A Comprehensive Review of Multi-Vendor E-Commerce Platforms for SMEs and Their Impact on Business Growth

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*Abstract: M*ulti-vendor e-commerce platforms are essential in the coming-of-age of the small and medium-sized enterprises (SMEs) and provide a common web marketplace for sharing digital space and selling products to a group of vendors simultaneously. These platforms have minimized entry barriers, raised visibility and helped SMEs to access broader markets in the global markets without necessarily investing heavily in physical infrastructure. They facilitate different e-commerce models such as B2B, B2C, C2C, and customer-to-business, enabling flexible relationships in trading and diversification of income. Vendor onboarding, integration of a secure payment gateway, order management and scalable front-end and back-end development are also key features. With the help of technological enablers, including artificial intelligence, machine learning, recommendation engines, digital payment systems, logistics automation, cloud computing, and SaaS solutions, SMEs will be able to optimize supply chains, increase efficiency in operations, and improve customer experience. The new trends, such as voice commerce, mobile commerce, AI-driven analytics, and social commerce, also increase the possibilities of SMEs to innovate, enhance customer interaction, and compete with bigger companies. Altogether, multi-vendor platforms (MVPs) help to sustain the growth and digital transformation of SMEs in the changing digital economy.

1. Introduction

Information and communications technologies (ICT) and use of digital technologies in e-business, e-marketing and e-commerce have greatly revolutionized business processes in the world. To SMEs, the onset of digital technology has come with both an endless number of opportunities and potential challenges [1]. The SMEs have the ability to enjoy digital tools previously enjoyed by large corporations, so that they can compete in the global markets and increase their client base. The companies that cannot embrace these technologies are likely to lose their competitiveness in markets that are becoming more digital and internet-based [2]. SMEs (Small and Medium Enterprises) are a giant and heterogeneous part of business, which is described by their efficient functioning and versatility. Business organizations of this size are envied due to their innovative nature, flexibility, and ability to accommodate the changing needs of consumers and the market. They also strongly contribute to building entrepreneurial abilities, creating jobs and to the development of local economies.

Electronic commerce is referred to as e-commerce. It refers to the carrying out of business via the internet and other means of electronic media [3]. Electronic commerce is defined as the use of the internet and other assets of information technology, like Electronic Data Interchange (EDI), in doing business. Electronic commerce (e-commerce or electronic commerce) is the act of purchasing and selling goods and services using an online medium. The payment methods that the site accepts include the electronic funds transfers, debit cards, and credit card payments using the digital shopping cart system [4]. In the context of the processes and activities pertaining to the sale of goods and services, certain sectors have undergone dramatic changes due to the e-commerce. E-commerce platforms have emerged as one of the digital economies of both the rich and developing countries.[5] The manufacturer may find it more profitable to use a dual-channel approach that brings them closer to consumers in order to win the market if channel substitution happens.

The adoption of multi-vendor marketplaces helps SMEs to diversify their product offerings, access the global market, and use a common infrastructure in logistics and payment processing. The emergence of multivendor e-commerce websites is one example of the changing consumer behaviour and innovativeness. These sites act as an online storefront, which provides a wide collection of merchandise that is supplied by a myriad of sellers, all competing to capture the consciousness and devotion of the sophisticated buyers [6]. Multi-vendor e-commerce services, especially, have become prominent with different independent vendors being permitted to carry their operations within the same online marketplace, giving their customers a large variety of goods and services. In contrast to the conventional single-vendor online stores, MVPs establish a cooperative ecosystem where vendors can share infrastructure, marketing, and customer traffic, and consumers get convenience, variety, and competitive pricing. The paper is speculative and literature-based in its structure, which does not deal with numerical experimental comparisons or mathematical modelling but rather with synthesising the existing research and industrial practices.

