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BRIEF REPORT

Roadmap for digital technology to foster India's MSME ecosystem—opportunities and challenges

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Abstract Digital technology can significantly enable India's MSME segment, provided the emerging infrastructure has joint buy-in from the government, solution providers and importantly users. The digital landscape catering to businesses has drastically changed in recent years, several elements have emerged that can start shaping the contours of a strong digital ecosystem. The challenges reside in addressing a complex and heterogeneous MSME segment, dominated by micro enterprises at different stages, and different levels of digital readiness. The enticement for businesses to fully embrace digital technology would be to provide a digital ecosystem that provides end-to-end solutions, from finance access, payments, operations, management to even skilling and knowledge sources that are convenient.

1 Introduction

MSMEs are a major contributor to the Indian economy, accounting for around 30% of GDP and providing employment to over 110 million people (Ministry of MSME, Annual Report 20–21). However, a more somber story emerges when examining details. The Indian MSME sector is unique in its long fat tail of relatively unproductive micro enterprises, which are unregistered or informal, new-to-formal-credit, and characterized by low growth and employment per unit. Most of the micro enterprises are sole proprietorships with less than five employees. Furthermore, informal micro enterprises are responsible for 80% of employment while contributing only 20% of output. This highlights the composition of India's current business landscape of tiny self-employed informal enterprises with low quality human capital [1].

Conversely, there is a severe deficit of formal, productive, and job-creating small and medium enterprises. Furthermore, while the MSME segment is perceived as a significant job creator, the quality and conditions of the jobs created are often precarious and in the form of casual labor, daily labor and self-employment, often with very little or no job security. For most micro enterprises, the entire focus is on making sure the business stays afloat, and not on growing the business. This business stagnation hampers many crucial aspects for an enterprise to grow and achieve scale, such as efficiency, innovation and production quality. While the magnitude of these problems are well known, little progress has been made to address them efficiently given the complexity and interconnectedness.

In effect, three critical ingredients needed for any early stage business to thrive, namely access to markets, skills and working capital, are sorely missing for most enterprises. On the other hand, significant public investment would be required to address these gaps and create effective market linkages, skills and mentorship, and access to finance. When considering the existing resource constraint conditions, the critical questions then become: (1) How do we identify high growth and potential enterprises and ensure that they are prioritized? (2) What are the critical life stages of these businesses and when do they most need support to harness their future potential? (3) What infrastructure and tools are required to track and identify promising firms early enough in their lifecycle for them to grow? Emerging digital data and technologies such as

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fintechs, E-commerce and ERP give us a unique and unprecedented opportunity to address the questions above with reasonable efficiency and effectiveness.

2 Building the digital ecosystem

Digitization is becoming increasingly part of our daily lives, and will be even more ubiquitous in the near future. Currently, many processes in microenterprises are manual, inefficient and not scalable. Hence, the requirement for technology to transform and spur growth in the MSME segment, in particular in the nano and micro enterprise segment is obvious. Ideally, a well-integrated and connected digital ecosystem is optimal to build connections, and drive transformation, from entrepreneur identification, creditworthiness, delivery of schemes, access to markets, right skills mix for different firm stages, as well as enabling granular and cost-effective data collection in the sector. However, this is not without significant challenges, since upgrading existing systems—or creating new ones entirely—is a notoriously complex process.

Furthermore the depth of digital readiness and requirement can vary significantly across sectors.

A situational assessment of India's digitalisation endeavours tells us how physical infrastructure needs to keep pace with the increasing advancements in digital penetration. The asset quality and usage which determines digital advancement (see figure above) is influenced by many factors. Data suggests that phone ownership has increased at the household level (88% have a phone, TRAI, 2019–20). As per the 2020 Pew study, smartphone penetration and internet usage hovered around 24% and 25% compared to 45% and 60% in emerging economies. India's low data cost has definitely attracted phone users, but inadequacies in infrastructure including electricity, mobile towers and broadband have discouraged usage and reliance for business use. This has specifically affected rural-based MSMEs which constitute 50% of the entire MSME sector. In addition, data security issues have been a worrying factor for digital payments and developing market linkages especially for women. Meanwhile the digital infrastructure has been receiving significant focus as the government has been nudging businesses, and developers including private Venture Capitalists, to support India Stack 2.0—the platform aimed at integrating and bridging the gap between financial services and MSMEs.

With 560 million internet users, a smartphone penetration rate of 50%, and 41 million digital financial transactions every day in 2020 alone, India is rapidly digitizing. Currently, the market size of India's consumer digital economy amounts to $85–90 billion and it is expected to grow ten times in the next decade reaching $800 billion by 2030. The COVID-19 pandemic, bringing an additional element of urgency and need, has accelerated the growth of the digital economy and, interestingly, most of this growth is expected to originate from tier-2 and tier-3 cities.

From the merchant side, while so far this sector has been dominated by a few large players, the consumer online market is becoming increasingly fragmented with a large presence of small players like e-kirana shops and gig-economy workers and platforms. Such players are drawn to digital platforms that allow them to access larger markets, simplify book-keeping, and receive fast, cheap, and secure payments. However, to what extent these smaller actors have progressed to ensure they have the means and capacity to effectively safeguard the data of their clients is still an open question.

