



ANALYZING THE IMPACTS OF INDUSTRY 4.0 ON FINANCIAL STATEMENT: AN EXPLORATORY STUDY

Binita Kumari

State Aided College Teacher, Department of Commerce, Deshbandhu College for Girls, Kolkata, West Bengal, India
&

Research Scholar (Ph.D), Department of Commerce, Vidyasagar University, West Bengal, India

Abstract: Industry 4.0 is the fourth industrial revolution, which is formed on the building blocks of Industrial Internet of Things, real-time data collection and predictive analytics using big data analytics, artificial intelligence, and cloud manufacturing. Industry 4.0, which is also called the Second Machine Age, will be making the data collection process much easier by rapidly developing technological devices and it is also expected to shorten the process, reduce margin of error and costs with the inclusion of self-learning robots in the production process. The dynamic process and modern role of business accounting are increasingly paying attention to innovations in finance. The Internet of Things, Robotic Process Automation has drawn attention to some new trends in finance. This shift will definitely affect the financial statements of a business organization by the use of virtual money, just-in-time production, and the decreasing role of humans in the production process being replaced by robots. As consequence, the financial ratios will also have an impact with respect to the changes in financial statements. The purpose of the present study is to explore the impacts of Industry 4.0 on Financial Statements and Financial Ratios.

Keywords: *Industry 4.0, Technological Revolution, Financial Statement.*

1. Introduction

Industrial Revolution through technological advances has been triggering the business environment for a change, which is more prominent by the introduction of Industry 4.0. The fourth industrial revolution, commonly known as "Industry 4.0" refers to a new digital industrial technology, digital transformation and the fourth phase of technological advancement which creates a digital business combining advanced manufacturing and operating techniques with smart digital technologies. The reason behind Industry 4.0's importance is its holistic approach integrating the digital and physical worlds. The marriage of digital and physical technologies would affect not only supply chain or manufacturing, but also its operations, revenue growth and value creation (Schwartz et al., 2017). The various applications in Industry 4.0 includes Big Data, Cloud Computing, Artificial Intelligence, Block Chain, Robotic Process Automation, Internet of Things, Cyber-Physical Systems, Simulation, Sensors and other tools such

as RFID, GPS, SMART-ID etc. The dynamics of processes in modern society and the role of business accounting are increasingly paying attention to innovations in financing. The limited use of new technologies in accounting and financial practice is a major limitation in assessing their effectiveness and usefulness (Onyshchenko et al., 2022).

Industry 4.0, which is an integrated production and logistics process, is expected to influence data flow within global value chains and business functions such as production, logistics, marketing, accounting, human resources, legislation along with growing robot and human interaction (Dai & Vasarhelyi, 2016). In this respect, accounting systems with their important roles in businesses require the adaptation of industry 4.0 by redefining the entire financial system and redesigning corporate strategies. Industry 4.0 presents the new potential for the transformation of the accounting process through digitalization and applies new tools such as big data analytics, networking and system integration (Aslanertik&Yardımcı, 2019).

2. Literature Review

Lasiet al. (2014) states that along with global social, economic and environmental challenges, the world is facing challenges associated with dramatic technological changes in promotion, digitalization and automation. In response to these challenges, Industry 4.0, an information-driven production system technology is new ray of hope.

Hermann et al. (2015) cited that Industry 4.0 is a virtual platform for direct communication and interaction of business participants. According to the study the platform operates on the basis of four key components: cyber-physical systems, the Internet of Things, smart factory, and the Internet of Services.

Aslanertik & Yardımcı (2019) suggest that in order to maximize organisations value, achieve competitiveness, responsiveness, higher performance and to become as efficient as possible, the companies may use different industry 4.0 tools and apply different analytical techniques or use various management approaches. But it should be noted that each of these tools have different benefits or may have some shortcomings.

Altuk& Kablan (2019) states that industry 4.0, which is also called the Second Machine Age, is expected to shorten the process, reduce margin of error and costs with the inclusion of self-learning robots in the production process. This shift will definitely have an impact on financial statements which depict the performance of a business organization.