1.1 Organisation of the Paper

Here is how the study is structured: Section I presents the term multi-vendor e-commerce platforms and their applicability to SMEs. Section II gives insight into the multi-vendor e-commerce platforms, their structure, features and modes of operation. Section III examines the problem of multi-vendor platform vis-a-vis SMEs. Section IV examines the impact of technological enablers on business growth. Section V presents a review of the existing literature on multi-vendor platforms and SMEs. Finally, Section VI presents the paper's main conclusions and suggests avenues for further study.

2. Understanding Multi-Vendor E-Commerce Platforms.

By allowing multiple vendors to list and sell their wares on the same platform, a multi-vendor e-commerce website streamlines the sales process and increases the potential for profit. It has been observed that people primarily search for websites that offer a variety of products under one roof. An e-commerce platform that supports many vendors is therefore in high demand [7], which enables customers to access multiple vendors simultaneously. An advantage for a multi-vendor store in the e-commerce sector is the ability to compare prices for products from multiple vendors. Figure 1 shows the Multi-Vendor E-commerce system below:

Fig. 1. Multi-Vendor E-Commerce System

The multi-vendor e-commerce system has to be reliable and data consistent with concurrent loads on its backend. Best practices encompass testing the back-end, strong error-checking and roll-back facilities in case of failed transactions in order to avoid corruption of the data. Checks of consistency are used to ensure that correct calculations are made on pricing, inventory and commissions even when the transactions are at peak levels.

Multi-vendor e-commerce This type of system needs to be designed to deal with errors, keep data consistent, and be numerically stable, when subject to the load of multiple users at the same time. The practices used in the industry have stressed full use of backend testing, which involves unit testing, integration testing and stress testing to identify easy breakages[6]. Exception management, retry logic and graceful degradation processes are error-handling mechanisms that are used to avoid system-wide failures. Database transaction management is applied to counter the rollback of transactions to ensure that no half-finished or unsuccessful processes (like interrupted payments or updated inventory) corrupt data in the system. Consistency checks in high-frequency transactions confirm numerical stability and accuracy of the data so that even when the operations load the maximum, calculations of pricing, commissions, taxes, and inventories are consistent.

2.1 Characteristics of Multi-Vendor Platforms.

Here are some key characteristics of a multi-vendor platform are as follows:

- **Market Research and Analysis:** Conducts market research to determine customer preferences, demands, and market trends. collects needs for the e-commerce platform through data analysis.
- **Requirement Gathering:** Engages with stakeholders, such as suppliers, customers, and internal teams, to compile specific platform requirements.

- **Platform Selection:** Evaluates the e-commerce platforms that are available or thinks about creating a bespoke solution based on project specifications, scalability, and financial limitations.
- **Front End Development:** Design User Interface where Designs come up with nice user interfaces that are user-friendly to users. Creates the experience (UX) of the platform [8], making it user-friendly and easy to use.
- **Backend Development:** Builds the back-end infrastructure of the platform, such as server configuration, database manager and implementation of application logic.
- **Vendor Onboarding:** Adopts a consolidated vendor registration procedure on the platform. Enables vendors to be onboarded to the platform, where they are offered the tools and resources needed to operate their storefronts.
- **Payment Gateway Integration:** Integrate Payment Gateways. This incorporates secure payment gateways into the site to enable smooth transactions between the seller and buyer.
- **Order Management System:** Develop order processing and an effective order management system to handle inventories, process orders, and monitor shipments.
- **Testing and Quality Assurance:** Conducts functional testing to make sure all platform features perform as intended. To determine whether the platform is user-friendly and to find any usability issues, conduct usability testing.
- **Launch and Deployment:** The multivendor e-commerce platform is deployed on a dependable hosting environment, and the launch plan and activities are coordinated.

Database locking, queuing and asynchronous processing are used to handle concurrent transactions so as to prevent race conditions. Load testing is conducted to ascertain that the order processing and payment gateways will be maintained and responsive when there are large volumes of transactions.