2.1 Identifying high potential entrepreneurs

One of the key features of creating a digital ecosystem is its ability to spur growth, and not just digitize processes that would be an incremental change. Hence, tackling the fundamental questions that hinder enterprise growth is critical. There is a need, as the first step, to genuinely address the dichotomy between subsistence entrepreneurs and growth oriented enterprises. This requires addressing the question—"*How to identify the gazelles among the many entrepreneurs*?".

Hussam et al. [2] explore the usage of community knowledge through a cash grant experiment to help target high-growth microentrepreneurs. They demonstrate that local entrepreneurs have high quality information about

Table 1 Stages of MSME Digitization

Level of Digitization	Digital Tools/Processes
Use of basic digital tools	Microsoft Office, email, WhatsApp, personal computers, mobile phones
Online presence	Website, social media, e-commerce sites, tablets, printers
Use of advanced digital tools, or digitalisation as part of the core business model	ERP, CRM, analytics, big data, automation, pure online business, scanners, bank card readers, central servers, imaging devices

Source: ERIA,ASEAN

each other, even after controlling for characteristics such as demographics and business acumen. They do find evidence that appropriate elicitation mechanism designs can realign incentives for truthful reporting, hence enabling at the local level to identify high potential entrepreneurs. However, there is an explicit lack of literature on identifying potential high-performing businesses in developing countries. Instead, existing literature has primarily focused on growing the household incomes of microenterprise owners. These papers have a much more specific focus on ultra-poor programs that provided grants and training to start businesses as mentioned in the works of Banerjee et al. (2015) or Bandiera et al. (2017). While not conducted in the Indian context, a well -study by Mckenzie [3] aimed at evaluating whether public policy can help identify high growth entrepreneurs through a business plan competition in Nigeria, launched by the government. This study is an ideal example, since it is one of the few references that explores the idea of targeting high-potential entrepreneurs. In this paper, after tracking winners over five years through surveys, they show some evidence that winning the competition led to more survival, higher profits and sales, and higher employment, compared to a random selection of non-winners. While these are interesting insights, scalability of concepts are critical, only then will we see the mass shifts. Understanding the role of community and technology, and the impact of competitive processes for identification purposes is useful, but needs to be better understood and be further integrated into a more scalable model. Further work is required to understand how various knowledge from the community can be gathered in digital format and how AI/ML can optimize decision making.

Among some initial insights, Mckenzie and Sansone [4] tested whether machine learning could be helpful in predicting success in a business competition plan to identify successful businesses. Mckenzie compared human judgment predictions from expert judges to evaluations using machine learning approaches. Among the insights, when looking at achievements three years on, judges' scores were uncorrelated with business survival, employment, sales and profits. Some entrepreneurial characteristics such as gender, age, ability and business sector have predictive power. However, overall, predictive power of models was significantly low, with modern machine learning methods not having noticeable improvements over human judgement.

2.2 What is required for an enterprise to thrive?

A business requires a combination of various factors that can have different weightage depending on the stage of the business. These factors broadly consist of talent and strategic leadership, operations, marketing, and finances. Many of these components can be part of a broader digital ecosystem. Furthermore, these factors need to take into account differing needs by stage of growth.

2.2.1 Credit

The role of credit in sustaining and expanding the business is one of the critical factors of success. The formal credit gap in the MSME sector is estimated to be at Rs. 16.66 lakh crore [5]. A recent study from Omidyar Network and Boston Consulting Group estimate that MSME digital lending has the potential to increase between 10 and 15 fold to reach INR 6–7 Lakh Crore ($80–100 billion) in annual disbursements. Though traditionally micro enterprises are considered to be self-funded units, in particular in the start-up phase, there is a growing trend for accessing credit, thanks to the financial inclusion initiatives of the government (e.g. MUDRA). 80% of business owners have a bank account while 99% are covered through biometric based Unique Identification Number (Aadhar), suggesting scope for leveraging technology for meeting the financial needs of individuals and small business owners alike. Formal credit from financial institutions have been lagging.

In particular, lack of credit history of micro enterprises have been impacting the penetration of lending in this segment. Further, coupled by the low profitability ratio and lack of working capital or financial resources, the majority of the businesses utilise credit for personal purposes; thereby limiting its growth and also being prone to higher NPA ratio. Formal financing is therefore limited by credit information and hence lending is restricted. Formal banks prefer to lend to enterprises who have a higher vintage—more than 5 years old (Bharat Inclusion initiative, CIIE). MSMEs therefore have to rely on informal sources of financing, friends and family in addition to exploitative money lenders. Furthermore, formal banking assessment processes are often manual and time consuming, require onerous documentation often not available and are subject to manual discretion and human bias, which often excludes certain marginalized groups given societal norms and divides.

Fintechs help address this challenge by building proprietary alternative credit assessment models that evaluate small businesses' from a credit worthiness standpoint through mobile friendly applications, hence enabling a greater understanding of their functions and challenges. Thereby devising unique lending models that enable greater financial access for the MSME segment. Infact, at the market front, digital credit has gained traction due to the rise in people going online and also due to the successive lockdowns as micro businesses were forced to minimise physical transactions. B2B lending grew at a CAGR of 72% from 2015 to 2019 (Inc42) pushed by

around 1300 fintech startups in the business lending space. Backed by good venture funding, digital lending through fintechs is aiming to plug the anomalies of existing credit systems by leveraging digital technologies as discussed below:

