

**Application for Ethical Approval for Secondary Research  
Undertaken Within Liverpool Business School****ETHICAL APPROVAL**Name of Student Applicant: **Aprampar singh**Supervising Tutor: **anil ota****OR** Name of Staff Applicant: [Click here to enter text.](#)

LJMU Student Number: 109529

LJMU Module Code as per canvas:

Title of Research Project: Development and strategizing industrial sector into manufacturing 4.0 in india

Programme of Study (please specify undergraduate or postgraduate course title):

**OR** Job Title (for staff members please specify full job title): postgraduate **mba.**

Where research involving human participants or databases of personal information is being conducted by a student or member of staff, the ethical implications of the project must be fully considered.

This form also provides the basis of the preliminary discussion that the student has with their supervising tutor.

**No research must commence without having received approval from The Module Leader. PRIOR TO submission Students must ensure that their Supervisor has provided feedback on all the documentation.**

**IMPORTANT INFORMATION FOR SUPERVISING TUTORS****APPLICATIONS – REQUIRING Module Leader Approval**

This form is to be used by students who plan to collect and analyse secondary data OR other data which is publicly available such as social media posts or company websites.

This form should NOT be used by students whose access to data requires consent from a specific person or organisation.

This form should NOT be used by students who plan to collect primary data using methods such as surveys, interviews and focus groups.

**Application for Ethical Approval for Secondary Research  
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A1. **Title of the Research Project:**

A2. **Personal Details of Applicant / Principal Investigator (PI) – *the student is designated at the PI***

**Given name :**  
Aprampar singh

**Family name:**  
Aprampar singh

**LJMU Email:**  
UPLASI59@LJM  
U.AC.UK

**Telephone:**

**Term Time  
Address:**

**Programme of  
Study / Job  
Title:**MBA

A3. **Co-applicant – *the Project Supervisor is the co-applicant***

**Given name:**

**Family name:**

**LJMU Email:**

**Telephone:**

**Post:**

**SECTION B: PROJECT DETAILS**

B1. **Proposed Study Dates**

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Start Date: 20 august 2023      End Date: December 11 2023

**B2. Background. Please provide brief details of the purpose of the project.**

Manufacturing Landscape in India: India is one of the world's largest manufacturing economies, with diverse industries ranging from automotive and electronics to textiles and pharmaceuticals. However, it faces challenges like low productivity, lack of innovation, and inefficiencies.

Demographic Dividend: India's youthful population provides a vast labor force and an opportunity to leverage technology for better skill development and employability.

Government Initiatives: The Indian government has launched various initiatives like "Make in India," "Digital India," and "Startup India" to promote manufacturing and technology adoption.

Global Competitiveness: To compete globally, Indian manufacturing must adapt to the changing global landscape, which includes more automation, customization, and digitalization.

**B3. Research Design. Please give a summary of the approach and method of the planned research including details of data to be collected and analysed.**

Research Objectives:

1. To assess the current state of the Indian industrial sector in terms of its readiness for Industry 4.0. To identify the key challenges and opportunities for implementing Industry 4.0 in India. To propose a strategic roadmap for the development of Manufacturing 4.0 in the Indian industrial sector.

2. Data Collection Methods:

Review existing literature, reports, and case studies on Industry 4.0 adoption in India.  
Analyse government policies and initiatives related to manufacturing and technology.  
Examine global best practices in Industry 4.0 adoption.

3. Proposed Research Timeline:

a. Literature review and desk research: 1 months

b. Data analysis: 1 months

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c. Report writing and strategy formulation: 0.5 months

4. Key Research Outputs:

A comprehensive report detailing the current state of manufacturing in India and its readiness for Industry 4.0.

A list of key challenges and opportunities identified through data analysis.

A strategic roadmap for implementing Industry 4.0 in the Indian industrial sector, including policy recommendations, technology adoption strategies, and workforce development plans.

Yes

☐

No

☐ no

**B5. Will you be collecting any data from social media? If so, please state what kind of data you intend to collect and how you intend to analyse it.**

**SECTION C: THE SOURCES**

**C1. Identify the sources for the study.** (e.g. Industry reports, journal articles, social media sites, newspapers, company reports). You must be specific. For example, if you are planning to use newspapers, you must state which specific newspapers you will use and include the dates of publication you will include.

