



# Business Process Management, Industry 4.0 and Lean Six Sigma for achieving Operational Excellence in Asset Management Companies: Case of India

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## ABSTRACT

Investors in India buy financial products from asset management companies (AMCs) to secure their financial future using various platforms for investing. To achieve sustained performance, AMCs need to explore technological advancements, methodologies to make their operations efficient and effective to provide seamless transaction experience across its various investment platforms. This study investigates the factors essential in achieving operational excellence in asset management companies (AMCs). The study uses 300 valid responses from a survey collected from eight prominent Indian AMCs. The analysis was conducted using SEM approach. The findings indicate that business process management, Industry 4.0, Lean Six Sigma enable achievement of operational excellence in Indian AMCs. This study is among the few empirical studies which examines the enablers of operational excellence in Indian AMCs.

**Keywords:** Business Process Management, Industry 4.0, Lean Six Sigma, Technology, Operational Excellence, Asset Management Companies

**JEL Classifications:** D2, L2, O12

## 1. INTRODUCTION

An asset management company (AMC) is a financial firm which pools money from investors and invests in various financial instruments. There has been significant growth in AMCs in India past decade as many investors are prioritizing saving and investing for safeguarding their financial future. To cater to increased number of investors, AMCs are focussing on improving their operations and making it efficient and effective. AMCs is an umbrella term for variety of financial institutions and businesses (Sharma, 2016; Dash and Mahakud, 2015). In India, Asset Management is primarily carried out by mutual fund (MF) companies.

Since the inception of Mutual Funds in 1964, there has been a steady increase in investment in them. However, in the past decade, the investment in Mutual Funds by Indian investors has grown exponentially. Currently around 2400 mutual fund schemes offered

by 45 mutual fund organizations are available for investment in India (AMFI, 2025). The Assets under Management (AUM) are around ₹77.14 trillion (US\$910 billion) (AMFI, 2025).

Investors are free to distribute their money among AMCs in the mutual fund industry, according to a number of sources (Kale and Panchapagesan, 2012; Ramanujam and Bhuvaneshwari, 2015; Savithri and Rajakumari, 2025; Majumdar and Chandra, 2025). Using a “Know Your Customer” approach, investors can make direct online investments in AMCs’ portfolios. Investors can easily transact with the banks. Through the mobile applications of investment organisations such as Groww, Zerodha Coin, ETMONEY, Kuvera, INDMONEY, PayTM Money, and others, investors can purchase a variety of mutual funds offered by AMCs.

To convince Indians that their mutual funds are safe, financial institutions, asset management companies, the Indian government,

the National Stock Exchange, the Bombay Stock Exchange, the Securities and Exchange Board of India, and non-governmental organisations are all involved.

People have realized the importance of early investing, and they are using technology to invest in financial instruments. Investing in Mutual Funds is very easy and has substantial benefits. The ease of Investing in Mutual Funds through various applications available on mobile phones have benefitted the young generation as they enter the workforce. Operational excellence is of paramount importance to the Mutual Fund organizations to provide a seamless experience to the investors during investing leading to customer satisfaction.

For achieving operational excellence in an organization, business process management (BPM), lean six sigma (LSS), Industry 4.0 (IN) have been used. However, there is a lack of evidence as to whether all three can be used in a unified manner to achieve operational excellence. This study aims to create a unified framework for achievement of operational excellence in Indian MF AMCs.

## 2. LITERATURE REVIEW

### 2.1. Business Process Management

Organizations aim to increase productivity, performance, customer satisfaction and return on investment (ROI) by focussing on managing and improving the outcomes of processes (Bhat et al., 2014; Bhasin, 2011). Significant enhancement to manage and improve its operations can be achieved by organizations by viewing business processes as an interrelated parts of a system which traverse many levels and boundaries (Van Looy, 2020; vom Brocke and Mendling, 2018; Amaral et al., 2022).