Meanwhile, the success of MSME penetration lies in the ability of these fintechs to expand their digital footprint by integrating their services with the small businesses. While the scope is high (63.4 million units), the challenges would be much higher given the diverse and fragmented nature of their operations. Accion, a global fintech impact investor has been supporting FairBanc, a startup based in Indonesia in partnering with small FMCG or mom-and-pop stores through 'embedded financing' i.e. where financial services are added on top of core offerings of tech platforms like a buy-now and pay-later solution. While Amazon and Paytm have used their platforms for vendor payments, digital lending is yet to be tapped fully in India. It is, however, the benefits of cross-functional support (agri-fintech, heath and edutech etc.) which lends fintechs an advantage in tapping the under-served MSME networks in India. Such cross functional fintechs can effectively provide customised services to end customers, enable better and seamless transactions across sectors and finally ensure that all the requirements of the customers are best served. Given the diversity of MSMEs and their multiple supply chain characteristics, such fintechs could better serve their interests and there would be better acceptance to such services. In addition, regulatory norms need to be revisited to enable cross-functional services, including in traditional institutions, to work more seamlessly within the system.

It would be, therefore, important for traditional institutions such as formal banks to learn from the fintech experiences. This will further accelerate the efforts towards expanding the digital footprint of MSMEs. While banks and NBFCs have taken efforts in moving some of their processes to digital systems, the structure is still yet to fully transition into a digital system and hence paper-based transactions are still ordained for customers. These, among others, are the various challenges which stand as bottlenecks for formal institutions in enabling this digital transition which are discussed below.

Credit information is a key factor for SME access to formal financing, including through reduced collateral requirements, lowered borrowing costs and shortening of the bank appraisal process. Improved availability and quality of credit information can thus also lead to large benefits in employment growth for SMEs. Further, as the PaisaBazaar study [6] suggests, 5 out of 10, in the case of the self-employed, do not know their own credit score. Further, the introduction of data streams from credit bureaus can lead to a sixfold increase in employment growth in MSMEs as compared to large firms. Stiglitz and Weiss argue in their 1981 paper that credit rationing may be an equilibrium situation when there is imperfect information due to the existing information asymmetries between lenders and borrowers in the ex-ante screening of projects (adverse selection) and ex-post monitoring of loan contracts (moral hazard). If a rise in the interest rate to clear the market lowers average borrowers' quality, lenders will choose to ration their credit. Therefore, introducing an accessible system and easy methods to avail credit will help foster a healthier level of enterprise growth.

In addition, gender differences also limit access to credit with the finance gap for women-owned MSMEs hovering around INR 6.37 trillion or 73% of total demand (IFC, 2019). Lack of asset ownership, financial literacy and even societal norms influence the outcomes of availing credit for women owned enterprises. This segment therefore leaves a large untapped market for digital credit where repayments are largely agnostic to such preferences.

2.2.2 Market linkages (e-commerce. social media, etc.)

Expanding the digital footprint of micro enterprises has been most easily influenced by social commerce. Infact, social media platforms such as whatsapp, facebook etc. have helped to connect the dots in encouraging digital adoption among small business owners. As per the CRISIL report, 47% of micro enterprises and 53% of SMEs have adopted digital sales platforms in India and another survey by the Endurance International Group suggests that 50% of micro and small enterprises adopted technologies such as WhatsApp and other Video Conferencing tools for pursuing their daily business operations. Digitisation in the form of social media marketing offers opportunities for businesses to increase their transactions and expand their clientele. It can help increase sales and also improve the quality of relationships with customers. Social commerce has been identified as a powerful lever for business growth in the form of increasing market share and profitability. Social commerce is also afoot in India with a variety of reseller platforms emerging and on-boarding home-based women entrepreneurs. The wave of digitization has also proceeded to provide more income enhancing solutions for the small businesses, through inorganic digital revenue streams (OECD, 2020). Many innovative solutions have emerged from the burgeoning tech start-up industry in India which are on-boarding the small businesses as their fulfilling partners for the end consumers. Vertical and horizontal e-commerce players are on-boarding mom-n-pop shops to provide spaces in their shops to store delivery parcels, and for proprietors to act as delivery persons, earning extra income, as well as generating more customer footfall. By providing new channels and methods to increase their reach, a digital platform will allow for better

functioning, especially when taking into account the growth in popularity of non contact and online services.

E-commerce plays a critical role in engaging micro entrepreneurs, especially in rural areas. The e-commerce market in India is estimated to grow to $200 billion by 2026 on the back of rapid internet penetration. Meanwhile, e-commerce in rural India is believed to bring a community level social reform. In India, the household sector, handicrafts and agro based products make better use of e-commerce. India Brand Equity Foundation forecasts that the Indian e-commerce industry will reach about $99 billion by 2024 with a growth of 27% CAGR during the period 2019–2024 with higher transactions in grocery and fashion or apparel. Tapping into the e-commerce market would require micro enterprises to re-work on their digital capabilities. The onboarding process followed by the major e-commerce platforms emphasise on having GST registrations which means most of the current small business owners will need to formally register themselves or seek GST certifications. In addition, the portfolio of products will need to be enhanced both in terms of quality and quantity which further needs proper accounting management, one of the grey areas for micro enterprises to address. Some of the platforms like Amazon's Saheli have been encouraging the onboarding of small businesses by supporting them in different stages—documentation, photo shoot, portfolio development, packaging and online vendor management.