Government Publications and Reports:

Ministry of Commerce and Industry, Government of India: Look for reports, white papers, and policy documents related to the "Make in India" initiative, "Digital India," and other relevant policies.

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NITI Aayog: Access publications related to technology, innovation, and industrial development in India.

Industry Associations:

Confederation of Indian Industry (CII): CII often publishes reports and research related to the manufacturing sector in India.

Federation of Indian Chambers of Commerce and Industry (FICCI): FICCI provides insights into industrial and technological developments.

Academic Journals and Research Papers:

Access academic journals and research papers on topics related to Industry 4.0, manufacturing, and technology adoption in India. Websites like Google Scholar or academic databases like IEEE Xplore and JSTOR can be useful.

International Organisations:

World Economic Forum (WEF): WEF often publishes reports on the state of Industry 4.0 adoption globally, including India.

United Nations Industrial Development Organization (UNIDO): UNIDO's reports can provide insights into industrial development trends.

Consulting Firms and Market Research Reports:

Reports from consulting firms like Deloitte, PwC, McKinsey, and KPMG can provide industry insights and trends in technology adoption in the manufacturing sector.

- C2. **How will you sample the specific sources?** You must be specific. For example, if you are using Mintel reports, you must state the names and dates of the reports you are planning to use, as well as the specific sections of those reports.

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Science direct, Manufacturing Sectors in India Outlook and Challenges, 2016, future of heavy industry in india

Research gate, India and Industry 4.0, 2018 ,challenges in terms of the digital divide, skill shortages, and infrastructure, it possesses significant opportunities due to its demographic dividend, innovation potential, manufacturing competence, global market access.

Industry 4.0—Awareness in South India, 2020, Industry 4.0 awareness in South India is on the rise, with government initiatives, educational institutions, industrial sectors, and startups playing a key role in promoting this transformation. While challenges such as infrastructure and skills gaps remain, the region is making significant strides toward embracing Industry 4.0 technologies to enhance its industrial competitiveness and innovation capabilities.

Port logistic issues and challenges in the Industry 4.0 era for emerging economies: an India perspective.

C4. **Does your study have inclusion or exclusion criteria? If so, please state here (e.g. sources included/excluded by date, topic, theme).**

**SECTION D: ACCESS**

D1. Are your study sources publicly available or are there specific access requirements?

yes ☐

The resources are publicly available, and I have checked that I can access them all.

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The resources are only available via the LJMU electronic library and I have checked that I can get access to them

☐ no

The resources require consent from a specific person or organisation

You must provide screenshots in your appendices to show you have access to all of the sources you have mentioned.

If you require consent from a specific person or organisation you will need to obtain signed consent and you should complete the ethics form for collection of primary data. This will need to be approved by LBS ethics committee.

**SECTION F: DATA ACCESS AND STORAGE**

*You must store any electronic data securely on upGrad portal. This includes storage of audi- visual recordings.*

*Personal data **must not** be stored on USB drives or other portable media or stored on home or personal computers.*

*Personal email addresses and telephone numbers should not be used on any documentation.*

**F1. Personal Data Management**

**Will the study involve the collection and storage of personal, identifiable or sensitive information from participants? (e.g. names, addresses, telephone numbers, date of birth, postcode, medical records, academic records).**

Yes ☐ ↩No ☐

If YES, please provide details of what personal information will be collected and stored

↩

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**F2. Will you share personal, identifiable data with other organisations outside of LJMU or with people outside of your research team? (e.g. supervisor, co-applicants)**

Yes ☐ ←      No ☐      Not Applicable ☐

If YES, please provide further details.  
[Click here to enter text.](#)

**F3. How long will personal, identifiable data collected during the study be stored?**

1 year

**F4. You must confirm that all data collected will be uploaded and stored on an LJMU pass worded protected system.**

Yes ☐      No ☐

**SECTION H: STUDENT DECLARATION**

Whilst undertaking my research I agree to carry it out in accordance with LJMU regulations, guidelines and principles. I have undertaken the appropriate ethics training and I am aware of the University Code of Practice for Research.

If any ethical issues arise during the research, I will firstly consult my supervisor who may need to seek written advice from the LBS Ethics Committee.