Organizations create processes to meet client needs or accomplish strategic goals. Organizational processes as defined by Dumas et al. (2018) are either event driven in real time or logically connected. Organizations have the option of implementing unit-based processes or cross functional processes. If cross functional processes are defined, organizations can leverage the principles of business process management (BPM) to achieve efficiency and effectiveness (Ho et al., 2009 and Suša Vugec et al., 2019). Strategy Alignment, Governance, Methods, Information Technology, People, and Culture are the six essential elements that organisations must consider while implementing BPM (vom Brocke and Rosemann, 2014; Dalaqme and Irsa, 2022). A successful BPM installation can be ensured by adhering to these six rules.

Each element presents distinct chances for expansion and strategic advancement for financial services AMCs. A top-down commitment to improve processes, connect strategy to process capabilities, build an enterprise process architecture, evaluate processes, and strategically including process owners, customers, and stakeholders is necessary to achieve strategic alignment. Governance in process management describes how choices are made, roles are assigned, process standards are established, and performance is evaluated based on those standards (Luftman et al., 2015).

Implementation of BPM initiatives grounded in six essential elements streamlines the cross functional business processes which are part of Operations. BPM makes the operations to be efficient and effective. Our study tests the impact of BPM on operational excellence in Indian mutual fund AMCs. The hypothesis formulated is:

H<sub>1</sub>: Business process management has a significant impact on operational excellence.

### 2.2. Industry 4.0

The term Industry 4.0 was introduced at 2011 Hannover Fair and was announced as a German Initiative (Xu et al., 2018). It was defined to conceptualize the smart factory concept (Cohen et al., 2017; Antony and Sony, 2020). Hermann et al. (2016) described Industry 4.0 as a collective word for concepts and technology throughout the value chain. In the context of Industry 4.0, the primary technologies are BDA, additive manufacturing, the internet of things (IoT), cloud computing, AI, 3D augmented reality, Blockchain and Digital Twin (e.g. Rosin et al., 2020; Götz and Jankowska, 2017; Moeuf et al., 2018; Zheng et al., 2018).

Big Data is vast, quick, and varied data from multiple networks. Business intelligence and decision support systems allow companies to examine enormous volumes of data (Wang et al., 2018). AI enables machines to perform human activities. Data is used by machine learning to make predictions and judgements (Reinhard et al., 2016). Internet-based services are provided by cloud computing. Typically, these services include platforms, hardware, and software (Chiarini and Kumar, 2021). Data sent online is unsafe. Cybersecurity safeguards data (Chouhan et al., 2017).

There is a wide variety of industrial uses for Industry 4.0. However, the implementation of Industry 4.0 in the service sector, namely in financial services, is not well documented (Dwivedi et al., 2021a; Dwivedi et al., 2021b). Financial services companies are beginning to embrace these technologies, although manufacturing industries use them more frequently. AMCs can use Industry 4.0 technologies due of the nature of financial and money-related interactions. AMC strives to offer the most seamless services in order to enhance the responsiveness and efficiency of industrial systems. Industry 4.0 has the potential to digitally alter AMCs operations and business processes if properly deployed. This will enable the AMCs to achieve operational excellence leading to customer satisfaction. The hypothesis formulated is

H<sub>2</sub>: Industry 4.0 has a significant impact on Operational Excellence.

### 2.3. Lean Six Sigma

Womack and Jones (1996) defined Lean methodology as a philosophy centred on business improvement. According to them Lean methodology consists of five core principles: How do customers define value, Waste Identification using Value Stream Maps, Generating smooth flow by executing value creating steps, making production pull based i.e. nothing is produced until customer's demands it and pursuing perfection through continuous improvement. Lean focusses on reducing waste so that efforts are carried for value inducing activities leading to increase in efficiency. Lean is more suited to short-term, simple improvements (Antony et al., 2017).

Snee (2010) defined Six Sigma as a corporate strategy that focuses on customer-critical outputs to identify and eliminate the sources of errors, faults, or failures in business processes. Six Sigma focusses on reducing the variability in the processes which make the processes to deviate from the target. This in turn increases the quality of the process by reduction of defects/errors leading to increase in effectiveness. Six Sigma uses Statistical Methods to reduce the variability in the processes. Six Sigma is better suited to dealing with complicated, long-term problems for which there is no known solution (Antony et al., 2019).

