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# The Road to E-Invoicing: Understanding Technology Readiness in Indian Industry

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**Abstract**
Through its portal, the government launched e-invoicing in India which has completed three years since its launch in the year October 2020. At the same time, it provided the industry with the essential information to transition from paper filing to electronic filing, which promotes green sustainability by conserving precious natural resources. The survey had 107 qualified respondents participate. The noteworthy findings indicate that the industry is currently in the middle of the preparedness spectrum, between explorers and skeptics. It is necessary to address the skeptics concerned about the possible drawbacks, risks, benefits, and uses of electronic invoicing to promote its complete adoption.

**Keywords:** E-invoice, Readiness, Technology readiness index, Technology Readiness Segment

## 1. Introduction

The concept of einvoicing may be new to Indian tax payers but it has been adopted by nearly seventy co untries in the last few years. Latin American and European countries are pioneers in the adoption of electronic invoice.

Businesses in Latin America are using business-to business (B2B) invoicing for business long before tax laws mandated it.In Europe, until recently, e-voicing was mainly focused on the public goods sector.

"By 2025, electronic invoices are expected to become the main form of international business information exchange, such as invoices and debit/credit cards."

## Review of Literature

The latest studies show that there are several benefits to economies worldwide by following e-invoices over paper invoicing due to reduced paper consumption and CO2 emissions (Bellon et al., 2022; Hagsten & Falk, 2020; Keifer, 2011; Koch, 2019).E-invoicing is becoming more and more popular among businesses looking to lessen their environmental effect since it is generally acknowledged as an essential part of sustainable business operations. Numerous research works have emphasised the advantages it offers in relation to financial savings, enhanced productivity, and decreased carbon emissions. E-invoicing has been

shown to dramatically cut down on paper usage, which lowers energy use and greenhouse gas emissions The significance of electronic invoicing in fostering accountability and transparency in financial transactions was also underlined by this study. In a similar vein, e-invoicing has been shown to expedite the invoicing process, leading to quicker payments and better cash flow for companies. Additionally, the scientists pointed out that e-invoicing solutions lower the risk of fraud and errors because they are more dependable and secure than conventional paper-based techniques. Furthermore, a meta-analysis conducted in 2020 by Lee et al. emphasised the benefits of electronic invoicing for the environment, demonstrating how it can assist businesses in meeting their sustainability objectives by reducing resource consumption and waste production.

E-invoicing can improve supply chain financing (SCF) by enabling faster, cheaper, and more innovative operations (Caniato et al., 2016; Marak & Pillai 2021; Pucihar et al 2024, Wuttke et al., 2013). Modern digital technologies, such as e-invoicing, are crucial for monitoring supply chains in real-time, while traditional credit risk assessment models grow less trustworthy (Moretto & Caniato, 2021).E-invoicing can improve government financial compliance and tax collection (Krysovatyy et al., 2021; Olaleye et al., 2023; Skare et al., 2023).Perceived benefits and trust in e-government positively impact e-invoice adoption rates. According to Qi and Che Azmi (2021), adopting e-invoices improves tax compliance efficiency.

E-invoices have numerous environmental benefits, including reduced paper usage, increased energy efficiency, carbon savings, and lower greenhouse gas emissions (Mirabella et al., 2011; Moberg et al., 2010; Poel et al., 2016; Pohl et al., 2019) (Veselá and Radiměřský, 2014).

According to Ruisaho (2014), paper invoices contribute to 10% of global tree loss. Global deforestation is a significant issue as trees absorb greenhouse gases, leading to climate change and global warming. Paper bills not only harm trees, but also increase CO2 emissions. Paper invoices generate four times more CO2 than e-invoices (Federation of Finnish Financial Services, 2010).

**1.1E invoicing in India**

E-invoicing was operated in India as part of the government's initiatives to improve invoicing efficiency, prevent tax evasion, and increase compliance. The Ministry of Finance in the Union Budget 2020 initially suggested the notion of e-invoicing. The implementation period was gradual, beginning with enterprises who exceeded a specified turnover threshold. To make invoice verification easier, India's e-invoicing system uses the Invoice Reference Number (IRN) and Quick Response (QR) code standards. This digital solution was created to assure invoice validity and simplify the reporting procedure to the Goods and Services Tax Network (GSTN).