Di Vaio & Varriale (2019) pointed out that the impact of Industry 4.0 will undoubtedly be large, given the development of the global economy. The advent of Industry 4.0 has a significant impact on the global economy and affects international business, which is changing consumer benefits, improving asset quality by increasing data output, re-establishing relationships as learning the value of new ways of collaborating, digitally transforming existing models into new business models, especially open web platforms create new opportunities and increase competition.

Onyshchenko et al. (2022) opined that in the period of Industry 4.0, the human factor in enterprises will decrease significantly, but it is the human factor that will be activated at important decision-making points. Although it is

known that all accounting procedures can be done by intelligent systems, it is believed that the human factor will be necessary to ensure effective control over the system being created. For this reason, accountants must have a sufficient level of knowledge in many areas, such as knowledge of robotics systems, software, development and computer science knowledge, and project management skills.

3. Research Methodology

The proposed study is exploratory in nature and is based on secondary sources of information collected from the various sources such as newspapers, reputed journals, articles, related websites, annual reports and other publications (IMD World Digital Competitiveness Ranking 2021 Report, PricewaterhouseCoopers report, Fortune Business Insights report and Industry 4.0 - Global Market Trajectory & Annual Report on Industry 4.0 etc).

4. Objectives of the Study

The objectives of the study are as follows -

- To identify the key components of Industry 4.0.
- To explore the impacts of Industry 4.0 on Financial Statements and Financial Ratios.

5. Key Components of Industry 4.0

Technologies such as Big Data or Data Analytics, Cloud Computing, Artificial Intelligence, Blockchain, the Internet of Things and Robotic Process Automation influenced the Accounting System by the evolution of fourth Industrial Revolution.

5.1. Big Data

The biggest impact of Industry 4.0 on accounting is the innovation of Big Data. It facilitates accounting and finance to take on a more strategic role and help shape the future. The existence of extensive data significantly changes the accounting process. Since big data is primarily composed of unstructured data generated from audio, video, and images, traditional accounting software and database system cannot properly analyze the generated financial statements (Warren et al., 2015). The existence of big data during Industry 4.0 is undeniable. They change the information life cycle from traditional to modern by removing multiple processes such as acquiring, classifying, transforming, indexing, and searching, and adding multiple processes such as collecting, sieving, synchronizing, pre processing, and monitoring (Coyne et al., 2018)

5.2. Cloud Computing

This is another major innovation of Industry 4.0. The evolution of accounting is changing the expectations of clients and accountants are forced to adjust the way they do it to meet the requirements. People are willing to do less paperwork as they need to focus on what they are passionate about in the things they want to do. This means that people will have to depend on technologies to help them work in a more integrated way. One of the current technological trends is the rapid development of cloud technologies (Khanom, 2017). It is one of the advance forms of digital accounting. Cloud accounting is a combination of cloud computing and accounting using a web server to create a virtual accounting information system. Cloud accounting services consist of three models: Infrastructure as a

Service (IAAS), Platform as a Service (PAAS), and Software as a Service (SAAS) (Mohammadi & Mohammadi, 2014).

5.3. Artificial Intelligence (AI)

It is the science of designing, creating and constructing a machine (computer) or computer program that would have an intelligence similar to that of a person. Intelligence in this case is the ability to act or solve problems in the way that people use their intelligence. The scope of intelligence covers many aspects of the abilities of the human intellect, such as reflection, knowledge, planning, learning, natural language processing, and the ability to manipulate objects. With artificial intelligence, the machine is expected to have general intelligence, just like humans (Onyshchenko et al., 2022). Various trends that could change the role of accountants in management accounting through the use of Artificial Intelligence based technology include: enterprise performance management (EPM), including business intelligence; predictive accounting; improvement of management accounting methods; IT management and shared business services; better skills and competencies in behavioral cost management and strategic planning (Meskovic et al., 2018).

