is despite the fact that there are several SCM performance measurement frameworks. The novel research direction of this investigation emerged from the observation that there is clearly an absence of an assessment framework to accurately describe the impact and benefit analysis and to what magnitude ICT has improved the competitive advantage of enterprises through the improvement of the enterprise supply chain. This research work assumes greater significance as a result of the present situation due to the Covid-19 pandemic, which has accelerated the need for Industry 4.0, digitalization, and embracing of ICT not only for the supply chain but also for all aspects of the enterprise. The motivation of this thesis is to make an original contribution to the body of knowledge in terms of addressing this gap in the rubrics of ICT effectiveness in SCM as also providing enterprises with a benchmark on their ICT deployment in SCM. This thesis is about the development of an assessment framework of ICT deployment in SCM, consisting of an empirical model and capability index and its dovetailing into the APICS Supply Chain Operations Reference (SCOR) model, which has universal appeal and wide acceptance. The rubrics and performance indicators of various constructs for measuring the impact of ICT in SCM in the empirical model evolved into an ICT capability index metric for SCM. This assessment framework of the benefits of ICT deployment can be used by any enterprise irrespective of the geography or country, vertical or sector, manufacturing or services. Measurement of the ICT impact on SCM aids decision-making and policymakers as also helps to identify targets and to track and benchmark progress. This can also provide insights on the selection of appropriate ICT tools after measurement of its impact on the supply chain paradigm and understanding success factors and operational challenges for the adoption of various ICT tools. The empirical model uses well-defined metrics from the SCOR process reference model corresponding to supply chain processes and performance constructs, thereby providing a robust research methodology. All of the SCOR processes and attributes are influenced by ICT, but this model also does not list ICT enablement as a metric of supply chain performance. The constructs used are reliability, responsiveness & agility, which are considered customer-facing, and cost & assets, which are internal process-facing. With regard to analysis, Confirmatory Factor Analysis (CFA) using Structural Equation Modeling (SEM) was used on the results of the survey questionnaire and semi-structured interviews for quantitative and qualitative inputs.