LEAD has undertaken a study[1] to understand the digital readiness of women entrepreneurs in rural India, particularly their willingness and their experience of participating in e-commerce and social commerce platforms. The researchers undertook a scoping exercise to understand the state of digitalisation in India focusing on e-commerce and also conducted in-depth qualitative interviews with 25 women entrepreneurs from rural and semi-urban areas of Kerala and Rajasthan to understand the ground realities. The forthcoming study looks at existing government and non-government infrastructure to promote e-commerce, and emerging social commerce platforms (via Facebook and WhatsApp) and general ICT applications for use by women entrepreneurs (WEs) as a supply side effect. The WEs motivation and existing capabilities to use ICTs to their advantage in increasing visibility and combating market competition as the demand-side effect
By comparing the digital readiness of various Indian states through a few parameters, researchers found that states such as Andhra Pradesh, Kerala, Maharashtra, Karnataka and Madhya Pradesh occupy top positions, and states such as Bihar, Rajasthan, Odisha are placed at the bottom
Based on the in-depth interviews with rural WEs, the study finds that in terms of familiarity and knowledge of using e-commerce and social commerce, they find it difficult to navigate any platform due to a wide use of the English language. Some of the interviewed WEs know how to operate only WhatsApp and can connect with clients as per their requirement, albeit low sales through it. In some cases, their husbands are responsible for handling financial transactions, cash or online. With regards to digital payments and mobile banking, rural WEs are more familiar with digital application platforms such as Google Pay and use this regularly only for receiving money, while many do not use mobile banking
Findings suggest that there is some awareness among entrepreneurs about the avenues for selling products online, but lack of awareness about onboarding procedures and modalities acts as a barrier. A concern for them is regarding the affordability factor while selling through e-commerce platforms. Almost all the women interviewed shared that there is an information gap on this and some suggested that it would be better to have orientation and hand holding capacity building programmes. The most basic issues that individual women entrepreneurs face is meeting the eligibility criteria to be onboarded onto these private ecommerce platforms. GST certification, incorporation and registration details and PAN number are just the first steps to be eligible to sell products online

[1] http://bwdisrupt.businessworld.in/article/Study-Finds-Low-Participation-Among-Rural-Women-Entrepreneurs-In-E-commerce-But-Show-Willingness-To-Adopt/21-10-2021-409437/

2.3 Operational efficiency

Micro and small entrepreneurs maintain stocks and inventory in analog format. Part of the challenge that comes with changing the existing practices and increasing MSMEs access will require the ability to keep tabs on the supply chain and fulfill orders immediately. MSMEs can take steps to digitize sales, cash flows, stock movement, invoices, receivables, and inventory details. The receivables, invoices, and inventory could also act as a psychological guarantee. The increasing use of digital contracting and push from governments toward formal invoicing by enterprises irrespective of their size provides further impetus for this transition. This has been especially significant for compliance management as GST-like compliances have moved online. With the rise of online retail, a digital transformation strategy that incorporates inventory management tools can create a unified, connected experience for customers and give workers the tools to be more productive and efficient. A robust inventory management system often incorporates a mix of software, hardware, mobile devices and apps, data analytics solutions and security tools. All of these initiatives aim at making it easier to deliver products to customers, when and how they want them.

Digital payments can significantly improve many aspects such as increasing geographic reach and customer bases, better price discovery, reduced land and labour costs, efficient backend management and accounting, and improved market access and information. Digital capabilities and their adoption among micro business owners are also determined by the 'push' from the consumers. As the McKinsey article by Peter Dahlstrom David Edelman [7] identified, consumer demand influences digital capabilities in different dimensions, as

consumers want to interact from any location (for e.g. a daughter working from another state selecting the appropriate groceries for her parents from their local shop), doing different things which find value for them (the daughter selecting products based on nutrition needs through the smart watch tracker of her father), customisation of products or service used (ensuring the product fits the requirements of her parents in a dynamic basis from data obtained) and simpler interactions (least time and efficiency for her to navigate from selection to delivery of the product). This means the erstwhile kirana owner, who used to know the preferences of each customer attending their shop, will now need to digitally design their service delivery to ensure consistent interactions in a less physically transactional world. In the context of digital payment adoption, Rajeev Kumar, Senior VP, Mastercard, suggests the "A-B-C-D approach" i.e. in order for adoption of the technology to be successful it will need to be 'Accessible' and 'Affordable' for the kirana owner, demonstrate the 'Benefit' or value it brings to him/her, needs to be 'Convenient' to adopt, and be 'Dependable' (Financial Express, July 4, 2021).

Catalyst, an initiative under LEAD, aimed to expand digital payments among micro merchants. The project gathered key insights from a survey conducted in 2017 from a representative sample of fixed stores merchants in Jaipur. Among the main findings, when looking at usage of digital platforms, younger, more educated merchants were more likely to actively use digital payments. Furthermore, volume of business and transactions, along with size was correlated with greater use. In general, fixed merchants are active users of bank accounts, however there are significant differences between users and non-users when looking at smartphone penetration and internet access. There is also a perception gap, where beliefs that digital payments will be beneficial for their operations and business, in particular projection of sales and potential cost efficiencies. However, this is tempered with a low willingness to pay for transaction fees. Among key insights is to ensure to address the heterogeneity among merchants, one size does not fit all. Moreover, in order to ensure that digital payments drive value, there is a need to instill a broader focus beyond just payments. Integrating workflows in a digital format along with payments such as invoicing, management and tax compliances would add value to merchants