Multi-vendor platforms should be able to serve concurrent transactions that start with several vendors and customers at a time. Handling concurrency is normally done by locking transactions, queue management, as well as processing asynchronously. Locking of databases will eliminate race conditions in operations that are of critical nature like updating inventory and confirming payments[9]. A common way of dealing with a large volume of transactions is by storing the requests in message queues and handling them one at a time or in parallel, depending on the capacity available to the system. The load testing is done to test the system performance under concurrent access, and this is to ensure that the order management system and payment gateways have consistency, response and reliability in handling peak transaction periods.

The uptime, latency, and failure-rate metrics are used to measure platform performance by stress-testing it at peak traffic levels. These metrics facilitate the detection of bottlenecks and assure of satisfactory system availability and transaction processing when the system becomes overloaded.

Multi-vendor e-commerce systems are tested on the basis of uptime, latency and failure rate, especially when at peak

traffic levels. The simulations of stress-testing are performed to evaluate the system availability (percentage of uptime), mean response time (latency), and transaction failure rates with regard to increasing loads. These simulators assist with the detection of bottlenecks and capacity limits of backend services. High uptime and low latency is important in ensuring the user trust is maintained, and the lowest possible failure rates will be needed to guarantee the processing of orders and payment goes through whenever a high-demand event happens (such as promotional sales or the seasonal highs).

2.2 Difference Between Single-Vendor Websites and Multi-Vendor Marketplaces.

The size of a client's holdings and the area in which they operate determine the client's unique budget constraints, network requirements, and the level of risk they are willing to take [10]. Therefore, the client and consultant should work together to determine the client's demands in light of the criteria in Table I below, which pertains to the choice between a single-vendor and a multi-vendor design:

TABLE I. COMPARISON BETWEEN SINGLE-VENDOR WEBSITES AND MULTI-VENDOR MARKETPLACES

Aspect	Single-Vendor	Multi-Vendor
Cost	Higher upfront cost	Reduced overall cost of ownership
Coordination	Less coordination required	High coordination is required.
Performance	May not offer the best solutions for every component	Each component's best-of-breed solution
Risk	High likelihood of end-of-life problems and vendor lock-in	Extremely minimal risk and expense of end-of-life problems and vendor lock-in
Innovation	Dependent on one vendor's innovation, limited influence, and isolated from competition	Independent of one vendor, more choices foster innovation and leverage
Compatibility	Lower risk of compatibility issues	Higher risk of compatibility issues; manageable if best practices are applied
Staff	The IT team only needs expertise with one vendor	The IT team requires diverse expertise to manage different vendors

2.3 Types of Platform Models:

The term "electronic commerce" refers to the acquisition, disposition, and promotion of goods and services over digital networks, including the Internet, television, radio, and computer systems [11]. The term "E-commerce" refers to business dealings that take place on the Internet, where the website is used as a container to carry out the process. Based karakteristinya Types of E-commerce can be divided into several, namely:

1) Business-to-Business (B2B)

Focused on providing products from one business to another business. Business associates who have previously established a relationship that has lasted long enough between them. Data is exchanged on a regular basis using the predetermined format; exchange and transmission of data do not have to wait. Using a peer-to-peer model, in which allows both businesses to share the processing intelligence.

2) Business-to-Consumer (B2C)

Open to the public, publicly accessible information, and free services that are used by many people, with a web-based interface. Service on request. The manufacturer, if the consumer requests, must be ready to respond. The client-server approach is often used.

3) Consumer to Consumer (C2C)

Direct sales between customers or references to individuals who sell goods and services to each other are both possible in a consumer-to-consumer model. Use an online platform like eBay.com to market their wares and services and make money from their expertise.

4) Customer to Business (B2C)

In the customer-to-business approach, customers (as individuals) are the ones who generate value, and the business is the one that reaps the benefits. One way in which the Internet may be utilised is as a bargaining tool, with customers offering valuable suggestions for new product development. Here, the person is making a difference for businesses that take their advice. Customers can sell things directly to the corporation on sites like Priceline.com.