The government's goal in mandating enterprises to generate e-invoices for B2B transactions is to increase tax transparency and efficiency. The e-invoicing system not only saves the manual work and potential errors involved with traditional paper-based invoicing, but it also allows firms to comply with tax requirements more effectively. Since its inception in July 2017, the Goods and Services Tax has been plagued by tax evasion. Reports indicate a revenue loss of over ₹70,000 crores over the last three years. However, that figure may be far from the truth. According to the Fifteenth Finance Commission and the International Monetary Fund, India loses about ₹5 lakh crore (40% of GST collections) each year due to evasion and fraud. e-invoicing will provide tax authorities with better monitoring over corporate transactions, allowing them to detect tax evasion in real time. Since each tax invoice must be authenticated, tax administrators will be able to intercept any fraudulent invoice in real-time, therefore limiting fake invoice generation and input tax credit. Overall, India's use of e-invoicing is a big step towards modernising the country's tax landscape and fostering digitalization in business processes and preventing tax frauds.

**1.2 Current Amendments & announcements**

On March 8, 2021, the CBIC announced that companies having a total revenue between Rs. 50 crore and Rs. 100 crores would be eligible to use the e-invoicing system starting on April 1, 2021. After that, on April 1, 2022, the government expanded the application of e-invoicing to include companies with a turnover of more than Rs 20 crore. Later, on October 1, 2022, the system was extended to include companies with annual revenue of more than Rs. 10 crores. CBIC has announced that e-invoicing would be available to companies with annual sales of more than Rs 5 crore starting on August 1, 2023. The turnover of every GSTIN in India under a single PAN will be included in the aggregate turnover for e-invoicing.

**1.3 Background**

Parasuraman defines Technology Readiness (TR) as individuals' willingness to adopt new technologies to fulfil personal and professional goals. The construct consists of four sub-dimensions that

predict people's behaviour with technology, including.TR can be increased by optimism and invention, or decreased by pain and insecurity. Pasuraman (2000)emphasised that a positive attitude towards technology increases one's readiness and desire to absorb and adopt technological innovation. However, negative beliefs can keep people from moving forward. The author also developed a 36-item scale measure, the Technology preparedness Index (TRI), to assist in assessing an individual's technology preparedness. In TRI 2.0, an individual's technology readiness stage is classified into four dimensions: optimism, innovativeness, discomfort, and insecurity. All four factors of technological readiness influence varying levels of technology adoption [McNamara et al 2022].

**1.3.1Optimism**

Optimism conveys a good attitude towards technology [Parasuraman, & Colby,2015]. [Blut & Wang,2020], individuals in the optimism stage prefer to focus on positive comments and the worth of the technology, as well as the benefits, usefulness, and quality received from technology adoption. As a result, they support technological transformation and believe that technical innovation is cognitively engaging, while learning about technology is fulfilling. Similarly, if an individual is optimistic about E-invoice transformation, they can encourage others to view E-invoice adoption in a more positive light, increasing trust in it (Park & Zhang, 2022).

**1.3.2 Innovativeness**

Innovative people have a strong willingness to adopt new technologies and are pioneers in technological transformation (Omar et al. 2023). According to the survey, innovative individuals are willing to take risks to achieve advanced technology transformation and adoption.

**1.3.3 Discomfort**

Discomfort focuses on an individual's level of comfort with technology adoption (Parasuraman & Colby 2015). People are anxious and uncomfortable with recent technology because they lack control and believe that the technology shift is difficult (Cimbaljevic et al ,2023). McNamara et al. [2022] unearthed that comfort level has a substantial influence on innovation uptake. Persons who are at a high level of discomfort have little confidence in technological transformation. They will deny technology adoption because they believe it to be unpleasant and stressful. As a result, it reveals that people who are uncomfortable with their technological competence have a low desire for e-invoice transformation due to a loss of control (Dash &Mohanty,2023).

