

Batting ahead: Management, innovation and the future of Indian manufacturing



Batting ahead: Management, innovation and the future of Indian manufacturing¹

Megha Patnaik, Mert Akan, Nick Bloom, Chaitanya Lekharaju,
Pete Klenow, PJ Nishok, Janak Nabar²

May 2024

-
- 1 We are grateful to the Stanford King Center on Global Development for research funding. We would like to acknowledge the excellent support of all our enumerators, particularly Aishwarya Pokale, Shreya Kale, Srushti Bhambere, Sakshi Rokade, Sonia Anja, Poonam Gawate, Pranali Gawate, Pranali Patil, Nitin Kalatre, Jui Walse, Poorva Vishwas, Bhavnoor Gill, Simran Hazarika, Anagha Menon, Bhuvana Ingale, and Dhruvi Pareek. We are also thankful to Yash Karmarkar and Barney Jopson for their support in building up the database of the firms for the study. We acknowledge the dedicated research support of Dipti Singhania, Vaishnavi Satpute and Divya Sebastian in the early rounds of the study. We are grateful to Forbes Marshall for their generous support in setting up the CTIER survey unit.
 - 2 Patnaik: Department of Economics and Finance, LUISS University (email: mpatnaik@luiss.it); Akan: Department of Economics, Stanford University (email: mertakan@stanford.edu); Bloom: Department of Economics, Stanford University and Stanford Institute for Economic Policy Research, and NBER (email: nbloom@stanford.edu); Lekharaju: Centre for Technology, Innovation and Economic Research (CTIER) (email: chaitanya.lekharaju@ctier.org); Klenow: Department of Economics, Stanford University and Stanford Institute for Economic Policy Research, and NBER (email: klenow@stanford.edu); Nishok: Centre for Technology, Innovation and Economic Research (CTIER) (email: nishok.pj@ctier.org); Nabar: Centre for Technology, Innovation and Economic Research (CTIER) (email: janak.nabar@ctier.org). For media related enquiries on the study, please contact Megha Patnaik and Janak Nabar.

Executive Summary

Just as the Indian Premier League is one of the leading cricket leagues in the world, Indian manufacturing is now positioned to take a global lead. India is one of the fastest-growing economies in the world as its manufacturing industry is positioned for take-off as we show with our new survey data.

If one were to compare Indian manufacturing firms today with the Indian cricket team, Indian manufacturing has come a long way from the Indian team of the 1990s which was heavily dependent on a handful of stars like Sachin Tendulkar, Rahul Dravid and Anil Kumble. There is still some way to go before Indian manufacturing can be compared to the Indian team of today where excellence is a norm and performance is driven by every department (batting, bowling and fielding). Indian manufacturing today would be akin to the team under Sourav Ganguly in the early to mid 2000s, where self belief and the possibility of being global leaders has begun to emerge. But as we did see, an innovation like the Indian Premier League has not only helped unearth talent from every corner of India, it has also enabled significant investments to improve domestic infrastructure and facilities to develop players and talent at various levels of the sport. Policymakers would do well to identify the right interventions to efficiently allocate resources for Indian firms depending on where they are in their journey when it comes to management practices as well as innovation.

Management is argued to be one of the leading factors in driving productivity variation, with a similar contribution to total variation as R&D and more than that of ICT. The India Management and Growth Survey (IMGS) collects data from more than 1000 manufacturing firms in India to measure management and innovation and link them to growth outcomes. We find in summary:

There is a tail of poorly managed firms that is impeding growth in India. Poorly managed firms drive the average management score of Indian firms down.

India has a cohort of elite firms: high performers that will drive growth and globalization. These firms have world-class management similar to firms in US and Europe with firm performance steeply rising in managerial ability.

India has the conditions ready to jump ahead into a world-leading manufacturing nation with its cohort of elite-managed firms. India could rapidly accelerate economic growth by improving the tail of poorly managed firms.

Motivation

India and China jointly contribute to half of global growth. According to the IMF's Asia Pacific Department, India's contribution to global growth is 16%, which is forecasted to grow to 18% in the next five years.³

GDP increases by the growth of inputs (e.g. more capital or labor) or higher Total Factor Productivity (TFP). There are two routes to increasing Total Factor Productivity. First is Within Firms: The same firms become more productive (e.g. new technology spreads quickly to all firms, like the Internet). The second is Between Firms: High TFP firms expand (e.g. more jobs) & low TFP firms contract (e.g. fewer jobs). This can be understood with the simple cricket analogy of "Team performance": Within players (improved performance of each player contributes to overall performance) and Between players (where a few star players determine the overall team performance). The lower total factor productivity of firms in India and China relative to the US is driven by "misallocation" of production inputs, with capital and labor trapped in less productive plants in India and China, while these inputs are proportionately allocated to more productive plants in the US (Hsieh & Klenow, 2009). Misallocation of inputs for production away from the most productive plants towards less productive plants in the Indian context can be driven by several barriers. These include contractual frictions in hiring non-family labor, higher tax enforcement on larger firms, financial frictions, difficulty in buying land or obtaining skilled managers, and costs of shipping to distant markets (Hsieh & Klenow 2014).