3. Multi-Vendor Platforms and SMEs.

Multi-vendor platforms enable SMEs to sell products alongside other vendors on a shared digital marketplace. Each vendor has the ability to manage its own storefront, control inventory, refresh product listings, and manage orders independently, typically with the owner of the digital platform earning revenue through commissions or subscriptions. Multi-vendor platforms offer SMEs several benefits. They reduce the cost and complexity of establishing a merchant's own e-commerce store, provide a larger audience, and enhance visibility through shared foot traffic and built-in marketing tools. Multi-Vendor Marketplaces also afford SMEs the capability to leverage analytics to improve understanding of customer preference, inform product selection and enhance operations [12]. Platforms like WordPress integrated with WooCommerce have gained popularity among SMEs lately because they provide a low-cost way to build scalable online stores while developing more control over product pricing and sales.

3.1 Role of Multi-Vendor Platforms in SME Growth

The worldwide expansion of business activity is essential, and commerce has greatly increased the amount of economic activity generated through the Internet. Specifically, multi-vendor platforms have enabled SMEs to access larger global markets and customers. SMEs are crucial to regional economies and continue to play a important role in economy, thanks to technological advancements and regulatory reforms, which have led to increased Internet usage. Multi-vendor e-commerce platforms provide SMEs with a more organised ecosystem for showcasing their products with other vendors who can share foot traffic and marketing.

Fig. 2. E-Commerce Helps SMEs to Grow

Multi-vendor platforms reduce entry-point barriers to global markets and give SMEs more opportunities to compete with larger firms (as shown in Figure 2). Despite the challenges posed by geopolitical uncertainty and global events like COVID-19 pandemic, SMEs using multi-vendor platforms have achieved improvements in business operations, an increased number and reach of markets, and enhanced customer engagement. Utilising additional tools, such as platform-based marketing, analytics, and customer support, will enable SMEs to capture customer preferences, send customised messages, and optimise their operations without the expense of a traditional advertising campaign.

3.2 Enhancing the Digital Transformation of SMEs

E-commerce is generating revenues and profit margins for the SME business sector, and it is not only the geography and potential for new customers that are saving businesses, for example, on what could be viewed as astronomical levels of marketing and communications expenses, but it is also improving customer experience. Seller and buyer communities are leveraging the new awareness of customer-centric plans to address regional and economic change in society [13]. Digital Marketing through Social Media is reducing costs for many SMEs, helping to create brand awareness and expand their customer base, as well as generate new sales opportunities. Especially, since the COVID pandemic, the digital space is even more rapidly expanding, and many SMEs are trying to use all online options to sell services and products to keep existing customers and grow new clientele. Customer satisfaction and loyalty have expanded, and GDP is increased or sustained operational engagement in our communities and countries. In light of the evolution of the SME channel in the digital world, delivery models are generating amazing opportunities for marketing and product/service development across broad industry sectors.

3.3 Benefits of Multi-Vendor E-Commerce in SMEs

Here are key advantages/benefits of multi-Vendor E-Commerce in SME are as follows:

- **Increase Market Exposure (Market Share):** A key benefit since multi-vendor platforms allow SMEs to be seen internationally. More visibility leads to more sales and stronger brand awareness.
- **Reduce Operational Costs:** Strong benefit because e-commerce lowers costs compared to traditional retail methods. Lower costs allow the SME to reinvest in the growth of the business and innovation.

- **Expand Market Reach (Global Access):** This is effective in market exposure, but it focuses on access and inclusivity. It opens up the desired customers that were initially inaccessible or markets that were initially inaccessible to SMEs.
- **Develop Customer Loyalty:** This applies as it helps in better access to information and the ease of use 24 hours a day increases relationships. Greater customer retention is achieved through greater ease of use and access leading to repeat purchases.
- **Improve Supply and Inventory Management:** Fits is an advantage since online platforms generate efficiency and automate operations. Management and efficiency minimize stockouts and overstock and enhance operational effectiveness.