Organizations have implemented Lean and Six Sigma together to reduce waste and eliminate defects in their organizations. This leads to improvement in efficiency and effectiveness (Antony et al., 2017). Dwivedi et al. (2021a) states that LSS maximizes stakeholder value by improving speed, agility, quality, cost and customer satisfaction. Laureani and Antony, (2017 and 2012) mention that many organizations have adopted LSS by following on the footsteps of GE and Motorola.

LSS has been implemented to achieve Operational Excellence in manufacturing organizations (Chiarini and Kumar, 2021). However, there is limited evidence of application of LSS to achieve Operational Excellence in Financial Services. Our study aims to provide evidence that LSS can be applied successfully to achieve Operational Excellence in Indian MF AMCs. The hypothesis formulated is:

H<sub>3</sub>: Lean six sigma has a significant impact on operational excellence.

### 2.4. Operational Excellence

Hammer (2004) defines operational excellence as achievement of better performance with present operational approaches. Every organization wants to execute their operations diligently which basically implies completing tasks on time while minimizing errors, expenditures and delays, providing value add to customers (Internal and External). Accuracy of tasks is of paramount importance to organizations. When organizations take steps to improve their operations to achieve competitive advantage, they are carrying out operational excellence practices. Carvalho et al. (2019), Bhullar et al. (2014), and Found et al. (2018) cite various examples of operational excellence practices implemented by organizations.

However, a recurring dilemma among organizations is the longevity of any operational excellence effort. There has been very little research on how to develop an OE model that can endure and continue to benefit the company (Carvalho et al., 2019; El Dardery et al., 2023; Shamsuzzoha and Jaakkola, 2024). Organizations are employing a wide variety of improvement initiatives to achieve Operational Excellence. We are proposing a unified model of applying lean six sigma (LSS), business process management (BPM) and Industry 4.0 to achieve operational excellence.

## 3. RESEARCH METHODOLOGY

### 3.1. Research Model

The research model in this study consists of first order and second order variables. Industry 4.0 and Operational Excellence are first

order variables. BPM and LSS are second order variables. Industry 4.0 which helps in automating business processes is measured by five determinants. Operational excellence is measured by seven determinants. BPM, a second-order variable that depends on six first-order variables—strategy alignment, governance, techniques, IT, people, and culture. First-order variables include four determinants measuring strategic alignment, four measuring governance, five measuring methodologies, three measuring information technology, four measuring people, and four measuring cultures.

LSS is another second-order variable that affects OE. Five sub-variables make up the second-order variable LSS. LSS tools and methods, waste elimination, the DMAIC approach (define-measure-analyze-improve-control), variability reduction, and measurement metrics are examples of first-order variables. LSS tools and techniques are measured by four determinants, waste elimination by four determinants, DMAIC methodology by three determinants, variability reduction by three determinants, and measurement metrics by four determinants. The second order research model is illustrated in Figure 1.

### 3.2. Research Instrument

Industry experts were consulted during the development of the research instrument, which was based on a review of the literature. The tool uses a five-point Likert scale to represent Industry 4.0, BPM, LSS and OE constructs (Yoshikuni et al., 2024). The construct list is shown in Table 1. A five-point Likert scale, which is regarded as one of the most popular and reliable scales, was used to create the survey questionnaire. Likert scales use a set of items to examine how respondents perceive the constructs in a questionnaire. Likert scales use numbers to express rank order to analyse responses in an ordinal manner. The findings show how respondents felt about the input that was given; “Strongly disagree,” “Disagree,” “Neutral,” “Agree,” and “Strongly agree” are some possible responses.

Second-order constructs, such as BPM and LSS, were used in the study. BPM was measured using six first-order constructs, while LSS was measured using five constructs. The six most crucial components of BPM—Strategic Alignment, Governance,

**Table 1: Research framework constructs**

Independent constructs	Code	Indicators
Business process management core elements	SA	Strategic alignment
	G	Governance
	M	Methods
	IT	Information technology
	P	People
	C	Culture
Lean six sigma efforts	VR	Variability reduction
	LST	Lean six sigma tools and techniques
	WE	Waste elimination
	DM	DMAIC
	MM	Measurement metrics
Industry 4.0 technologies	IN	Industry 4.0
Dependent construct	Code	Indicators
Operational excellence	OE	Operational excellence

Source: Author's work

Methods, Information Technology, People, and Culture—were emphasised by Rosemann and vom Brocke (2015). Belhadi et al. (2020) provided the second-order LSM constructs which are variability reduction, DMAIC Methodology, Waste elimination, LSM tools and techniques, and measurement metrics. OE and IN are independent constructs.