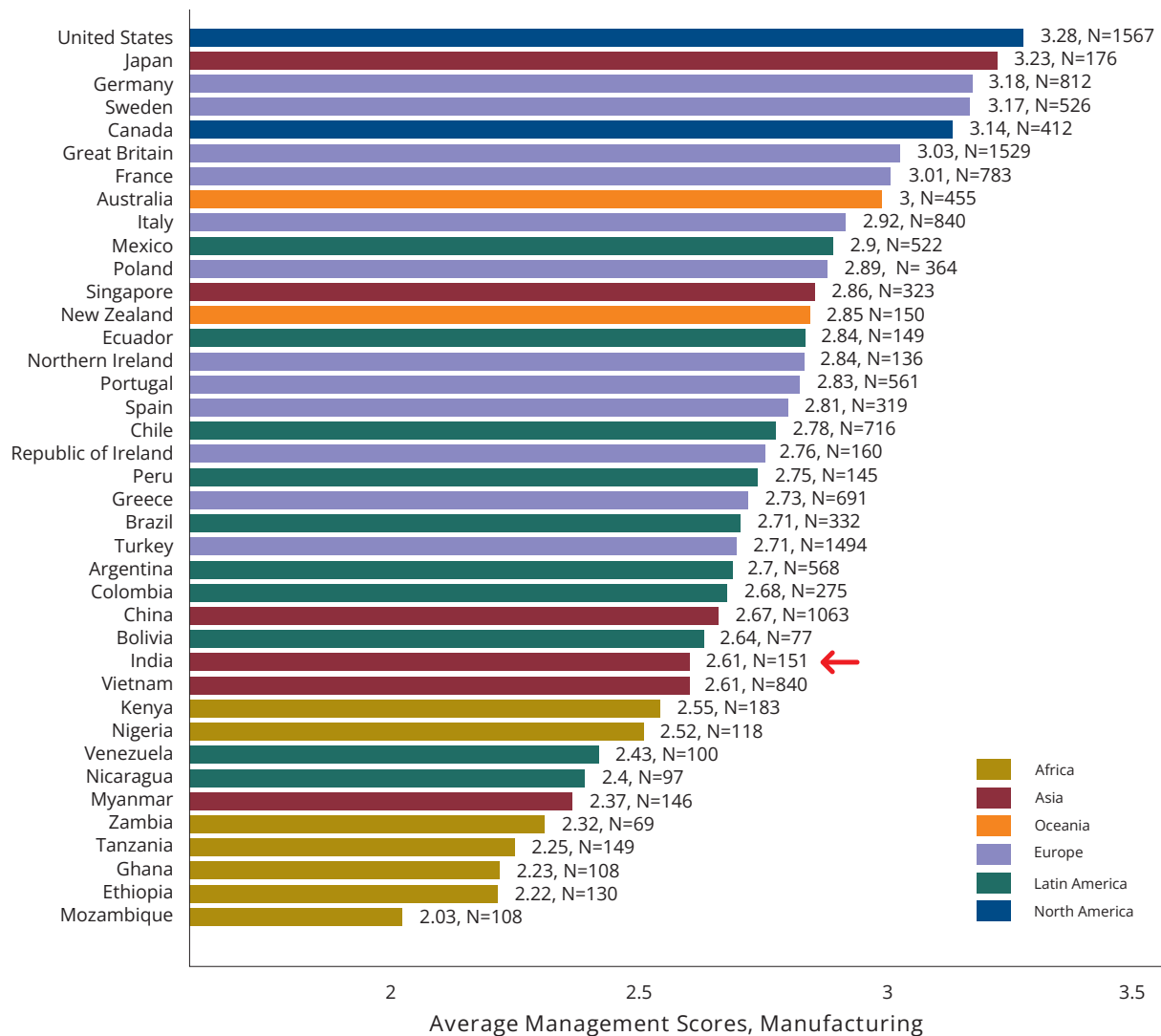
One important driver of productivity is management. Bloom et. al (2019) shows that the contribution of management practices in productivity is about 20%, similar to the contribution of IT or R&D. In an earlier study, Bloom & Van Reenen (2007) using cross-country data collected on management practices from a wide range of developing and developed countries for the World Management Survey, showed that firms in developing countries like India, Brazil, and China, had significantly lower average management scores than firms in developed countries such as the US, Japan, and Western Europe (see Figure 1). Their phone surveys scored firms on monitoring practices (collection and processing of production information), target-setting practices (ability to set coherent, binding short- and long-run targets), and incentive practices (merit-based pay, promotion, hiring, and firing). The low average of management practices in developing countries was attributed to a persistent thick tail of badly managed firms.

In our study, the IMGS sample was selected from a sampling frame where one of the key criteria was the availability of annual reports and financial data that could be used to validate the responses provided during the data collection. When we use the IMGS sample for India, we will find that management scores among our sample of firms in India have a strong overlap with the US MOPS (Management and Organizational

3 <https://www.thehindu.com/business/Economy/indias-share-of-global-growth-to-rise-to-18-in-5-years-imf-official/article67438455.ece>

Practices Survey) establishments score distribution as in Bloom et al (2019), suggesting that India also has a share of firms that match the US management distribution in performance. .

Figure 1: Wide spread of management across countries



Notes. Source: World Management Survey. Bars are ordered from highest to lowest average overall management score. "N" indicates the number of observations per country.

Some of the other key findings based on the IMGS sample are also consistent with those found in the US 2015 MOPS study, namely that management practices in the firms are positively associated with firm size, they are positively associated with firm performance (especially for value added, profitability and the propensity to export), and finally that management practices of firms are positively associated with innovation (i.e. the introduction of new products either to the firm or to the market as

well as improvements in existing products). Our findings show that one of the key ingredients for Indian firms to be globally competitive (for a share of firms), namely structured management practices are well and truly in place.