5.4. Blockchain

A digital data storage system consists of many servers (multiserver). In blockchain technology, data created by one server can be replicated and verified by another server, which is why blockchain is often compared to a bank's cash book containing all customer transaction data. However, this general ledger is available to all blockchain users and is not limited to authorized bank employees. With blockchain, a transaction no longer has to depend on a single server, because the transaction will be replicated throughout the network. The nature of the network is peer-to-peer, blockchain users can also avoid a variety of frauds that can occur due to data modification or hacking. On the blockchain, each block (a special area that contains all the changes in a transaction) consists of a hash, which is an identifier of digital data. Now each block contains the hash of the previous block. Each block in this system is interconnected and if there is an attempt to change the data in one block, then it must change the data in another block. Each block, protected by cryptography, is connected to create a network. Through the blockchain, intermediate transactions will be much more efficient than regular transactions, which still require the existence of intermediaries (Onyshchenko et al., 2022).

5.5. Robotic Process Automation

It is a combination of related technologies such as standalone systems, machine learning, AI and robotics. These latest technologies have shaped the structure of RPA solutions and became the basis for RPA. It works by clearly replicating the actions of today's employees, using existing core programs, accessing websites, and manipulating spreadsheets, documents, and e-mail to complete tasks (Lamberton et al., 2017). The functions of finance and accounting are always under pressure in terms of improvement and new technologies. RPA technology will undoubtedly affect accounting and finance. The automated workplace of accounting will significantly change the role of the accountant. Much time-consuming, manual work will be replaced by technology, so accountants will be able to focus on strategies and analysis. RPA and automation will destructively change accounting processes and operations. RPA will be particularly inefficient, and accounting professionals will focus more on strategic operations in the context of strategic accounting management. RPA will also provide automated internal control / audit and automated critical financial reporting (Onyshchenko et al., 2022). This technology not only improves the efficiency of

accountants, but also creates access to financial data in real-time, so that reporting and analysis can be performed simultaneously and continuously. RPA does not replace accountants; it develops their work in a progressive and positive way and allows them to focus on the greatest value they can give to their organization (Sanicciati, 2016).

6. Impact of Industry 4.0 on Financial Statements and Financial Ratios

6.1. Impact on Financial Statements

IAS 1 sets out overall requirements for the presentation of financial statements- a statement of financial position, statement of profit or loss and other comprehensive income, statement of changes in equity, statement of cash flows and notes including significant accounting policies and other information.

Statement of Financial Position describes the resources of a firm (assets) and the claims on those resources (liabilities and shareholders' equity) on a specific date (Wahlen, Baginski, & Bradshaw, 2015). Statement of financial position provides most comprehensive picture of an organisation's financial position. It reports an organisation's assets (what is owned) and liabilities (what is owed).

Profit and Loss Statement refers to a financial statement that summarizes the revenues, costs, and expenses incurred during a specified period. Profit and Loss Statement is analyzed to check the financial health of a company. The Income Statement reports the revenues and expenses for a specific period of time (Weygandt et al., 2015).

The **Statement of Changes in Equity** reports the changes in owner's equity for a specific period of time. This statement indicates why owner's equity has increased or decreased during the period (Weygandt et al., 2015). Statement of Changes in Equity is the reconciliation between the opening balance and closing balance of shareholder's equity.

The third principle of financial statement is **Cash Flow Statement**. The purpose of the statement is to inform financial statement users about the sources and uses of cash (Wahlen et al., 2015).

The additional information is presented in the **notes** in the financial statements (IASB, 2014) which comprises of a summary of significant accounting policies and other explanatory information.

In order to benefit from financial statements, financial information must faithfully represent economic phenomena. Financial statement will be more effective and useful when all the financial information has been considered and they faithfully represent the economic phenomena. For a perfectly faithful representation, a depiction would be complete, neutral, and free from error (IASB, 2018). As the uses of big data will facilitate accurate and opportune information, thus the Industry 4.0 will gain importance for the fair presentation of financial statements. Hence, it is anticipated that Industry 4.0 will change the significance of items in the financial statements.

Impact on Statement of Financial Position

Impact on Cash and Cash Equivalents

According to IAS 7 Cash Flow Statement, cash is the total of cash in hand and demand deposits. Cash equivalents, on the other hand, are short-term investments with high liquidity that are readily convertible to cash (IASB, 2017).

Keeping on track with the changing business environment, today's most money transactions happen through the internet. The use of cameras, sensors and shopping apps are leading us to a cashier less stores (e.g. Amazon Go). This technological advancement make an impact in the ways of payment, which may abolish cash transactions as the cash register also can be made in absence of cash payments and cashiers.