**1.3.4 Insecurity**

The feeling of insecurity stems from mistrust of technology. When one doubts the benefits of technology, as well as its capacity and trustworthiness, a sense of unease arises (Park & Zhang,2022) Moreover, Hung & Cheng[2013) indicate that technological insecurity manifests as a lack of confidence in its security and privacy. People who are insecure will emphasise the potential risks or negative outcomes of technological innovation. As a result, they are sceptical about the E-invoice and so discourage its acceptance and use [Humbani & Wiese,2019].

**1.4 Technology Readiness Index and Its Significance**

Parasuraman developed the Technology Readiness Index (TRI) to assess people's willingness to adopt and use new technology. It is founded on the assumption that people have varying levels of preparedness or willingness to adopt and use new technology.

The TRI is a multi-item scale that measures four dimensions of technology readiness:

- Optimism: Looking positively at technology and b elieving that it can provide control, flexibility and efficiency in people's lives.
- Innovation: Tendency to be a technology innovato r and thought leader.
- Discomfort: Feeling out of control over technology and feeling overwhelmed by it.
- Distrust: Doubt about technology and its ability to work effectively.

These four dimensions are combined to produce an overall TRI score, which can be used to classify customers into various technology ready groups, ranging from "explorers" (high TRI) to "laggards" (low TRI).

In this research, the four dimensions of technology readiness introduced by the TRI 2.0, with optimism and innovativeness serve as the driver to motivate the E-invoice adoption and transformation while discomfort and insecurity serve as the inhibitor to E-invoice ac-acceptance (Omar et al 2023) In addition, technology readiness varies from one person to another [Lai & Muhammad,2006]. People at different stages of technology readiness exhibit diverse technology adoption behaviours. Some people may accept new technology with a positive attitude, whilst others may reject it or require encouragement to do so (Alhammadi et al 2023)

**1.5 Technology Readiness Segment**

Parasuraman & Colby [2015] underlined how important it is to categorise an individual according to their technological segment when it comes to adopting new technologies. The authors argued that there are five distinct categories based on an individual's level of technological readiness: sceptics, explorers, avoiders, pioneers, and hesitators.

- Skeptics:Persons who prefer to visualize technology with pessimistic/negative beliefs.
- Explorer:Persons who is willing to accept new technologies and has low resistance to change.
- avoiders:Persons who resist change and are less motivated with the latest technology.
- Pioneers:Personswho focus on the advantages and risks of technology.

Kim et al (2019)state that the technology sector is essential because it enables businesses and authorities to comprehend the desires of their people. The idea that the technological readiness segment aids in predicting an individual's technology adoption behaviour was further corroborated by Ramírez-Correa et al. [2020]. When consumers are easily distinguished within a given segment, service providers can better create and adjust their marketing strategies to effectively meet the needs of their customers. The acceptance of new technology is then aided by it [Badri re al 2014].As a result, TRI 2.0 is crucial to authorities, business owners, and practitioners since it facilitates the understanding of the dynamics behind the implementation of E-invoice in the industry to ease the adoption process and ensure its success.

The TRI has been widely employed in a variety of contexts, including marketing, consumer behaviour, and technology adoption research. It enables organisations to better understand their customers' or users' attitudes towards new technology and modify their products, services, and communication strategies accordingly.

### 1.6 Materials & Methods

#### 1.6.1Population and Sample

The main purpose of the research is to study the usage of E invoicing among the industry , for which the population identified were companies which were members of South India Equipment Manufacturers Association (SIEMA). The members consisting of 768 were considered for the study and the questionnaire was distributed to them. The completed questionnaire received was 107 despite regular follow-up and so this number was retained as the sample size to carry out the research. Kangu (2017) defines a response rate of 50 percent or more as sufficient and suitable for analysis, 60% or more as good, and more than 70 percent as great. Thus, the response rate is valid with a sample size of 107 respondents who were working professionals whose organizations were members of SIEMA,Coimbatore.