One area where Indian industry has typically fared badly has been its spending on R&D. According to the CTIER Handbook: Technology and Innovation in India 2023, the total amount of industrial R&D expenditure was just about USD 6.5 billion in 2021⁴. To put this into perspective, Alphabet, the world's largest spender on R&D spent close to 5 times that of all of Indian industry. Our findings that a share of Indian firms match the US average in performance when it comes to management scores (where the US stands out globally for its better-managed establishments), coupled with the positive association of management scores with the propensity to export as well as innovate, clearly suggest that there is a share of Indian firms that are poised to be globally competitive and ready for global leadership positions, provided they ramp up their expenditure on R&D significantly. When one considers the findings on Indian firms in Bloom & Van Reenen (2007), there is also a need for focused interventions by the government and industry associations to address the persistent thick tail of badly managed firms. For example, Bloom et al. (2013) found for Indian textile firms, a management intervention led to significant improvements in quality, inventory, and output, increasing productivity and profitability.

While creative destruction can generate growth by entrants and incumbents creating new products that displace the products of competitors, incumbents can also improve their existing products: Garcia-Macia et al. (2019) show for the US that most growth appears to come from incumbents, driven by improvements of existing varieties rather than the creation of brand new varieties, and own-product improvements by incumbents appear to be more important than creative destruction for growth. We examine innovation by incumbents in India by directly eliciting firm-level measures for this in our survey and we also link these to the management practices present in the firm. Firms in our sample that are engaged in innovative activity also on average see a higher share of sales attributed to improved versions of existing products rather than entirely new product innovation.

KEY FINDINGS

Wide distribution of management scores across firms

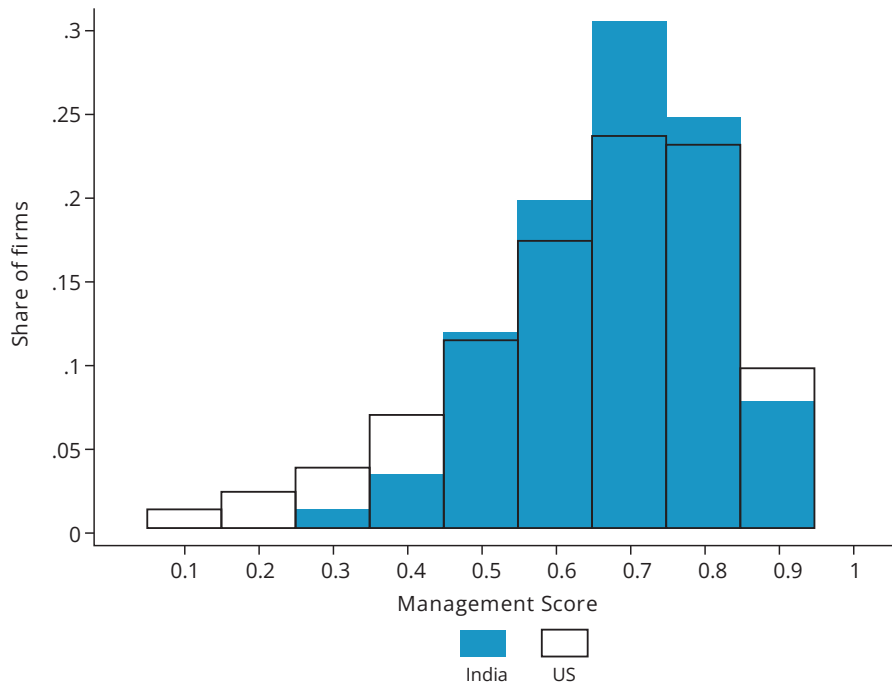
The blue bars in Figure 2 shows the distribution of the MOPS scores normalized to the country-specific mean, displaying a considerable dispersion in the fraction of structured management practices adopted.

4 The CTIER Handbook (2023) is available at <http://ctier.org/handbook2023.html>.

The wide spread in adoption of management practices across firms that we see in India is in line with cross-country evidence.⁵ We can imagine that factors such as product market competition, labor laws and the access to a skilled workforce that was found to be important in the US context (Bloom et al. 2019) may also be driving variation in the adoption of management practices in India.

Figure 2 also marks the distribution of management scores in US manufacturing establishments measured using the 2015 MOPS. We find that management scores among our sample of relatively larger firms in India have a strong overlap with the US MOPS establishments score distribution, suggesting that India also has a share of firms that match the US average in performance.

Figure 2: Management score distribution



Notes. Management score is the unweighted average of the score for each of the 8 questions, where each question is first normalized to be on a 0–1 scale. The sample for India is all 1004 survey observations. Sample for the US is from deciles for the US MOPS (2015). The Census Bureau has reviewed this data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied to this release. DRB Approval Number: CBDRB-FY22-CES008-00

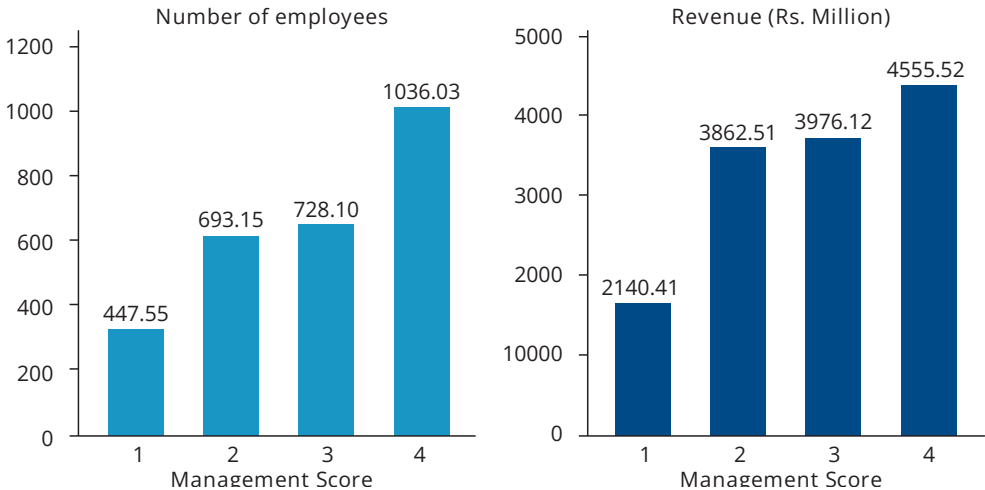
5 For details, see https://www.johnvanreenen.com/_files/ugd/b451bf_77b15aa3c4044bd091f24449b103ab6a.pdf