Please tick the box to agree that by submitting this application electronically you agree to the declaration above: ☐ yes

Signature:      APRAMPAR SINGH

Date: 25/10/2023



**Application for Ethical Approval for Secondary Research  
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I have read the student's proposal and ethics application. I support this application for ethical approval as outlined in the documentation. If during the research I become aware of a situation that affects the ethical approval, the student will be instructed to contact the LBS Research Committee for clarification and advice.

Signature: APRAMPAR SINGH

Date: 21/08/2023

Print Supervising Tutor's Name: ANIL OTA

Supervisor must tick the box here to confirm that you have reviewed and support this application: ☐

**SECTION J: CHECKLIST OF ATTACHMENTS** (Please tick relevant boxes)

**Please include all supporting documents ticked below as part of your application NOT as separate files/documents**

☐ NO

Complete data collection and analysis plan

☐ YES

Screenshots of examples of each of the sources that you plan to use



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[www.emeraldinsight.com/1741-038X.htm](http://www.emeraldinsight.com/1741-038X.htm)

# How manufacturing firm characteristics can influence decision making for investing in Industry 4.0 technologies

Lisa Bosman, Nathan Hartman and John Sutherland  
*Purdue University, West Lafayette, Indiana, USA*

Investing in  
Industry 4.0  
technologies

**1117**

Received 1 September 2018  
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## Abstract

**Purpose** – Investing in Industry 4.0 is an important consideration for manufacturing firms who strive to remain competitive in this global economy, but the uncertainty and complexity of where to focus technology investments is a problem facing many manufacturers. The purpose of this paper is to highlight a region of manufacturing firms in the Midwest USA to investigate the role of firm size, access to funds and industry type on decision to invest in and deploy various Industry 4.0 technologies.

**Design/methodology/approach** – A survey was developed, piloted, and deployed to manufacturing companies located in the Midwest USA, specifically, Indiana, USA. A total of 138 manufacturing firms completed the full survey. The survey participants were requested to rank order the various technology categories with respect to previous historical spending, workforce capabilities and anticipated return on investment. The survey was supplemented with publically available data. Due to the use of rank-order data to identify Industry 4.0 priorities, a non-parametric analysis was completed using the Kruskal Wallis test.

**Findings** – The findings suggest that manufacturers with less than 20 employees and/or less access to funds (sales less than \$10m) prioritize digital factory floor technologies (e.g. technology directly impacting productivity, quality and safety of manufacturing processes). Larger manufacturers with 20 or more employees and/or access to more funds (sales greater than or equal to \$10m) prioritize enterprise support operations technologies.

**Originality/value** – Research studies and reports tend to lump manufacturing's perspective of Industry 4.0 into one homogenous group, and rarely acknowledge the limited participation of "smaller" Small and medium-sized enterprises, which account for the far majority of manufacturing firms in the USA. The value of this study is on the "novelty of approach," in that the data collection and analysis focuses on heterogeneity of manufacturing firms with respect to size, access to funds and industry type. The findings and recommendations are beneficial and relevant to organizations supporting Industry 4.0 efforts through workforce development and economic development initiatives.

**Keywords** Decision making, Technology implementation, Strategy

**Paper type** Research paper

## 1. Introduction

Manufacturing is an economic engine driving innovation and prosperity through providing jobs and improving life with a diverse array of products including food, pharmaceuticals and technology. In 2016, the USA was home to 251,774 manufacturing firms, provided \$2,175bn in total manufacturing output, and employed about 12.3m manufacturing workers (National Association of Manufacturers, 2016). Scientists and engineers comprised only 3.4 percent of all private sector jobs in 2016, yet they are central players in high-tech organizations, research-based companies, and advanced manufacturing; US manufacturers employ 64 percent of scientists and engineers and are accountable for 70 percent of US patents to US entities (Bureau of Labor Statistics Occupational Employment Statistics, 2016). In the USA in 2016, manufacturing had the highest economic impact in that for every \$1 which adds value to manufacturing, \$1.40 in additional value is created in other sectors (US Department of Commerce Bureau of Economic Analysis, 2016). Manufacturing creates jobs throughout the economy and US economic growth is very much correlated with



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