#### 1.6.2 Research instrument.

The questionnaire has three parts namely part one has demographics of the industry chosen, part two has questions seeking answers regarding adoption of e-invoicing and part three has questions regarding Technology Readiness (TR) adopted from Parasuraman & Colby (2015).

This study used a single survey method to obtain data; hence, a review is required to make sure the dataset is free of common method bias (CMB). As a result, a single-factor analysis by Harman was carried out, and it was discovered that this study is free from CMB with 36.55% of the variance, which is below the 50% criterion (Podsakoff et al 2003)

### 1.7 Results & Discussions

#### 1.7.1 Demographic Profile

**Table 1 showing Demographic profile.**

| Sample characteristics | Number of respondents (107) | Percentage (%) | Cumulative Percentage (%) |
|---|---|---|---|
| **Type of Organization** | | | |
| Limited company | 8 | 7.5 | 7.5 |
| Private limited | 69 | 64.5 | 72.0 |
| Sole Proprietor | 7 | 6.5 | 78.5 |
| Partnership | 23 | 21.5 | 100.0 |
| **Type of Industry** | | | |
| Micro | 17 | 15.8 | 15.8 |
| Small | 68 | 63.6 | 79.4 |
| Medium | 22 | 20.6 | 100 |
| **Experience (Number of years in the industry)** | | | |
| 5-10 | 2 | 1.9 | 1.9 |
| 10-15 | 10 | 9.3 | 11.2 |
| 15-20 | 12 | 11.2 | 22.4 |
| 20-25 | 42 | 39.3 | 61.7 |
| More than 25 | 41 | 38.3 | 100.0 |
| **Number of Employees (Size of Firm)** | | | |
| Less than 50 | 2 | 1.9 | 1.9 |
| 50-100 | 23 | 21.5 | 23.4 |
| 100-150 | 24 | 22.4 | 45.8 |
| 150-200 | 31 | 29.0 | 74.8 |
| More than 200 | 27 | 25.2 | 100.0 |

The Demographic profile of the industry surveyed were analysed and shown in the above table The representative sample taken for the survey has limited Company (7.5 %), private limited company ( 65 %),sole proprietorship ( 6.5 %) and partnership firms (21%).

The classification of industry based on definition of MSME ,Government of India was carried out based on the sample surveyed was micro (15.8%), small(63.3%) and medium(20.6%).The total experience of the firms in the industry was studied and found that (9.3%) has 5-10 years of experience,(9.0%) has 10-15 years of experience,(11.7%)has 15-20 years of experience,(35.5%) has 20-25 years of experience and (34.5%) has more than 25 years of experience. The number of persons employed on permanent employment was studied and found that (10.8 %) has less than 10 employees. (24.4%) has between 10-50 employees ,(35.5%) has between 50- 100 employees, (15.4%) has between 100- 150 employees, (5.9%) has between 150 -200 employees and (5.2 %) has more than 200 employees.

#### 1.7.2 E- Invoicing Awareness

**Table 2 Awareness of E invoicing**

| Statement | Response | | Percentage (%) | |
|---|---|---|---|---|
| Are you aware that E invoicing is made mandatory ? | Yes 107 | No 0 | 100 | 0 |
| Do you have readiness for E invoicing ? | Yes 74 | No 33 | 69 | 31 |

There is total awareness among the industry regarding the Government announcement about the e-invoicing, but it noticed that 69 % of the industry are ready to adopt it as they have trained staff to handle it and rest of them (31%) are currently do not have trained manpower to do E filing and generally outsource the same through GST practitioners or chartered accountants.

#### 1.7.3 Reliability and Convergent Validity Test

The reliability and validity of the four stages of technology readiness was considered by assessing the Cronbach alpha and composite reliability(Hair et al 2015). The Cronbach Alpha ranged from 0.78 to 0.88 and Composite reliability ranged from 0.82 to 0.90.