Structured management associated with larger firm size

Figure 3 shows the relationship between the structured management score and size (employment and revenue). The blue bars in the left panel show average employment within each quintile of management score. The dark blue bars in the right panel show the same but for revenue in Rs. million. We can see from the upward-sloping pattern in both graphs that firms that have higher management scores tend to be systematically larger both in terms of inputs (employment) and outputs (revenue) than those with less structured management practices.

More recent cross-country studies examine data from multiple MOPS surveys across the world to measure the relationship between management and size. These studies suggest that the correlation between management and firm size being stronger means firms with more structured management being able to grow larger through market forces. The positive relationship between management and size that we see in India in Figure 3, based on our IMGs sample, is in line with evidence from other cross-country MOPS studies. Countries like the US have a larger correlation of management and size measured by log employment (coefficient is 2.98), while this is relatively lower for countries like Pakistan (0.66) and Russia (0.52). When comparing the employment-management coefficient for different countries, the relation depends on the market forces. India lies somewhere in between, with a correlation of 2.62, close to the value for China (2.35).⁶

Figure 3: Management and firm size



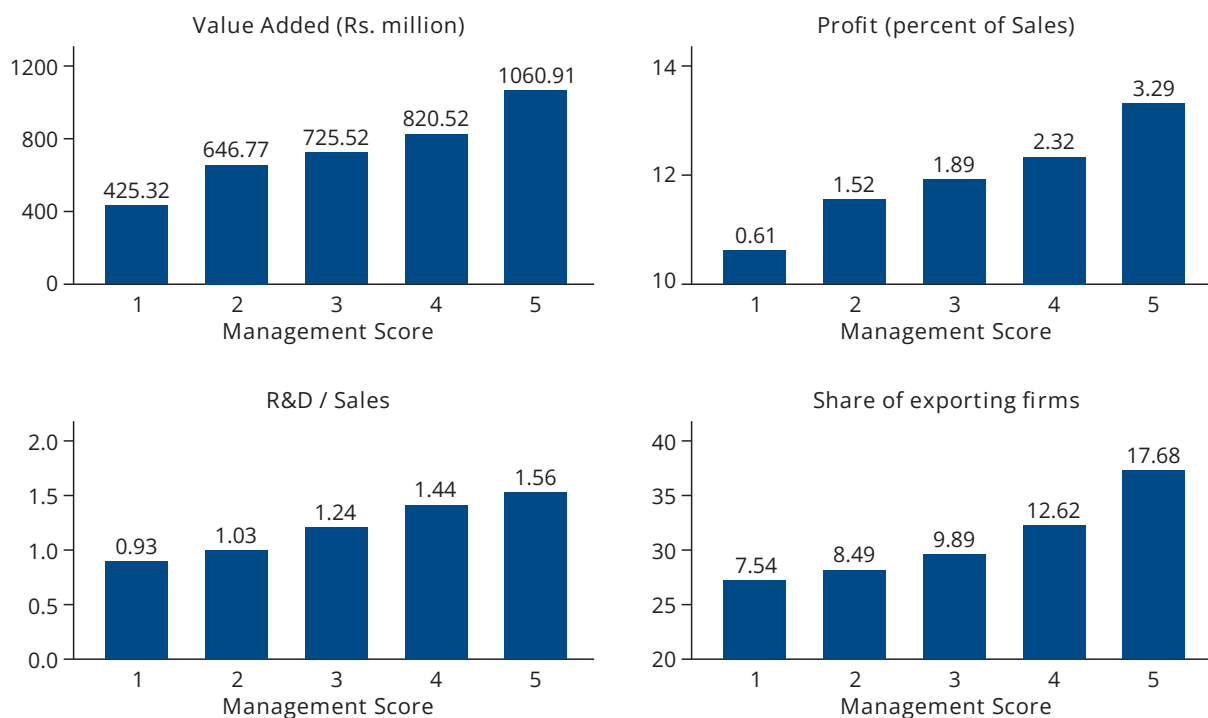
Notes. Employment is from the response to the question “How many full-time employees are there at your business (this includes all workers, contract employees, payroll employees, and managers)?” Revenue is from the response to the question (Sales is measured as the response to this survey question): “What was the total sales in FY 2021-22?”. The x-axis shows quartiles of the management score, the score is calculated as the unweighted average of the score for each of the 8 questions, where each question is first normalized to be on a 0–1 scale and the unweighted average is then normalized to have mean 0 and variance 1. Employment and Revenue are winsorized at 1%.

6 See https://www.johnvanreenen.com/_files/ugd/b451bf_77b15aa3c4044bd091f24449b103ab6a.pdf

Structured management associated with better firm performance

Given the variations in management practices noted above, an immediate question is whether these practices link to performance outcomes. In Figure 4, we examine whether structured management practices are correlated with measures of performance. We first check for value added, and find that management is associated with higher value added in firms. Next we move to profitability, a performance indicator that firms care about. As the figure shows, higher adoption of management practices is associated with higher profitability (measured by profit as a percent of sales). Management is also correlated with a measure of innovation: R&D intensity (measured as R&D expenditures scaled by firm sales). Structured management is also positively correlated with exporting activity.