3.4 Future Trends and Emerging Opportunities for SMEs

As the evolution of digital economy, the future of e-commerce to SMEs is changing with trends and opportunities. Multi-vendor marketplaces are increasingly becoming an important characteristic of e-commerce since SMEs will be able to post their products in other vendors, gain economies of scale of customer traffic, and enjoy marketing and analysis tools that are being offered outright by online marketplaces. Nevertheless, mobile commerce does invite business enterprises to invest and develop websites and content that is oriented towards mobile-first platforms and content that is small screen and limited attention spans content. On the same note, voice commerce and conversational interfaces are also on the rise, and this necessitates the SMEs to develop optimised voice assistant and smart devices search strategies [14]. The AI and ML are constantly expanding, enabling SMEs to automate their customer-servicing activities and inventory control, overcoming market inefficiencies, and reducing a competitive gap with larger firms.

Social commerce, in which social networks have added e-commerce functionality to their service is also providing new avenues on which SME can access consumers through developing compelling content instead of just using big box stores. These are compounded by multi-vendor market places which offer SMEs an opportunity to develop reach and visibility of their brands at a scalable and affordable cost. Other reasons that support the future of e-commerce among SMEs are the consumer need to be sustainable and solutions that embody ethical consumption, whereby SMEs that embrace the same opportunities can open doors to consideration.

4. Impact on Business Growth with Technological Enablers.

Multi-vendor platforms enable SMEs to increase sales, expand markets and use digital tools to achieve sustainable growth in the following ways:

4.1 Impact of Social Media on Business Growth and Performance

Social media is experiencing a meteoric surge of popularity, and businesses and marketing agencies are feeling its impact. The social media sites that are popular offer an avenue through which companies reach their customers and make their identity. Companies are able to create brand profiles and employ tactics such as fan pages, competitions

and sweepstakes in these social networks [15]. People do not have to climb the mountain of glamorous magazine advertisements; they can observe what their friends and relatives like on social networks and make decisions to make purchases relying on this information.

1) Social Media as an Essential Marketing Tool

Common tricks and insignificant involvement have diminished the efficiency of conventional advertising methods such as radio, print and direct mail. Social media on the other hand has been found to be a nimble and must-have kind of marketing. Social media has enabled businesses to build brand awareness, engage more and connect with more customers thoughtfully and in ways that are cost-effective since it has helped to foster engagement with the audiences; it has also enabled the brands to share their values and create unique forms of engagement with their audiences. Non-traditional and editorializing ads offer the companies an opportunity to be innovative, directly react to customer values, and embrace the changes swiftly according to personal or industry trends. The presence of platforms cut in the online world is ultimately bringing in new customers as well as cementing existing relations and a considered and mindful approach has been proven to be a competitive edge in the intertwined market.

2) Revenue Generation

Sales Growth and Revenue Generation Multi-vendor e-commerce platforms provide SME access to a large customer base without requiring major investments in physical stores or independent websites. SMEs selling products alongside other vendors can also identify new customer segments, grow sales volume. Increased visibility through promotions, deals, and platform-driven marketing campaigns also increases sales, generating volume and revenue. Studies suggest that the fastest revenue growth for SMEs was seen on platforms versus offline sales.

4.2 Integration of Emerging Technologies.

Multi-vendor platforms use AI, blockchain[16], and cloud tools to boost personalisation, secure payments, and streamline logistics, helping SMEs grow efficiently, including giving following points:

3) Role of AI, ML, and recommendation engines in SME growth.