All the values are above the suggest value by (Nunnally 1978, Hair et al 2014). Therefore, all the measures of Technology Readiness have adequate internal consistency reliability. Internal consistency reflects the extent to which items within an instrument measure various aspects of the same characteristic or construct which means a measure yields the same number or score each time it is administered, all other things being equal (Hays & Revicki, 2005). The convergent validity for the technology readiness elements was examined. From the AVE result of all the constructs score above the recommended value 0.5 as suggested by Hair et al.(2021). Convergent validity refers to the degree to which a new measure correlates with other variables and other measures of the same construct.
Construction must deal not only with relevant variables but also with different and inconsistent v ariables (Krabbe, 2017).

**Table 3 shows the Reliability and Convergent Validity Test Results**

| Cronbach Items | Alpha | Composite Reliability | AVE | item | Loading |
|---|---|---|---|---|---|
| Optimism | 0.81 | 0.87 | 0.73 | OP1 | 0.82 |
| OP2 | 0.78 | | | | |
| OP3 | 0.79 | | | | |
| OP4 | 0.81 | | | | |
| Innovativeness | 0.88 | 0.90 | 0.71 | IV1 | 0.79 |
| IV2 | 0.92 | | | | |
| IV3 | 0.97 | | | | |
| IV4 | 0.71 | | | | |
| Discomfort | 0.79 | 0.82 | 0.85 | DS1 | 0.82 |
| DS2 | 0.89 | | | | |
| DS3 | 0.63 | | | | |
| DS4 | 0.68 | | | | |
| Insecurity | 0.78 | 0.87 | 0.69 | IS1 | 0.74 |
| IS2 | 0.90 | | | | |
| IS3 | 0.79 | | | | |
| IS4 | 0.81 | | | | |

**1.7.4 Discriminatory validity**

This type of validity determines whether separate items that are not related with assessing the variable are measuring another variable. The test is also known as the Fornell and Larcker criterion, and the technique involves creating a matrix of latent variables with the full diagonal values replaced by the square root of the variable's AVE values (Fornell & Larcker, 1981; Hair et al., 2013). According to the rule of thumb, the diagonal cell value must be higher than the numbers in the entire column and row. the average variance extracted from the individual factors (Fornell and Larcker 1981a). It is observed that the AVEs of the constructs are greater than the square of its correlations with the other LVs. Thus, satisfactory discriminant validity is achieved.

**Table 4 shows Discriminatory validity analysis**

| | Optimism | Innovativeness | Discomfort | Insecurity |
|---|---|---|---|---|
| **Optimism** | (0.634) | | | |
| **Innovativeness** | -0.026 | (0.699) | | |
| **Discomfort** | -0.477 | -0.011 | (0.544) | |
| **Insecurity** | -0.255 | -0.027 | 0.262 | (0.589) |

**1.7.5 State of E-Invoice Readiness**

**Table 5 shows E Invoice Readiness**

| Item | Mean |
|---|---|
| Optimism | 3.6 |
| Innovativeness | 3.1 |
| Discomfort | 2.8 |
| Insecurity | 2.5 |
| Overall TRI* | 3.35 |

*The overall TRI score is based on the average scores on the four dimensions of technology readiness (after the reverse coding on discomfort and insecurity).

The Optimism score gauges a person's upbeat outlook and conviction that technology enhances control, adaptability, and productivity in life.Depending on the scale being used, a score of 3.6 (on a range of 1 to 5) indicates a reasonably high level of optimism regarding technology. Respondents who score highly on optimism typically see technology as a tool that improves their life and opens new chances. The Innovativeness score indicates a person's propensity to lead thinking leadership and be a technology pioneer. A score of 3.1 denotes a moderate degree of technological innovation. A moderately innovative person is usually game to test new technology, albeit they might not be among the early adopters. The Discomfort score calculates how much a person feels like they have no control over technology and that it is overwhelming them. A lower discomfort score (2.8) indicates a perceived lack of control over technology or a comparatively low level of discomfort. Respondents that score low on discomfort are typically at ease utilising and communicating with technology. A person's mistrust of technology and doubts about its functionality are reflected in their Insecurity score. A lower insecurity score (2.5) denotes a comparatively low degree of mistrust or insecurity towards technology. Respondents who score low on insecurity are more likely to have faith in technology's ability to perform as intended and to be less dubious of it. A moderate to slightly above-average level of technological preparedness is indicated by the total TRI score of 3.35, which also demonstrates a generally favourable attitude towards E invoicing with some areas of concern or discomfort.