Figure 4: Management and firm performance

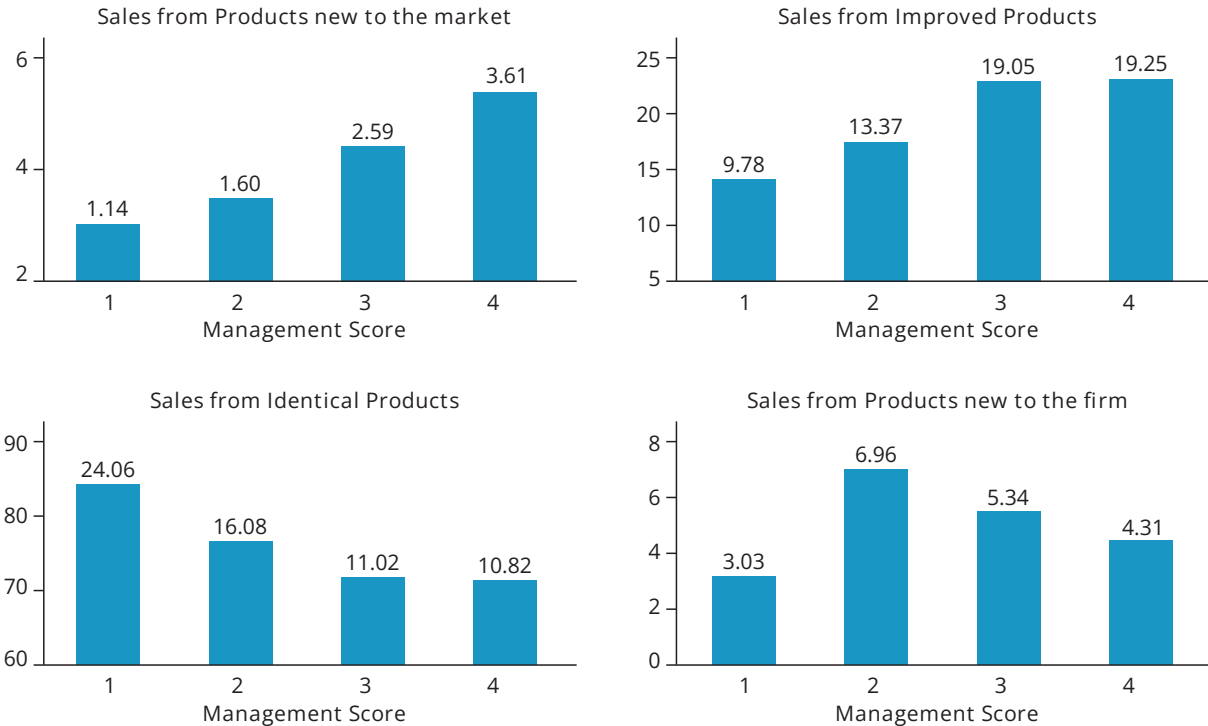


Notes. Value Added is measured as (Total Income + Change in Stock) - Intermediate Inputs. Profit is measured as Profits Before Interest, Taxes, Depreciation, and Amortization (PBITDA). R&D Exporters are defined as firms with positive earnings from exports in FY 2021-2022. Management score is the unweighted average of the score for each of the 8 questions, where each question is first normalized to be on a 0-1 scale and the unweighted average is then normalized to have mean 0 and variance 1. The sample is restricted to all survey responses which had a match to CMIE Prowess. Each outcome is winsorized at 1%.

Structured management associated with innovation

We also examine whether structured management is associated with higher sales from innovations. In our survey, we asked firms “What percent of sales from your products in FY2021-22 was from each of the following? (in %)” with the four categories provided: “Identical versions of products that you sold in FY2020-21 (%)”, “Improved versions of products you sold in FY2020-21 (%)”, “Products new to you in FY2020-21 but existing in the market (%)”, and “Products new to the market in FY2020-21 (%)”. Overall, 50% of firms report sales come from sources other than identical products as the previous year, suggesting active product innovation. Innovations appear to be demand-driven: on average 56.4% of the new products were introduced due to customer requests.

Figure 5: Management and sales from new products (%)



Notes. The y-axis shows percentages of sales as responses to the survey question: “What percent of sales from your products in FY 2021-22 was from each of the following? (in %)”. Note the responses for each individual add up to 100%. The sample is restricted to 937 of 1004 survey respondents who answered the question. The x-axis shows the quartiles of the management score, calculated as the unweighted average of the score for each of the 8 questions, where each question is first normalized to be on a 0-1 scale and the unweighted average is then normalized to have mean 0 and variance 1.

Product innovation varies by management: Figure 5 shows that structured management practices are associated with higher percent of sales from products new to the market and improved products and lower percent of sales from identical products. First, more structured management is associated with higher sales from products new to the market. The coefficient from the OLS regression of percent of sales from products new to the market on the standardized management is 1.05 and significant at the 1% level. This suggests that a one-standard deviation increase in the management score is associated with approximately a 1 percentage point increase in sales from products new to the market. For reference, the average percent of sales from products new to the market is 4%, so this corresponds to a 25% increase. Second, more structured management is associated with higher sales from improved products. The corresponding regression coefficient is 4.25, which suggests that a one-standard deviation increase in the management score is associated with more than a 4 percentage point increase in sales from improved products. As the average is 15%, this corresponds to a fourfold increase. In contrast, there is a significant negative coefficient between percent of sales from identical products and the management score. The coefficient magnitude from the simple regression is -5.93% suggesting that a one standard deviation increase in the management score is associated with a 6% percentage point decline in sales from identical products. Finally, there is no monotonicity seen in the relationship in the bar graph and the OLS regression also does not find any significant relationship between the management score and sales from products new to the firm but already existing in the market.