Today, many people and constituencies can access technology that is used for the creation of digital currencies where a complex set of algorithms is minted by servers working in an almost lawless way, which are called Blockchain (Scardovi, 2017). The digital currency such as crypto-currency functions both as currency and as a virtual accounting system that has a deep impact on the statement of financial position of an organisation.

Impact on Inventories

One of the biggest innovations of Industry 4.0 is the introduction of the concept of just-in-time (JIT) production. JIT production is a manufacturing system where goods are manufactured immediately when required to the next stage of process for production and also goods are transported to the customers at the moment, they have raised their demand. JIT minimizes inventory cost and increases efficiency as the manufacturers receive the materials as and when required for production and thus do not have to pay storage cost.

Introduced by Industry 4.0, Smart products are products empowered with mechatronic systems that can communicate with each other through the Internet and monitor physical processes. These interactive products can gain awareness of their surroundings and operational states so they can make decisions and trigger events (Reiner, Picard, & Albrecht, 2013). Smart products will be able to connect with other smart products through IoT. For instance, the fridge will send an e-mail to users informing them about the amount of food it contains or whether the food is fresh or not (Görçün, 2017). The users accordingly can make their buying decision as per the requirement of smart product. This kind of innovative technology helps in management of inventory and will decrease inventory cost.

Impact on Fixed Assets

Emergence of smart factories will enhance the uses of smart machines and robots in the manufacturing process. Using of this kind of technology will increase investments in fixed assets. Fixed assets will be able to communicate with other fixed assets with their sensors, estimate their own value, make more reliable predictions for their useful lives, choose the best depreciation method and adapt their predictions when needed (Altuk& Kablan,2020). So, the representation of fixed assets in financial statement will gain more attention in upcoming days.

Impact on Intangible Assets

Big data can help us understand the nature of intangible assets and plays a vital role in allowing soft assets appear in the actual financial statements with the use of quantitative valuation methods (Warren et al., 2015). Today companies are investing in technology, software and Internet of Things to gain the technological competitiveness, which make an increasing value of intangible assets in financial statement.

Impact on Short-Term Liabilities

According to IAS 1 Presentation of Financial Statements an entity shall classify a liability as current when it expects to settle the liability in its normal operating cycle; it holds the liability primarily for the purpose of trading; and the liability is due to be settled within twelve months after the reporting period (IASB, 2014). Introduction of Industry 4.0 with smart factory, machines and robots amount of production labour is very likely to decrease. So, the amount payables to employees and other staff related expenses will perhaps decreases, which will affect a reduction in short-term liabilities.

Impact on Long-Term Liabilities

According to IAS 1 an entity shall classify all other liabilities that are not current as non-current (IASB, 2014). Introduction of Industry 4.0 is expected to increase the amount of long-term liabilities as the technological transformation will increase the expenditure of fixed assets.

Impact on Shareholders' Equity

As like long-term liabilities, due to huge technological investment the company may prefer the financing the investments in long-term assets with shareholders equity.

Table 1: The impact of Industry 4.0 on statement of financial position

<u>Statement of Financial Position</u>			
<u>Current Assets</u>		<u>Current Liabilities</u>	
Cash and Cash Equivalents	↓	Short term borrowings	—
Financial Assets	—	Trade and other payables	↓
Trade and Other Receivables	—	Current income tax liabilities	↓
Inventories	↓	Short term provisions	↓
<u>Non-current Assets</u>		<u>Non-current Liabilities</u>	
Financial Assets	—	Long term borrowings	↑
Property, plant and equipment	↑	Long term provisions	↓
Intangible Assets	↑	<u>Equity</u>	
		Paid-in share capital (Investments for fixed assets)	↑

Source: Computed by Researcher

Impact on Profit and Loss Statement

Technological developments will reduce the cost of sales because of decreasing inventory and labour costs. Sales productivity will increase as the customer driven manufacturing system will help to reduce number of sales returns. As the huge depreciation expenses due to huge investment in fixed assets will increase the operating cost. Instead of increase in operating coat, as the cost of sale decreases and sales volume will increases, company will manage to earn more profit.