Professionals and industry experts pre-tested the questionnaire and key components of the survey. To get their opinions on possible changes to the questionnaire, the potential removal of indicators, and further suggestions about respondent categories, the researcher conferred with subject-matter specialists who had the requisite authority and experience in OE. The questionnaire incorporated the suggestions from the pilot and primary surveys.

### 3.3. Sample Description

This study takes a descriptive, empirical, and exploratory approach because there is a dearth of research on the factors influencing OE in AMCs. The study uses purposive sampling method and focusses only on Indian AMC employees who work in mutual funds and participate in OE initiatives within their companies.

This study looks into the problem in the context of AMCs in India. The sample size of 300 includes both the main sample and the pilot research sample. The purpose of the pilot study, which had 100 participants, was to evaluate the instrument, confirm the validity and reliability of the foundational model to improve its specification before the main study, and determine the feasibility of the suggested technique for the main investigation. A total of 200 respondents from Mutual Fund AMCs in the respondent classes of operations managers, process improvement managers, OE department team members, and LSM Black Belts participated in the main study. Only companies that had previously carried out OE initiatives were included. The employees of mutual fund companies were the target demographic.

In India, there are forty-five mutual AMCs. For this investigation, eight were chosen. These companies were chosen due to their contribution to the overall assets under management (AUM) in Indian mutual funds. They account for half of all retail and institutional investors' investments in mutual fund schemes in India. Aditya Birla MF, Axis MF, HDFC MF, ICICI MF, Kotak Mahindra MF, Nippon India MF, SBI MF, and UTI MF are the organisations taken into consideration for the study.

### 3.4. Statistical Methods

The survey data collected from the questionnaire was analyzed by using several statistical methods in a multi-step process. We first conducted a validity study to ensure the research tools were reliable. A pilot study was conducted to ensure content validity. Exploratory factor analysis and confirmatory factor analysis were carried out to discover underlying structure of variables, check for convergent and discriminant validity. A structural model was also used to test the hypothesis and to check the overall fit of the model. All the analysis were carried out using JMP software.

### 3.5. Data Validity

Prior to performing the multivariate analysis, we verified the

validity of the study instruments. We looked at three important components of construct validity: Discriminant validity, convergent validity, and content validity. By making changes to the items based on our previous study and the literature, we were able to attain content validity. As a pilot, we conducted interviews with fifteen managers to see if we might expect a reasonable degree of comprehension. A few in-depth interviews resulted in the adoption of modifications.

## 4. RESULTS AND DISCUSSION

### 4.1. Measurement Model

The validity and reliability of the scale were assessed through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Preliminary diagnostics confirmed the suitability of the dataset ( $n = 300$ ): The Kaiser–Meyer–Olkin (KMO) index was 0.75, exceeding the recommended minimum of 0.50, and Bartlett's test of sphericity was significant ( $P < 0.05$ ). These results indicate that assumptions of normality, linearity, and homoscedasticity were not violated (Hair et al., 2018; Yoshikuni et al., 2024).

EFA revealed strong factor loadings, ranging from 0.591 to 0.934, all of them except one, above the suggested threshold of 0.70. Convergent validity was supported, as average variance extracted (AVE) values ranged between 0.533 and 0.850, exceeding the minimum threshold of 0.50, while Cronbach's  $\alpha$  coefficients were consistently  $>0.70$ , confirming internal consistency (Hair et al., 2018).

Discriminant validity was assessed using the Fornell and Larcker criterion (1981). For each construct, the square root of its AVE exceeded the corresponding inter-construct correlations, providing clear evidence of discriminant validity.