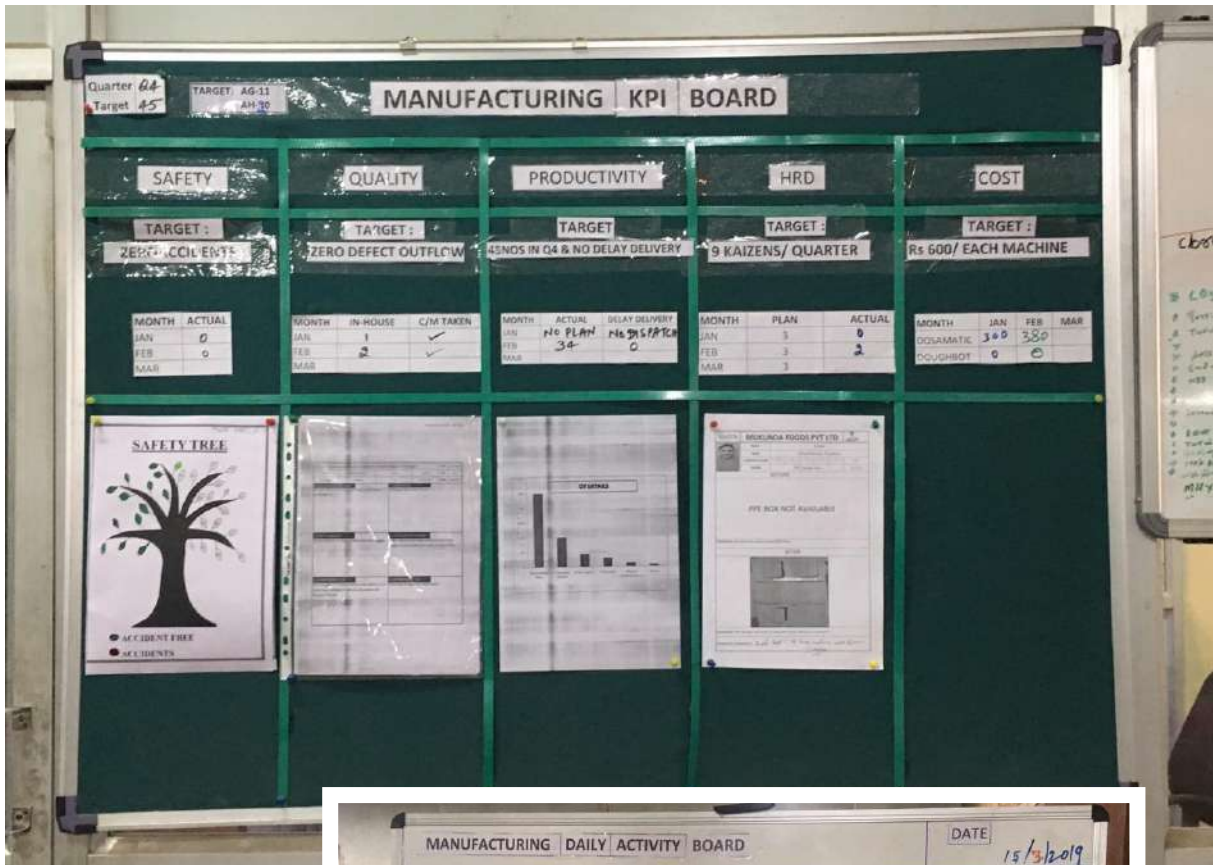
Pictures

Cognitive testing

DAILY PPM			PPM TRACKING				
DATE :- 17/01/2019 C PPM-Target-20 OEE :- 82.58 % Dec-18-06			YEAR	AVERAGE PPM	REJ. PPM	REW. PPM	REJ + REW PPM
REWORK PPM			2015		113	24	137 57
REJECT PPM			2016		67	11	78 36
REW + REJ PPM			2017		163	38	201 100
00	425	425	Sr No	MONTH (2018)			
QTY PRODUCED - 30565			1	JANUARY	238	0	238 11
REJECT QTY - 13			2	FEBRUARY	219	22	241 11
REASON FOR REJECT - JFC-006 on 4/5 by 0.05mm 97.4			3	MARCH	271	0	271 12
2) L6P D6 4 29-973, 925-389 Under size			4	APRIL	230	0	230 16
3) CS-ME-M10X15 TAPPING damaged due to PF 94.0%			5	MAY	148	0	148 10
4) US95 Flange O.D under size by 0.030mm 99.02 Nos			6	JUNE	202	16	217 14
5) IP 17F1 0.043992 4/5 by 0.050mm 97.02 Nos			7	JULY	219	0	219 14
6) CV-MM USB O/S by 0.1mm 94.03 Nos			8	AUGUST	184	0	184 14
REWORK QTY -			9	SEPTEMBER	133	13	146 11
REASON FOR REWORK -			10	OCTOBER	179	0	179 14
CUSTOMER COMPLAINT - PG-1 IS MIXUP WITH PG-2			11	NOVEMBER	218	13	231 18
Qty. of No.			12	DECEMBER	93	0	93 07
			PENDING POINTS :-				

DAILY DISPATCH PLAN					
Customer	Product	Qty	Customer	Product	Qty
TATA			BW China	R. G.	
				S. O.	
			BW Korea	080	
M & M				G. M.	
				S. O.	
Other				R. G.	
				T. S.	