Table 2: Impact of Industry 4.0 on Profit & Loss Statement

<u>Profit & Loss Statement</u>	
GrossSales	↑
(-) SalesDeductions	↓
Net Sales	↑
(-) Cost of sales	↓
Gross Profit/ Loss	↑
(-) Operating Expenses	↑
(+) Other Operating Income	—
(-) Other Operating Expenses	—
Operating Profit/ Loss	↑
(+) Financial Income	—
(-) Financial Expenses	↑
Profit or Loss for the Period	↑

Source: Computed by Researcher

6.2. Impact on Financial Ratios

The financial ratios that are likely to be affected by the introduction of Industry 4.0 are as follows -

Liquidity Ratios

Liquidity ratios are metrics that are used to measure a company's ability to meet its financial obligations, evaluate the risk of liquidity, and determine whether the net working capital is positive or not (Akgüç, 2017).

Current Ratio - This ratio is a short-term measure that is used to compare current assets with current liabilities to assess a company's liquidity position (Elliott & Elliott, 2006).

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Introduction of Industry 4.0 will enhance better inventory management by the implementation of just-in-time production system. Thus, based on the preliminary assumptions that the decrease of current assets is more than the decrease of current liabilities, it is expected to a decline in current ratio may take place.

Quick Ratio (Acid-Test Ratio) - This ratio measures whether a company can meet its short-term obligations or not with respect to its most liquid current assets (Altuk& Kablan,2020).

$$\text{Quick Ratio} = \frac{\text{Cash+Short-term marketable investments+Receivables}}{\text{Current Liabilities}}$$

Based on the preliminary assumptions that an organisations operating in just-in-time production system, the quick ratio fails to keep its importance and it may remain closer to the current ratio.

Cash Ratio - The cash ratio is a measurement of a company's liquidity. It shows a company's ability to repay its debt. The cash ratio is a company's ability to pay off its current liabilities with cash and cash equivalents (Karapınar & Zaif, 2016).

$$\text{Cash Ratio} = \frac{\text{Cash+Short-term marketable investments+Receivables}}{\text{Current Liabilities}}$$

Due to introduction of digital currency like cryptocurrency it is expected that cash should be converted into digital currency. Hence, cash ratio should be decrease.

Debt Ratios

The debt ratio measures the relative amount of liabilities, particularly long-term debt, in a firm's capital structure; and the higher it is, the greater the long-term solvency risk (Wahlen et al., 2015).

Debt to Asset Ratio - Debt to Asset Ratio is a leveraging ratio that defined how much debt of a company owns compared to its assets. It is the percentage of a company's assets that are being financed by its debt.

$$\text{Debt to Asset Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

Based on the assumption that the increase portion of expenditure on fixed assets will be financed from long-term liabilities, amount of total debt will increase. Hence, Debt to Asset ratio may increase.

Debt to Equity Ratio – This ratio measures how much debt a company has compared to its assets. The optimum debt-to-equity ratio is considered to be around 1 while higher ratios indicate that the company may not be able to repay its debt obligations or meet its interest expenses (Akgüç, 2017).

$$\text{Debt to Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Shareholders Equity}}$$

As the introduction of Industry will increase the total long-term liabilities, it is expected to debt-to-equity ratio will increase.

Activity Ratios

The aim of activity ratios, also known as asset utilization ratio or operating efficiency ratio, is to assess how efficiently a company manages its various assets (Robinson et al., 2009).

Inventory Turnover Ratio –Inventory turnover ratio shows how many times a company turned over and replenished its inventory over a specific period of time. This ratio measures the efficiency of inventory management.

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

Based on the assumption that a company adopts a customer-oriented and just-in-time approach, inventory turnover will make no sense. In other words, the production and sales of stock will be carried out simultaneously.

Liquidity Ratio

Asset Turnover Ratio - The asset turnover ratio measures the efficiency of a company's assets in generating revenue or sales.

$$\text{Asset Turnover Ratio} = \frac{\text{Net Sales}}{\text{Average Assets}}$$

It can be assumed that the increase in the investments in fixed assets will be larger than the increase in net sales, which will decrease the asset turnover.