The e-business environment for SMEs is rapidly changing due to the development of AI and ML technology [17]. Because they automate laborious and complex activities and use data to inform their ideas, they help SMEs compete more effectively with larger e-commerce companies[18]. Because chatbots and virtual companions are controlled by natural language processing algorithms, SMEs are able to provide distinctive shopping services and round-the-clock customer care on a big scale. Customers are happier as a result, and employees are held responsible for taking on more responsibility[19].

Besides, since bigger e-commerce platforms have more sophisticated systems, SMEs have been able to increase sales because AI's suggested suggestion engines are based on customer behavior and interests. Particularly in the area of supply chain and inventory management, SMEs have reported that machine learning algorithms are highly beneficial. In order to minimize waste, predictive models in small enterprises should make sure that inventory movement is precise and regularly monitored. They should also use projections to more precisely anticipate demand as they develop [20]. However, SMEs using ML and AI will undoubtedly face certain obstacles.

This research takes a more conceptual approach and fails to give mathematical justification of the recommendation engine that is run by AI. The customary research examinations measure such systems with the usual measures of performance like precision, recall, and root mean square error (RMSE) to determine the quality of predictions and suggestions.

Time Series models and regression analysis are the common forecasting methods used in predictive inventory management of SMEs. Such techniques theoretically permit the estimation of demand and inventory planning without necessarily having to involve explicit mathematical definitions in the current research study.

4) Payment Systems and Digital Wallets

Payment systems are an essential part of e-commerce, which allows online retailers, service providers and traditional businesses embracing digital channels, to accept secure, efficient payments. A payment gateway is a mechanism to transmit information about payment from a merchant's platform to an acquiring bank or payment processor. Some gateways allow payment information to be transmitted straight from the customer's device to the acquiring bank or payment processor, excluding the merchant's internal systems. Merchants may find it easier to comply with numerous requirements, such as the Payment Card Industry Data Security Standard (PCI DSS), if this is the case.

Digital payments allow SMEs to process transactions in a faster and more flexible manner than traditional payment systems potentially, and to do so at lower cost. Digital payment systems also provide improved convenience for customers, facilitate cross-border payments, and reduce reliance on cash, creating a pipeline for SMEs to scale their market access to new and existing customers, and better manage financial transactions.

5) Logistics Automation and Supply Chain Optimization

E-commerce has radically changed the logistics world, with the number of online transactions booming and changing the conventional ways of supply chain implementation. Most B2B networks are shifting to B2B2C models and relying on portions of existing warehouses and distribution centers to provide products through e-commerce. The automation of logistics is becoming a key efficiency factor in e-commerce, not only in warehouse and sorting facilities, but also in the transit of products in various transport modes, such as trucking, rail, and port tasks. The automation of these processes allows businesses to shorten time to delivery, maximize use of resources and increase the resilience of the supply chain, which in turn, enhances the overall performance of the business [21]. The fact that self-driving trucks are coming, as well as ports, is a sign of a transformational opportunity in the future despite the issues with associated costs of automation implementation.

Digitalization, along with Industry 4.0, is another area that is making supply chain optimization stronger. Analytics solutions to help companies become more resilient, mitigate risks, and make informed decisions. Much of the research purposefully investigates the impact of digital technologies and automation on supply chains and their performance, risk mitigation strategies and practices, and supply chain resilience. This multidisciplinary area contributes to an

understanding of frameworks for efficiency, adaptability, and long-term competitive advantage in global supply chains by incorporating business, information systems, engineering, and quantitative analytics [22][22]. The following are examples of where the global logistics system is experiencing varying degrees of automation (Figure 3):
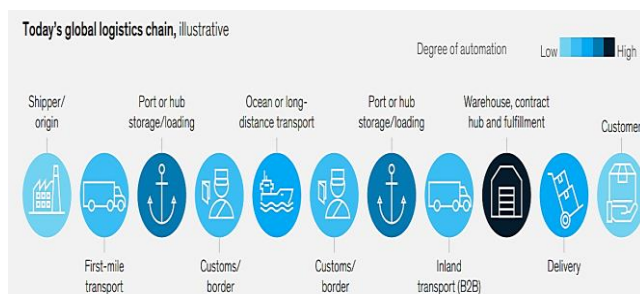

Fig. 3.   Automation is Emerging Across the Global Logistics Chain.