A firm in Pune - targets to meet and tracking of defects visibly displayed and clearly specified on a board and displayed at a prime location (near the loading and unloading entrance) in the factory.



MANUFACTURING DAILY ACTIVITY BOARD DATE: 15/3/2019

DOSAMATIC			DOUGHBOT			MACHINING		
NAME	ACTIVITY	STATUS	NAME	ACTIVITY	STATUS	NAME	ACTIVITY	STATUS
Prabhat	Plan Fine filling		Prakash B	leave		Pranav	Plan fine filling	
Sunil	M/C - 100		Sanjay	M/C - 100		Kabir	Let out	
Jeel	M/C - 100		Prakash	M/C - 100		Arjun	M/C - 100	
Prakash P	M/C - 100		Meghanna	M/C - 100		Manoj	M/C - 100	
Ajith	M/C - 100		Suganesh	M/C - 100		Yash	M/C - 100	
Arjun	leave							

SPECIAL ACTIVITIES:-

A firm in Bangalore - KPI tracking and clearly displayed boards measuring daily targets for each of their kitchen tech products at the employee level.

Enumerator teams





"INDIA MANAGEMENT AND GROWTH SURVEY"

Last update: 25 July 2023
 Highest response on single day per enumerator: 5 responses by SH
 Highest responses in 2 weeks by an enumerator: 9 complete responses by AP
 Highest responses in a week: 31 Complete responses [W32]

● Operations Pending Submission
 1 Provisional (Account) - AM
 2 Payment (Account) -

WK/EN:	PV	BG	SH	AP	HG	PG	ST	AG	Other	MDT	TOTAL (+P)	NK	Ac	SK
W30	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W31	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W32	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W33	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W34	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W35	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W36	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W37	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W38	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W39	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W40	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W41	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Complete	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Incomplete	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Enumerator teams working out of the CTIER Pune office

Research team visiting Indian factories



Validation info about the survey online



BENCHMARK RESEARCH METHODOLOGY TEAM ▾ MEDIA WMS INTERNATIONAL ▾ INDIA SURVEY



Management and Organisational Practices help businesses grow in terms of efficiency, product innovation, and customer acquisition. The India Management and Growth Survey aims to document and understand these phenomena for businesses in India. To conduct our project, we collect data directly from top management through direct interviews, in which aspects of organizational practices and business growth will be explored. This project is funded by the King Center on Global Development at Stanford University and conducted in collaboration with CTIER which has contributed with its rich network and knowledge of the Indian entrepreneurial fabric.

Management and Organisational Practices help businesses grow in terms of efficiency, product innovation, and customer acquisition. The Indian Management and Growth Survey aims to document and understand these phenomena for businesses in India.

To conduct our project, we will collect data directly from top management through direct interviews, in which aspects of organizational practices and business growth will be explored. This project is funded by the King Center on Global Development at Stanford University, and will be conducted in collaboration with CTIER which has contributed with its rich network and knowledge of the Indian entrepreneurial fabric.

If you have been contacted by one of our analysts to answer the questionnaire, your participation is of utmost importance to our project and we really appreciate your contribution! We are convinced that our project will contribute to increasing the performance and growth of the Indian business sector, and your contribution is fundamental to achieving this goal.

All information collected during the interviews is strictly confidential and covered by the protocols of the Researchers' Academic Ethics Committees. All information will be used purely for academic purposes and the aggregated results will help inform the development or improvement of public policies in India.

Phases of the project

1. Business leaders are invited to participate in an interview

A group of qualified analysts addresses the top management of a sample of businesses and invites them to participate in a survey on use of management and organisational practices.

2. An expert team on data collection interviews business leaders

On behalf of Stanford University, an experienced team of in-house analysts working from the CTIER office will conduct an interview with top management representatives. All analysts receive intensive training on business concepts and will use standard methodologies to reach management representatives and complete interviews.

3. The research team analyzes the data and shares the results

After all the interviews have been completed, the research team analyzes the data collected, aggregates and synthesizes the responses of the participating managers and produces a report that outlines the main trends on management practices and growth. As a thank you for their participation, all participants will be sent a report with the preliminary results to the e-mail address provided during the interview.

The research team is composed of Professors Nick Bloom and Pete Klempner at Stanford University and Megha Patnalk at LUISS University.

If you have any doubts or questions about the project or specific questions on the questionnaire, please do not hesitate to contact us at the following addresses: chaitanya.lekharaju@ctier.org, +91 8827766642.

Methodological Appendix

The India Management and Growth Survey aims to document and understand phenomena of management, efficiency, product innovation, and customer acquisition for businesses in India. To conduct our project, we collect data directly from top management through direct interviews, in which aspects of organizational practices and business growth are explored. This project is funded by the King Center on Global Development at Stanford University, and conducted in collaboration with Centre for Technology, Innovation and Economic Research (CTIER). Further information about the survey can be found at <https://managementresearch.com/india-survey/>. The sample used in the main body is based on 1004 observations collected so far.

The survey's sampling frame of more than 8000 firms was selected to be firms in Prowess to capture more information about the firm without increasing burden on the respondent. Prowess is a firm-level database of Indian companies created by the Centre for Monitoring the Indian Economy (CMIE). The principal source of the data is Annual Reports of the individual companies. We further expand the sampling frame to firms from First Source for a more representative sample. This allows us to measure profits, R&D expenditure and exporting activity, among other performance measures, and validate background characteristics such as year of incorporation and ownership information.