Shareholders' Equity Turnover Ratio -The Equity Turnover is a ratio comparing net revenue and average shareholders' equity to measure the efficiency at which a company is utilizing the equity capital contributed by stockholders.

$$\text{Asset Turnover Ratio} = \frac{\text{Net Sales}}{\text{Average Shareholders' Equity}}$$

Based on the assumption that the financing of the fixed asset investments will be provided by shareholders' equity and that this increase will be larger than the increase in net sales, there may be a decrease in the shareholders' equity turnover.

Equity Turnover Ratio - The Equity Turnover is a ratio comparing net revenue and average shareholders' equity to measure the efficiency at which a company is utilizing the equity capital contributed by stockholders.

$$\text{Equity Turnover Ratio} = \frac{\text{Net Sales}}{\text{Average Shareholders' Equity}}$$

Based on the assumption that the financing of the fixed asset investments will be provided by shareholders' equity and that this increase will be larger than the increase in net sales, there may be a decrease in the equity turnover.

Profitability Ratios

Profitability Ratios helps in determining the financial performance of business at the end of an accounting period. Profitability ratios show how well a company is able to make profits from its operations.

Gross Profit Ratio –Gross Profit Ratio measures the relationship between the gross profit and net revenue. It is also known as the Gross Profit Margin, when it is expressed as a percentage. It indicates the percentage of revenue available to cover operating and other expenditures. Higher gross profit margin indicates some combination of higher product pricing and lower product costs. On the cost side, higher gross profit margin can also indicate that a company has a competitive advantage in product costs (Robinson et al., 2009).

$$\text{Gross Profit Ratio} = \frac{\text{Gross Profit}}{\text{Net Sales}} * 100$$

Based on the assumption that the sales returns and cost of sales will decrease, it is suggested that gross sales margin and net sales will increase.


Operating profit Ratio - Operating profit ratio is a type of profitability ratio that is used for determining the operating profit and net revenue generated from the operations. It is expressed as a percentage.

$$\text{Operating profit Ratio} = \frac{\text{Operating Profit}}{\text{Net Sales}} * 100$$

Based on the assumption, the increase in depreciation expenses in parallel with the long-term assets leads to an increase in operating cost. Though, the reduction in cost of sales and increase in sales volume will manage to earn more profit.

Table 3: Impact of Industry 4.0 on Financial Ratios

<u>Financial Ratios</u>		
Liquidity Ratios		
Current Ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	↓
Quick ratio	$\frac{\text{Cash} + \text{Short-term marketable investments} + \text{Receivables}}{\text{Current Liabilities}}$	↓
Cash Ratio	$\frac{\text{Cash} + \text{Short-term marketable investments} + \text{Receivables}}{\text{Current Liabilities}}$	↓
Debt Ratios		
Debt to Asset Ratio	$\frac{\text{Total Debt}}{\text{Total Assets}}$	↑
Debt to Equity Ratio	$\frac{\text{Total Debt}}{\text{Total Shareholders Equity}}$	↑
Activity Ratios		
Inventory Turnover Ratio	$\frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$	↑
Asset Turnover Ratio	$\frac{\text{Net Sales}}{\text{Average Assets}}$	↓
Equity Turnover Ratio	$\frac{\text{Net Sales}}{\text{Average Shareholders' Equity}}$	↓
Profitability Ratios		
Gross Profit Ratio	$\frac{\text{Gross Profit}}{\text{Net Sales}} * 100$	↑

Operating Profit Ratio	$\frac{\text{Operating Profit}}{\text{Net Sales}} \times 100$	
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Source: Computed by Researcher

9. Conclusion

Industry 4.0 with integrated production and logistics processes, growing interaction between robots and human and data flows within global value chains will have a significant impact on all business processes. In this context accounting systems which have a very important function for businesses need to adapt to industry 4.0 by redefining the whole accounting system, as well as redesigned strategies. Industry 4.0 offers a new potential for the transformation of the accounting process through digitalization and application of new tools of industry 4.0. The conformance of accounting to Industry 4.0 will decrease errors and fraud, which will produce financial reports of high quality. The ratios used in financial analysis will provide users with more reliable information.

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