Among other highlights is the need to instill trust and usage capabilities to new users to digital. Furthermore the study highlights the need for a multi-prong strategy involving a wide range of actions from relevant practitioners. Specifically, solution providers can target early adopters through new models that offer digital payments and beyond that reduce or eliminate costs. Government can also play a key role to support innovative infrastructure that supports digital integration of various services, in particular for last mile delivery for small merchants

Further, as Ertmer [8] proposed, for a successful digital integration in overcoming technology barriers, the attitudes and beliefs which the small business owner hold should be used positively to exploit the support provided in terms of infrastructure (data connectivity and quality). This would mean inculcating a design thinking approach which would assist the micro entrepreneur to utilise the digital platforms in the most suitable and effective way

2.3.1 Capacity building

With proper hand holding and by providing appropriate training support, small businesses can appropriately use technology and also increase their confidence levels. This is more important for digital adoption which precedes digital integration. The Government, and associated institutions like Khadi and Village Industry Commission under the MSME Ministry, have devised various schemes like Digital MSME to build awareness among small businesses and for their digital adoption and eventual integration. While the integration has been largely focused on the Government E-Marketplace (GeM), the efforts can largely plug into the entire digitisation process. However, a lot is desired for developing capabilities among micro enterprises due to their divergent requirements and their lack of investment in digital technologies. This stems from a resistance in adopting digital technologies, which is further associated with their lack of understanding, capacities and capabilities, as the MSME ministry supported Intuit study (2017) shows. While ERPs and CRMs might sound alien to them, adoption of such platforms would enhance their capabilities and help them to stay competitive in a globally intertwined market. The agility offered and the scope for upscaling would further increase if the transition is seriously considered by the small business owner. This change in attitudes and beliefs towards digital technologies as Ertmer [8] proposed is the first step towards bridging the gaps. The Intuit study recommends making affordable technologies accessible through government-led interventions in the forms of subsidies, leveraging case studies promoting higher Returns of Investment (RoI) through campaigns and designing training programs which can address key skill gaps across supply chains. This would influence the perception of using digital technologies assisting better value capture by the small business owner.

Digital modes can also be convenient for training and providing valuable knowledge to entrepreneurs, who often value "just when needed" information. Ideas42, a not for profit organization that uses insights from behavioral science to improve lives, developed a scalable mobile based training program to simplify management lessons into "rules of thumbs" knowledge for micro enterprises. They tested their program in India (in collaboration with LEAD) and the Philippines and obtained interesting results. Their training programme was delivered through an interactive voice response message (IVR) via mobile phone and improved key financial management practices between 2 and 8% among participants trained, compared to a control group. There was a high level of engagement, on average for both countries, 76% of clients picked up the call and listened to 70% of the training message. This digital mode

of training was also cost-effective, particularly for India where the cost was about 67% less than in-person training. Further, such training would help develop the digital capacities of the entrepreneurs and has been found to be important in building their resilience against crises situations which impact small enterprises (MicroSave Consulting, 2021).

3 Institutional set-up

Some institutions are also paving the way for digital infrastructure, among these are National Payments Corporation of India (NPCI) with their interoperable Unified Payments Interface (UPI) system for digital payments in India, Account Agggregator (AA) model institutionalized by RBI and a new e-commerce innovation with Open Network for Digital Commerce (ONDC).

NPCI has definitively been a game changer with it's mobile-based digital payments Unified Payments Interface (UPI). The year on year growth has hovered around 75%, with around 2,100 crore transactions in the past year.[2] Specifically, P2M (person to merchant) transactions on UPI for October 2021 stand at close to 40% of all the UPI transactions by volume. Recognizing that microenterprise proprietors need specific support for digital on-boarding, NPCI has also created a separate category of P2P-M under which they are not charged the Merchant Discount Rate (MDR). Such microenterprises can thus be more easily onboarded by UPI players on to the platform with a distinct merchant category code. As per the NPCI circular from June 2019, such easy on-boarding is available for microenterprises which have low inbound ticket value transactions up to INR 50,000 per month. A strong payment system is central to MSME growth. Such a digital payment facility can optimize payment processes, as well as enable growth through easier access to online markets through payment convenience, as well as to enhance customer experience to partner with issues who can provide discount schemes giving instant customer satisfaction.

Typically, data for individuals is often fragmented and siloed across various entities, hence often challenging to access and assess credit worthiness of individuals and/or their enterprises. For example, a customer cannot seamlessly share the data residing in his/her different bank accounts and other financial institutions (insurance companies, mutual funds, etc.) with the new lending institution from which he/she is seeking a loan. Hitherto, such a lack of framework led to inefficiency and inappropriate credit assessment, leading to a vast majority of individuals and enterprises being credit-starved. To overcome this, RBI has institutionalized an Account Aggregator (AA) model that provides a robust system to democratize credit access to microenterprises [9]. The model is already operational with seven NBCF-AAs authorized by RBI. This model has high potential by providing avenues for cash-flow based working capital lending using the digital payments trails of thin file microenterprise proprietors. There is also a need for a targeted customer awareness and education with regards to the benefits of AA and related data usage and confidentiality. Lastly, fees structure should be based on market forces, as regulatory policies based on other aspects could discourage uptake.

When looking at digital commerce, the latest innovation ONDC (open network for digital commerce) is aimed to disrupt market access. This is being argued as the UPI moment for e-commerce as the relationship between buyer and seller is taken away from a specific platform (think Amazon, Flipkart) and made platform agnostic. Something like this happened in UPI where one can transact on UPI without being bound by platforms like Paytm and PhonePe to name a few. Another intermediary step in this regard is the GeM (Government e-marketplace) which provides MSMEs transparent access to government procurement. Such a step allows the government to experiment and learn about how the MSMEs engage with complex procurement designs and thereby make the ONDC more robust in terms of designing its cataloging, payments gateway, logistics and grievance redressal.