The survey includes questions that help capture firm size. First, is the question on employment: "How many full-time employees are there at your business (this includes all workers, contract employees, payroll employees, and managers)?" Second is the measure of revenue: "What was the total sales in FY2021-22? Please provide in Rs Crores."

A novel feature of the survey to introduce measures of innovation. While broad initiatives such as Community Innovation Surveys directly measure dimensions of innovation, such information is limited for developing countries. In the main text, we use the responses question "What percent of sales from your products in FY2021-22 was from each of the following? (in %)", where the options are "Identical versions of products that you sold in FY2020-21 (%)", "Improved versions of products you sold in FY2020-21 (%)", "Products new to you in FY2020-21 but existing in the market (%)", and "Products new to the market in FY2020-21 (%)".

The management practices section of the survey covers three main sections: monitoring, targets and incentives. The monitoring section asked firms about their collection and use of information to monitor and improve the production process. For example, how frequently were performance indicators tracked at the establishment, with options ranging from "never" to "hourly or more frequently". The targets section asked about the design, integration and realism of production targets. For example, what was the time-frame of production targets, ranging from "no production targets" to "combination of short-term (less than one year) and long-term (more than one year) production targets". Finally, the incentives asked about employee bonus, promotion and reassignment/

dismissal practices. For example, how were employees promoted at the establishment, with answers ranging from mainly on factors other than performance and ability, for example “most based on tenure and other factors” to “based solely on performance and ability”. The construction of the aggregate management score and question-wise summary statistics are shown in table A.

Table A
Summary statistics: Management module:

	Mean	SD	Min	p(10)	p(25)	p(50)	p(75)	p(90)	Max	Obs
Management Score	0.63	0.1	0.047	0.46	0.54	0.64	0.73	0.79	0.94	1004
What happens when a problem arise?	0.85	0.2	0	0.66	0.66	1	1	1	1	997
# of key per performance indicators (KPI)	0.74	0.2	0	0.66	0.66	0.66	1	1	1	941
Frequently KPI reviewed	0.49	0.2	0	0.16	0.33	0.50	0.50	0.83	1	957
Display boards location	0.55	0.4	0	0	0	0.50	1	1	1	999
Time frame of operational targets	0.70	0.3	0	0.33	0.33	0.66	1	1	1	1000
What are bonuses based on?	0.50	0.3	0	0	0.33	0.50	0.66	1	1	1000
Criteria for promotion	0.77	0.2	0	0.66	0.66	0.66	1	1	1	999
When is an under-performing employee reassigned or dismissed?	0.44	0.4	0	0	0	0.50	1	1	1	998

Notes. The table shows summary statistics for the management score as well as each question. The management score is calculated as the unweighted average of the score for each of the 8 questions, where each question is first normalized to be on a 0-1 scale and the unweighted average is taken.

We closely follow the scoring mechanism of Bloom et al. (2019) to arrive at an aggregate management score. The management score for each firm is generated in two steps. First, the responses to each of the 8 management questions are normalized on a 0-1 scale. The response which is associated with the most structured management practice is normalized to 1, and the one associated with the least structured is normalized to zero. We define more structured management practices as those that are more specific, formal, frequent or explicit. For example, when asking “When is an under-performing employee reassigned or dismissed at this business?”, the response “Within 6 months of identifying under-performance” is ranked 1 and the response “Rarely or never” is ranked 0. If a question has three categories, the “in between” category is assigned the value 0.5. Similarly for four categories the “in between” categories are assigned 1/3 and 2/3 and so on. The scores for individual questions are then aggregated by taking the average of the question-

wise scores across all the answered questions. Then, we standardize this aggregate measure across firms, to have mean zero and standard deviation 1. Thus the summary measure is scaled from 0 to 1, with 0 representing an establishment that selected the bottom category (little structure around performance monitoring, targets and incentives) on all 8 management dimensions and a 1 representing an establishment that selected the top category (an explicit focus on performance monitoring, detailed targets and strong performance incentives) on all 8 dimensions. Table A shows summary statistics for each question.

References

Bloom, N., Brynjolfsson, E., Foster, L., Jarmin, R., Patnaik, M., Saporta-Eksten, I. & Van Reenen, J. (2019), 'What Drives Differences in Management Practices?', *American Economic Review* **109**(5), 1648–1683.

Bloom, N., Eifert, B., Mahajan, A., McKenzie, D. & Roberts, J. (2013), 'Does Management Matter? Evidence from India', *The Quarterly Journal of Economics* **128**(1), 1–51.

Bloom, N. & Van Reenen, J. (2007), 'Measuring and Explaining Management Practices Across Firms and Countries', *The Quarterly Journal of Economics* **122**(4), 1351–1408.

Garcia-Macia, D., Hsieh, C.-T. & Klenow, P. J. (2019), 'How Destructive is Innovation?', *Econometrica* **87**(5), 1507–1541.

Hall, R. E. & Jones, C. I. (1999), 'Why do Some Countries Produce So Much More Output Per Worker than Others?', *The Quarterly Journal of Economics* **114**(1), 83–116.

Hsieh, C.-T. & Klenow, P. J. (2009), 'Misallocation and Manufacturing TFP in China and India', *The Quarterly Journal of Economics* **124**(4), 1403–1448.

Hsieh, C.-T. & Klenow, P. J. (2014), 'The Life Cycle of Plants in India and Mexico', *The Quarterly Journal of Economics* **129**(3), 1035–1084.

Cover

Cricket photo: PA Images / Alamy Stock Photo

Factory photo: Forbes Marshall, Chakan, Pune, India