### 4.2. Structural Model

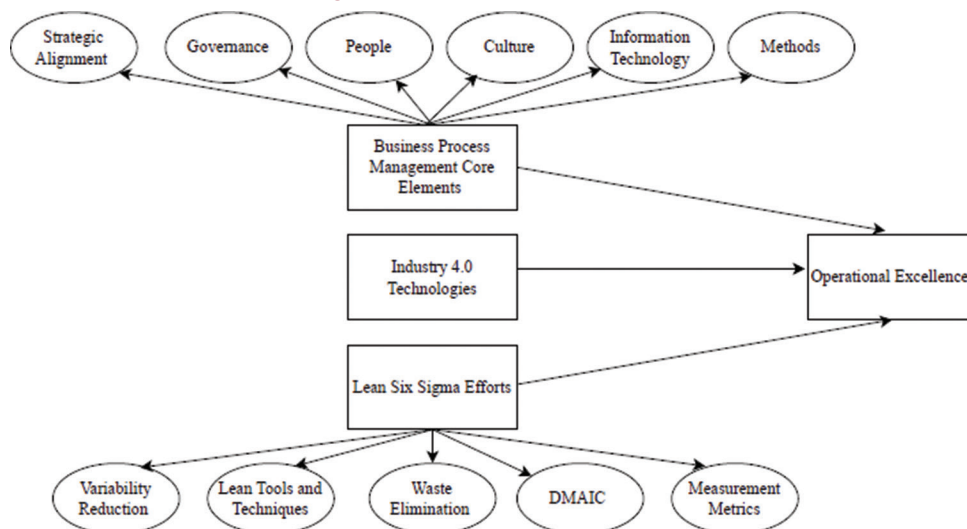
The SEM Model was estimated using JMP software and the results are shown in Figure 2. All independent variables had significant direct effects on the dependent construct in the second-order model. The comparative fit index (CFI) and root mean square error of approximation (RMSEA) provide additional guidance for determining model fit. These indices are bounded between 0 and 1. CFI values  $>0.90$  and RMSEA values  $<0.10$  are preferred (Hair et al., 2019). Our model has CFI value of 0.89 and RMSEA value of 0.09 indicating a reasonably good fit.

Table 2 shows the results for direct relationships between constructs. Industry 4.0 significantly OE ( $\beta = 0.643$ ,  $P < 0.01$ ). BPM significantly OE ( $\beta = 0.995$ ,  $P < 0.01$ ). LSS significantly OE ( $\beta = 0.496$ ,  $P < 0.01$ ).

### 4.3. Discussion

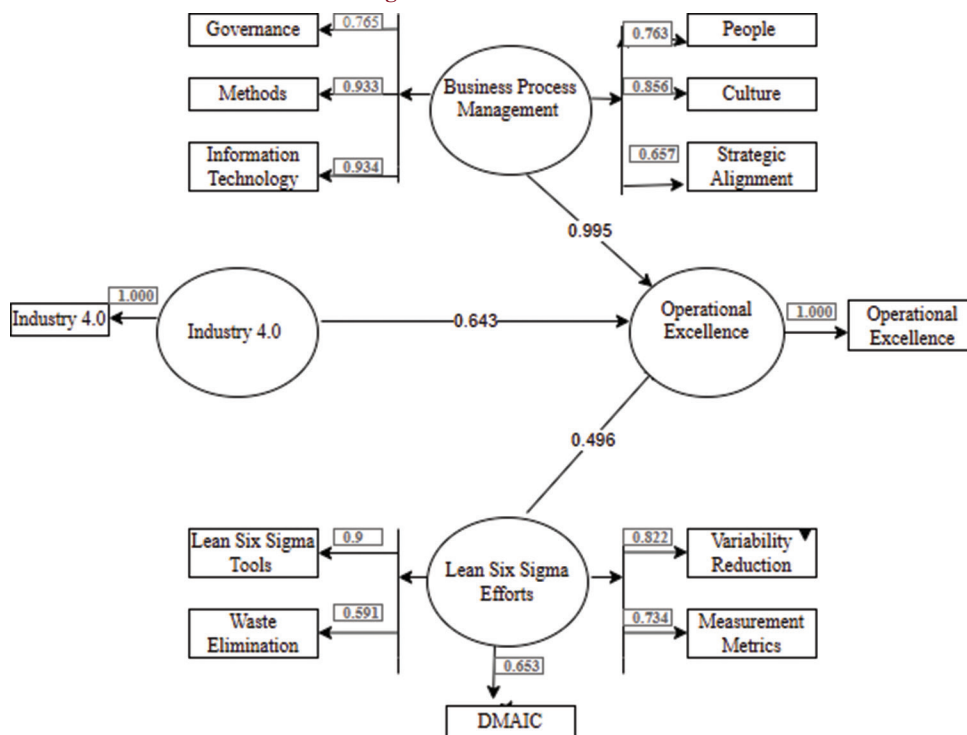
OE and Industry 4.0, two independent first-order variables, and BPM and LSS, two second-order variables, were the main subjects of the study. The dependent variable was OE in Indian Mutual Fund AMCs, and the researchers looked at how each independent variable affected this variable. A model was created using the structural equation modelling (SEM) technique and then tested it