4 Challenges for digital transformation

The advancement of a new digital ecosystem introduces new challenges that will need to be addressed. These challenges will be further compounded by the existing difficulties with the current ecosystem and efforts to set up a digital infrastructure, which will need to be addressed in order to improve the effectiveness of this system. Some challenges will be compounded due to the implementation of a new system and will require a concerted effort that starts from the very initial stages of implementing this transformation. They range from a lack of knowledge required to operate in this sphere to data privacy concerns, all of which can have a lasting negative impact if not addressed in a comprehensive and timely manner.

Digital knowledge gap and digital execution: One of the issues with introducing a new system would involve the introduction of new processes and formalities. The knowledge required to operate in this system will be entirely different and more technical in nature, which may prove to be a difficult transition. As discussed by Klapper [10], introducing basic digital literacy programs and

[2] https://www.thehindubusinessline.com/opinion/why-digital-payment-is-a-public-good/article34093572.ece

finding a way to educate entrepreneurs in the basics of these digital processes will need to be undertaken in order to ensure that this system can be adopted by everyone. The disparate levels of digital knowledge and access to digital resources will be a major hurdle to tackle.

Barrier to set up costs: The most basic issue that comes with adopting technology into any business is the cost of setting up these resources. While technology can have multifold benefits for MSMEs, from improving access to finance, expanding market reach, enhancing efficiency to reducing costs, most MSMEs are far away from reaping these benefits of digitalisation. The additional costs for renting necessary machines (like a Point-of-Sale Machine) or signing up with a payments gateway provider may be too expensive for some of the smaller enterprises. These enterprises may need to hire an extra employee just to manage this scenario of cashless transactions and monitoring the digital interface, which could be an additional cost that they may not be prepared or geared to bear.

Complexity in integration: While it is clear that this digital infrastructure plan highlights the value and benefits of technology adoption, such as understanding consumers behaviour and market information, it will not be as easy to implement in practice. Pantano and Viassone [11] discuss how the complexity of procedures and lack of trust in grievance redressal systems in cases of transaction failures, hassles in withdrawing cash from bank/ATMs to cater to suppliers and workers, and frequent news about bank failures, suggests that adoption of the strategies mentioned above will inevitably take more time. There is also the question of whether the integration of this relatively more complex system will be worth it for the entrepreneurs since the current pervasive belief is that any time spent in visiting the bank and addressing the complexity and inefficiencies of the banking process is a potential loss of sales and business. This dissuades them from adopting digital technologies, including payments, which is one of the initial steps to adopt this strategy.

Cyber security and data privacy, digital fraud: Data privacy and digital security are emerging areas of concern that will have to be dealt with from scratch, especially when introducing a more digitally forward ecosystem. Information and Cyber Insecurity are the top two categories of threat types for business operations, as concluded by the India Risk Survey of 2018. The specific types of threats that most businesses were concerned with were data theft, phishing, and hacktivism. At present, there are two main protection mechanisms that exist for consumers which are the Account Aggregator system (a voluntary system that allows for easier and quicker access to finance) and the Personal Data Protection Bill, 2019, which deals with the processing of personal data. However, there are very few centrally produced schemes that introduce or detail any key types of data privacy requirements that must be maintained. This will prove to be a key challenge that the digital ecosystem proposed should be prepared to deal with, since it introduces new types of risks that could have serious consequences on the operations of these businesses. On a baseline level, the system will also have to be prepared to deal with data breaches and fraud—a rising cause for concern that was addressed as recently as September 2021, when the US consulate arranged for cybersecurity training for MSMEs. Building a basic cyber security and digital protection framework that is easy to understand will make businesses more open and willing to adopt and move forward with this ecosystem.

Asymmetric power, platform dominance: Articles from Seethamraju and Diatha (2019), and Venkatesh and Kumari [12], along with a recent report from the Vidhi Center for Legal Policy studied and analysed the current level of digital infrastructure for Indian e-Commerce. It was found that there is an underserved dependence, with a majority of sellers requiring to make fundamental changes to their business practices to accommodate the rules of or optimise operations on the existing platforms. As a result of these accommodations, sellers do not feel "locked in" to a particular platform. However, these reports have also pointed out that sellers felt that they were locked in to e-commerce in general. As a result, it would be easy to suggest and implement a revamp of the system, as long as the sellers are open to stay in the field of e-commerce. By providing better provisions and incentives for these entrepreneurs, it would also provide them with more "power" as opposed to simply making amends in order to accommodate the requirements of other platforms.