**1.7.6 E – Invoice Readiness Segment**

Each unique technological readiness score was added together and then split into five segments, as recommended by Parasuraman & Colby (2015), to determine the e--invoice readiness section. Explorers, Pioneers, Sceptics, Hesitators, and Avoiders are the five segments. The target respondents' level of technological preparedness for adopting e-invoices is depicted in Figure below.

**Table 6 shows the E-Invoice Readiness Segment**

| Segment Classification | Percentage (%) |
|---|---|
| Explorers | 27.2 |
| Pioneers | 38.2 |
| Skeptics | 24.2 |
| Hesitators | 8.1 |
| Avoiders | 2.3 |

Here 27.2% of the workforce belongs to the explorers segment. According to Kim et al. [2019], explorers are early adopters of technology. Ramírez-Correa et al. [2020] found that explorers have the lowest level of discomfort and insecurity regarding technology compared to other segments. As a result, they are optimistic and innovative with technology, which has increased their motivation to adopt e-invoice. Consequently, with 38.2% of the sample, pioneers comprise the largest segment. The pioneers' group of responders consists of extremely driven individuals who are not very convinced about adopting new technologies. They adopt technology in an inventive and upbeat manner. While they are open to adopting electronic invoices, they also want to receive satisfactory technical support (Wahyuni and Juraida,2021). Of the respondents, 24.2% are sceptics, meaning they are somewhat motivated but very apprehensive about adopting new technologies, such as electronic invoices. Employees in the skeptics category, according to Hallikainen et al.(2020), felt that the technology's reliability was insufficient, which deterred them from utilising it. Nonetheless, once they are familiar with the e-invoice system's protocols and are persuaded of its advantages and security, they are open to using e-invoice (Badri et al 2014). The hesitators only make up 8.1% of the sample surveyed and have low levels of innovation. Mason et al (2023) indicated that hesitators exhibited high levels of perceived barriers and are more hesitant to change and adopt new technologies, lends more credence to this. 2.3% of the targeted personnel are avoiders. Employees in the avoiders' section are the least likely to adopt technology because they hold strong unfavourable opinions about it (Mason et al 2023). Therefore, while implementing e-invoice, this avoider's segment feels a great deal of unease and uneasiness, which eventually leads to low levels of optimism and technology adoption.

**1.8 Results :Implication, and Conclusion**

It has been three years since E invoicing was introduced in India and currently the fourth year is going on and Government has already taken steps to facilitate and familiarise this process. E-invoice uptake and readiness, particularly among Indian industry have emerged as key factors contributing to the success of the initiative. This survey provides an extensive review of the employees' technology readiness index and section for e-invoice adoption in SMEs, and it is based on the TRI 2.0 scales proposed by Parasuraman and Colby (2015). Sizable number of firms surveyed in this research have adopted to usage of e- invoicing showing the implementation of Government has been well executed. However, a quarter of the respondents were still sceptical about using e- invoicing due largely to lack of familiarity with online filing in the GST portal. It is observed that many firms depend upon GST practitioners or chartered accountants.

**1.8.2 Discussion and Future Directions**

The current survey identified the specific segment's preparedness and adoption of e-invoicing as well as the technology readiness index. To meet the expectations of the employees from the skeptics category, legislators and business owners need to emphasise the value and necessity of e-invoicing which is well carried out by the Government. A larger sample can be studied covering all sectors namely micro, small ,medium and large firms with the aim to study the actual difficulties technically and commercially. The preparedness level of the commercial staff in using the e- filing system can be studied sector and classification wise, so that Government can conduct more training programs to encourage more easier adoption of E invoicing.

The adoption of invoicing is showing favourable results as Government has rolled out the scheme in a phase wise manner. The shift shall help in the Government in practising green sustainability as well as monitor the economy to prevent fake invoicing. Further, separate research can be taken up to find out the how much e filing is contributing to the sustainability.

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