**Figure 1:** Presents the research model



Source: Author’s work

**Figure 2:** Structural model



Source: Author’s work

**Table 2: Direct effects**

Relationship	Beta value	Wald Z value	Level of significance	Result
IND -> OE	0.643	7.144	P<0.01	Supported
LSS -> OE	0.496	5.006	P<0.01	Supported
BPM -> OE	0.995	4.091	P<0.01	Supported

Source: Author’s work

statistically using JMP software. According to Hair et al. (2018), a threshold value of 0.90 for the comparative fit index (CFI) indicates a significant model fit. The dependent variable OE in

our model has a significant CFI of 0.89. Thus, in the context of AMCs, the conceptual model put forth in our research model has been validated.

## 5. CONCLUSION AND IMPLICATIONS

The goal of the research is to improve mutual fund AMCs’ OE procedures. The researcher’s examination of pertinent elements and their effects on OE in this field was beneficial to both the academic community and particular Indian businesses. An

explanation of how this work advances our understanding of OE, and its practical uses is provided below. Academic literature focusses primarily on Banking and Insurance sector. Literature on Operations in Mutual Fund AMCs is scarce. This research, which is the first of its type, attempts to evaluate the framework for OE implementation among mutual fund AMCs. This study stands out because it experimentally tests the effect of three independent constructs—BPM, LSS, and Industry 4.0 on OE in AMCs. To our knowledge, this is the first empirical study to examine this topic. OE in general has significant coverage in academic literature. However, the researcher did not find any studies focusing on OE in Mutual Fund AMCs in India considering the three independent factors: BPM, LSS, Industry 4.0.

This study developed a model based on analysis of collected data and supported by literature which Mutual Fund AMCs can use to achieve operational excellence in their organization. In Financial Services Sector, LSS initiatives are primarily implemented in Insurance and Banking domain. Implementation of LSS in Mutual Fund AMCs is not widespread. In this study, it was empirically proven that LSS can achieve OE in MF AMC. Organizations can consider implementing LSS to make their operations efficient and effective. Very few MF AMCs have robust BPM practices leading to inefficient business processes causing customer dissatisfaction. This study proves that robust BPM implementation by enabling core elements of BPM can achieve Operational Excellence. Organizations can consider implementing BPM to achieve OE. Industry 4.0 practices have been implemented individually in organizations. However, the practice of Industry 4.0 implementation to achieve operational excellence is limited. This study empirically proves that Industry 4.0 can be helpful to organizations in achieving operational excellence.

One of the limitations of the study is the consideration of selected Mutual Fund AMCs in India. Only eight MF companies were selected based on whether they have Operational Excellence initiatives in their organizations. Some experienced practitioners might have been left out due to their lack of affiliation with these eight companies. We used a strict timeline of 1995-2024 for this literature evaluation to find articles published in English-language journals that could be accessed using databases like ProQuest Direct and EBSCOhost. Consequently, significant journal articles can be left out.

Based on the constraints mentioned above, this study can be extended to other MF companies in India who are planning to enhance their operations. This study can also be extended to other countries by collecting survey data from executives employed in MF companies of those countries. Publications from other sources, languages can also be considered for literature.

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