Persistent digital divide and infrastructure related issues: While adoption of digital technologies is rapidly increasing on the retail side, Klapper [10] and Kwabena et al. [13] both found that there persists a low level of adoption of digital technologies for managing supply-side processes. This, when considered along with the persisting heavy dependence on cash and credit-based low value transactions, creates major difficulties for smaller retailers to attempt to move towards a digital platform. As a result of this and the persisting inefficient processes, poor physical infrastructure, inadequate access to and poor reliability of digital technologies causes limitations to the adoption of digitalization by small retail stores. Inherent contradictions regarding the benefits of transparency, a lack of a sense of control, tax implications and mistrust in the external regulations in digital context denote the small retailers' existing incapacity to comprehend the changes and resources required to meet the challenges. Language barriers can also be a contributing factor to the digital divide, as most content is programmed in English. A 2017 study by KPMG India and Google highlights that most Indians have

Table 2 Smartphone and Internet penetration India

Rural Households Using Electricity (%), (NSSO)	Percentage of rural households with computer (NSSO)	Percentage of rural households with internet(NSSO)	Mobile Ownership among women in % (NFHS)	Rural Internet Usage (TRAI)	Rural Tele Density (TRAI)	Broadband penetration in rural (MeIT)
66%	4.4%	14.9%	47.8%	33%	59.5%	29.2%

Table 3 Lending process—traditional institutions versus fintechs

Process	Traditional (Banks, NBFCs etc.)	Fintechs
Assessment process	Manual, inefficient and therefore not scalable	Fintech leverages the power of technology to provide the best analysis for small enterprise assessment For e.g., Lendingkart processes business loans in 72 h with no requirements for collaterals or assets
Bureaucracy	Borrowers need to interface with at least 2–3 agencies and touchpoints	Minimised by the automated process largely used by fintechs to connect the physical process online
Timely process	Physical processes are time consuming (30–60 days at minimum)	Drastically reduced through the automated process Fintechs like Razorpay have a settlement cycle of 2 days for domestic and 7 days for international transactions on bank approvals
Documentation	Onerous documentation that is not available or limited in its ability to capture trustworthiness accurately	Documentation support is customised by fintechs looking at the profile of the applicant (e.g. Capital Float). They seek less than 5 documents for assessment which the applicant need to just upload online
Decision bias	Manual discretion and human bias, which excludes certain marginalized groups, especially women, given societal norms and divides	Fintechs in India have been backing algorithms for their customer evaluation. Some of the interesting fintechs like Coine.ai, which provide small ticket loans of Rs. 10,000 to Rs. 30,000 for economically weaker sections, have adopted AI and ML-based paperless risk assessments using prediction algorithms and automated disbursements. These have a better performance ratio in reducing bias

more trust in their local language. The big players in the digital space—Google, Amazon and others.—have identified this gap and made their services available in vernacular language.

5 Policies—Role of Government

Government can play a critical role in enabling the digital ecosystem, among some of the areas:

a. Promoting formalization:

- Udyam registration: There is a dire need to help MSMEs navigate the bureaucratic maze of regulations and licenses through digital solutions. Creation of an easy to use system like the Udyam Registration Portal has been a pioneering step in this direction. The system helps create a unique identity for the enterprises that can be used for uptake of various incentives offered by the M/o MSME. Udyam registration however is only the first step. The registration does not provide an avenue to leverage it for adhering to various classes of regulations and licensing, across multiple government departments straddling central, state and municipal administration. The result is that MSMEs in India are perennially sub-optimally formalized, with fractured and siloed registration processes. This is unlike in the case of Aadhar number for individuals, which with its linking with the PAN card, provides a systemic KYC solution that cuts across various specific legislations and administrative departments.
- GST portal: GST as an indirect tax system has been hailed in as many quarters as it has been hated in others. While it has helped large businesses derive value from the tax harmonization across various states in India, it has imposed a tax burden on those

MSMEs which were earlier not under the tax radar. After an initial few years of adjustments from MSMEs and course corrections from the government, it seems the GST system has fallen well in place for all ecosystem actors. The portal is now to to get integrated with the TReDS which will amplify the process of formalization through digitization. It is expected that more such business tools be innovated and introduced into the GST portal such that it emerges as an all encompassing solution for the MSMEs. Synergies where possible need to be explored between the GST portal and the Udyam registration portal.

- MSME Sampark: The portal has the potential to be an undisputed marketplace for matching the MSME employers and the skilled graduates. The Government of India has the prior experience of creating such a nation-wide marketplace platform albeit in a different industry, IRCTC with the railways. There is a dire need to have such a dedicated solution for MSMEs in a digital age where the Udyam registered MSMEs and the PMKVY trained can undertake a matchmaking exercise. Over a period of time, both the economic actors can build for themselves a credible digital portfolio to showcase and attract with their credentials. With sufficient planning and foresight, such a solution can help India improve the quality of employment as well in the medium term, addressing the looming demographic challenge.

b. Easing government procurement norms:

- Government e-marketplace (GeM): Government of India, with its vast administrative reach, is one of the biggest buyers of industry goods and services in the country. It is vital therefore that such procurement benefits the MSMEs to the maximum extent possible. As per the official GeM portal (Nov 2021), one-fourth of the sellers on the portal are MSMEs accounting for more than 55% of the total order value. This is a commendable feat, reached in a span of close to five years since the launch of the portal. Nonetheless, there is a need to increase the absolute number of MSMEs that participate in the portal. At a little over 7 lakh MSMEs participating, it is a mere 1% of the total 6 crore+ MSMEs in India. There is thus a evident need to ensure that a large majority of MSMEs are informed and onboarded to the platform. The official GeM data, as analyzed by Financial Express (2019), suggests that the state governments have outperformed central government procurement in terms of order value. This is a heartening sign that needs to be accelerated as the state governments are closer to the enterprises and the support from the state governments (including its departments, PSUs and district administration) can increase the overall numbers of MSMEs selling on the portal. More traction also needs to be ensured for specific GEM-related initiatives created for MSMEs owned by diverse social groups such as women, SCs, STs and physically disabled entrepreneurs.
- MSME Samadhan: In line with the government procurement, there needs to be a heightened focus on the timely payments to be made to the MSMEs digitally. This is important as stable cash flows are one of the crucial determinants of the growth trajectory for MSMEs. In fact, the MSME Act contains detailed provisions on the matters related to the delayed payments to the MSMEs, pursuant to which MSME Samadhan and its institutional body, Micro and Small Enterprise Facilitation Council (MSEFC) is created. Again, as per the Financial Express (2021), close to 90,000 applications have been filed on the portal ever since its launch in 2017, with 30% of them arising within last year alone. This needs to be contrasted with the fact that 7 lakh MSMEs participate in GeM portal, indicating that one in eight MSMEs selling to the government has filed the delayed payments application. Close to 40% of the total applications received so far are yet to be reviewed, indicating the tardy progress of the settlements of delayed payment cases. There is a need perhaps to work both on the supply- and the demand-side: increase the awareness among MSMEs selling to the government to file delayed payments cases on the Samadhan portal and increase the capacity of the MSEFC for faster settlement of the cases. It must be stated however that the delayed payments by the government is of course only a part of the problem, as MSMEs payments are delayed by the large corporate buyers. A recent report by Global Alliance for Mass Entrepreneurship (GAME), 'Unlocking Credit for India's Job Creators' (2021), estimates that close to INR 15 lakh crore worth of payment is pending for registered MSMEs in India.

c. Adopting new processes and technologies:

There is a need for the government to articulate its vision and strategy across the emerging digital technologies that are poised to transform the way businesses are conducted. Two nascent technologies below have shown positive results in various countries and is pertinent that India puts a sharp focus on these:

- DLT: Distributed ledger technologies (DLT), commonly known as blockchain, can prove to be a boon for MSMEs to expand their businesses. It can allow them to capture their rightful share in the end prices of the products, as the technology helps clearly identify the value addition that can be attributed to the various players in the chain. This is especially useful in areas like trade, where MSMEs can hope to benefit in terms of verifications for supply chain financing, traceability and contract management. There is a role for the Government of India and the state governments to articulate a vision and a strategy to promote adoption of blockchain in various infrastructure, exports and domestic value chains. As a beginning, Ministry of Electronics and Information Technology (MeitY)'s 'National Strategy on Blockchain' [14] recognized crucial areas of national interest such as land records, supply chains, identity management, notary services as vital from the point of potential blockchain applications which have direct impact on financial and opportunity costs incurred by MSMEs in India to ply their businesses. Setting up a clear agenda and an action plan would help nudge the industry towards adoption of DLT, to the benefit of MSMEs.
- 3D printing: Much of the manufacturing MSMEs in India are geared into the traditional factory systems, steeped into the nineteenth and twentieth century industry production technologies. The twenty-first century digital age promises a revolution in additive manufacturing, commonly known as 3D printing. There needs to be active promotion of the technology such that more high quality, zero defect products can be churned out by the MSMEs, leading to lower operating costs and more stable work orders for growth planning. MeitY has come out with a 'National Strategy for Additive Manufacturing' [15] for the additive manufacturing technology and this can provide the base for M/o MSME to update and refine its existing relevant schemes for the active adoption of the recommending that existing schemes that provide technological upgradation support to MSMEs should also incentivize the additive manufacturing technology adoption as part of supply chains. Further, such focus can specifically be put on the MSMEs based in regional industrial clusters.

6 The way forward

Building a digital ecosystem for MSMEs can transform India's MSME segment. Among key insights to achieve this, efforts in enabling digital transformation of small businesses need to entail a broader understanding of the segment. Digital solutions need to accommodate the heterogeneous nature of the group which are largely composed of micro enterprises. This would mean digital solutions for MSMEs should leave space for flexibility and innovation. Government led efforts in the form of digital awareness schemes need to accommodate this aspect. As convenience and cost effectiveness receives more credence among the group, digital adoption would work where the business finds value in getting digitally integrated. This is further influenced by push and pull factors of the market (read customers) who are equally digitally aware and/or ready to accept digital transactions. The following factors have been identified here which could determine the future of digital transformation among MSMEs at different levels of their digital interactions. (1) Change in attitudes and beliefs among small entrepreneurs supported by digital training to move towards integrating digital processes which begins from the value proposition digitisation holds for them. On the other hand the convenience factor as that is offered by social commerce platforms such as whatsapp and facebook would need to be replicated across processes (2) A move towards a cashless transaction or reduced reliance on cash enabling higher adoption of digital payment solutions (3) Seamless compliance process (registration, GST, asset ownership etc.) and procurement norms for onboarding of small businesses into e-commerce, digital financial services (4) easing regulatory norms for enabling cross-functional services (5) successful integration with government initiated platforms under India Stack 2.0. More market players are required in this space given the current prominence of UPI platform 6) Addressing concerns of security and privacy of small business owners especially women which are often overlooked (7) expanding online vendor payment systems to subsume small businesses (8) increasing digital credit through active role of fintechs catering to the small scale requirements of micro businesses and (9) the advent of new technologies providing more customised digital solutions catering to the segment which can find value in the scale offered. These factors would lay down the ecosystem which through a combination of policy interventions by the government and innovative practices by private players can facilitate digital transformation among MSMEs. They can also address the digital divide and information asymmetry, ensuring change in attitudes and beliefs, and expanding market linkages assisted by digital technologies.

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