

ABSTRACT

In today's globalized economy, WCM is of extreme importance, specifically in a capital- and labor-intensive sector, like manufacturing, where the onus is on continual advancement of products and technologies. So, integrating a mix of firm-level as well as macro-economic determinants influencing efficiency would assess the WCM at its best. This would expand the performance dimensions and opportunities for the overall manufacturing sector. Additionally, a better management of working capital adds to the value, profitability, and other opportunities (Sharma and Kumar, 2011). Managing working capital efficiently saves the firms from facing financial constraints in the near future (Bodnaruk *et al.*, 2015) as well. However, its inefficient management has seen substantial business failures making management of working capital components of utmost importance. Hence, first the working capital management (WCM) efficiency needs to be evaluated carefully to improve it. Second, the causes or factors behind inefficiency in managing the working capital needs focus. Lastly, a WCM efficiency prediction model would offer directions to focus on the most vital determinants simulating the effect on WCM efficiency and be a valued information source for promoting the existing knowledge body.

The current research initiated with the general understanding of Indian manufacturing firms, emphasizing prominently on prevailing WCM efficiency in these firms. This study tries to offer a better understanding of WCM efficiency by answering the questions i.e. (a) How to assess the WCM efficiency in Indian manufacturing sector; (b) What is the prevailing WCM efficiency condition in Indian manufacturing sector; (c) Which are the foremost determinants influencing WCM efficiency; (d) What is the relationship of selected determinants with WCM efficiency; (e) What is the order of the significant determinants based on their importance while examining

relationship with WCM efficiency; (f) What are the recommendations drawn from the inferences of our research for enhancing the WCM efficiency?

This research has been conducted on a panel data of 1391 Indian manufacturing firms spread across nine industries i.e., chemicals & chemical products, construction materials, consumer goods, food & agro-based products, machinery, metals & metal products, miscellaneous manufacturing, textiles, and transport equipment. The time period taken for the study is 2009-2020. The secondary data for above mentioned industries were collected from CMIE (Centre for Monitoring Indian Economy) Prowess database, which is a database of the financial performance of the companies and is headquartered in Mumbai, India.

The current research adopted multi-stage approach wherein first stage comprised of the assessment of WCM efficiency scores for all the selected manufacturing firms using slacks-based measure (SBM) of data envelopment analysis (DEA). The efficiency was computed using MATLAB software in which inventory period, receivables period and payables period were taken as inputs and return on total assets was used as output. The results highlighted high variability in the efficiency values across the industries signaling differing working capital levels throughout the firms. Additionally, the maximum values underlining efficient firms is 1 and in comparison, minimum values across selected nine industries range around 0.001-0.334 highlighting a huge lag among the inefficient firms to achieve WCM efficiency. Further, the variation among the industry wise mean and median efficiency values detects inconsistency in efficiently managing the working capital in some industries. The industry-wise and whole manufacturing sectors' mean WCM efficiency values are greater than the median WCM efficiency values indicating positively skewed values and specifies fewer firms to be efficient in managing the working capital. The mean and

median values 0.330 to 0.537 calls for huge improvement in WCM and requires more focused operations to survive the cutthroat competition in emerging markets, such as India.

Second stage entails the assessment of the relationship of the determinants, selected based on their importance from previous literature, i.e., capacity to generate internal resources (CFLOW), total fixed assets (TFA), size (SIZ), age (AGE), productivity (PRD), leverage (LEV), cost of external financing (CEF), interest coverage (IC), structural capital (SC), human capital (HC), growth (GRT), gross domestic product (GDP), and interest rate (INT) with WCM efficiency. In line to this, the current research scrutinizes the panel data regression namely fixed effect model for estimating the relationship. The results of fixed effects model highlighted CFLOW, LEV, GRT, TFA, and PRD to be significantly influencing WCM efficiency wherein CFLOW, GRT, TFA, and PRD had significant positive influence with WCM efficiency and LEV was found to influence WCM efficiency negatively.

Lastly, third stage involves computing of WCM efficiency model using the significant determinants obtained from second stage. This stage adopted multi-layer perceptron (MLP) technique of ANN for validating the proposed model using IBM SPSS Statistics 20 software wherein 90 per cent of the dataset was for network training and 10 per cent for network testing. Particularly, analysis for two layers was performed i.e. for input layer and output layer. The input layer comprises of five independent significant determinants obtained from second stage – panel data fixed effects model (i.e. CFLOW, LEV, GRT, TFA, PRD). The output layer encompasses one output determinant attained from first stage – WCM efficiency scores using SBM-DEA (i.e., EFF) with the standardized range [0, 1]. Furthermore, this stage executed sensitivity analysis for assessing the average and normalized importance of the significant predictors (i.e., CFLOW, LEV, GRT, TFA, and PRD) considering their impact on WCM efficiency. The findings from sensitivity

analysis signified the sequential importance as CFLOW, PRD, TFA, LEV, and GRT as most important to less important predictor.

The findings of the current study have several implications and suggestions for industry managers, practitioners, investors, academicians, and other stakeholders. First, implementing WCM practices efficiently benefit firms not only based on their internal level indicators, but also because of external and macro-economic factors. Industry managers, thus, needs to reinforce the significance for such indicators. Second, in terms of achieving WCM efficiency, industries have progressed differently through various levels. For practitioners in the chemical & chemical products, consumer goods, food and agro-based products, and textiles, bigger prospects for improvement persist. Third, a substantial variation and skewness among all the selected industries indicates high inconsistency in WCM within individual industries. Hence, creating opportunities for managers to work towards improving the efficiency and performance in straggler firms by following the efficient firms or firms with best practices. Such opportunities are supposed to be best for smaller firms but are required for some large size firms too. Fourth, the current study reveals large variation among selected industries regarding the WCM efficiency or liquidity measure. While specific levels of liquidity are necessary and inescapable, the mangers need to focus on the unwarranted costs and lost profits which are borne by the firms and emerges from holding excessive liquidity. Hence, financial managers must focus on reducing or eliminating such losses by actively implementing liquidity management strategies.

The current study has some limitations and numerous prospective avenues for future research. In consideration to the inputs and outputs, a sensitivity analysis may be performed with modifications in its values. Having taken a sample from a developing economy, the results of our study are generalizable only among developing contexts. Therefore, to overcome this shortcoming,

we suggest a comparison to be carried out in a developed and developing economy. These are situations in which the companies may have had to switch their working capital strategies to adapt to the markets. Therefore, we suggest that future studies address these market variations and draw emerging trends to delineate the strategies to greater efficiency of WCM.