Fig. 3 Low-High automation scale is constructed not on the numeric measures but on the qualitative benchmarks of the previous research including the extent to which the process is automated, the level of human involvement, and the level of the technology deployment.

6) Cloud Computing and Saas Solutions for SMEs.

Software as a Service (SaaS) is software that has been distributed over the internet. Applications are licensed on a subscription, pay-as-you-go, and even a free basis, depending on alternative revenue streams such as advertising. Consistent with all cloud computing, all SaaS applications run on the provider's servers and are accessed through public networks via downloaded browsers or synchronously [23]. SaaS, and cloud services more generally, often provide the best value for SMEs. SMEs often have limited IT budgets, limited in-house capabilities, and little opportunity to invest in hardware, software, or infrastructure; unable to compete in the same way as larger firms [24][25]. SaaS and cloud services are particularly valuable to SMEs in their cost and availability of top technology and IT resources because they can rent or subscribe to services rather than maintaining ownership of hardware and software [25][27]. By utilising cloud-based decision-making tools and other applications, SMEs can achieve operational efficiencies, enhance competitiveness, and effectively compete in the digital marketplace [28].

5. Literature Review

This analysis provides direction for SMEs in choosing appropriate digital strategies and informs future research and practical implementations in technology-driven company growth by highlighting important trends, results, and comparative insights from previous studies on multi-vendor e-commerce platforms.

Fan and Pongpatcharatrontep's (2020) research here centres on supply chain management, which encompasses the three main flows of data, money, and goods. Apart from that, the Kano questionnaire is the primary tool for researchers to determine what information SMEs (knowledge users) are interested in. Even while e-commerce across borders is booming in many countries, Thailand is still in its infancy, and small and medium-sized businesses (SMEs) in the northern part of the nation lack access to resources that may teach them how to market to Chinese consumers. The main objective of this research is to list the several facets of the cross-border e-commerce business process that small and medium-sized

businesses (SMEs) must understand, since there are numerous components involved and varying degrees of importance to each [26].

Romadiana *et al.* (2020) proposed that small and medium-sized enterprises (SMEs) use e-commerce platforms to advertise and sell their products online to compete globally. However, SME offenders continue to use traditional forms of advertising and promotion. As a media marketing and marketplace outcome, e-commerce technology is not widely used, leaving SMEs to rely on traditional selling methods and unable to expand internationally. The development of a prototype e-commerce portal is necessary to give small and medium-sized businesses (SMEs) a platform for online product sales and advertising. For business process analysis, the functional analysis approach is employed. Following a functional analysis, a business development model was created through the adoption of SMEs, with a focus on business model innovation [27].

Mthembo and Osakwe (2020) looked at how prepared small and medium-sized businesses (SMEs) in Windhoek, Namibia were to use the e-Commerce Business to Consumer (B2C) model in their advertising campaigns. The adoption of e-commerce by SMEs is crucial because of the significant role they play in Namibia's economy. Quantitative data were collected to gauge their level of preparedness for electronic interactions, and SPSS was used for statistical analysis. The results showed that both large and small businesses in Namibia are prepared to use business-to-consumer e-commerce. Their concerns centre on cybersecurity and funding, and they want the government to step in and help [28].

Almtiri and Miah's (2019) review employs a positivist interpretation of the obtained data in conjunction with quantitative methods of analysis, namely a questionnaire. Descriptive statistics in SPSS will be utilised for accurate data analysis in this investigation. Small and medium-sized business (SME) managers in the United Arab Emirates have a negative impression of e-commerce, which is a major barrier to its implementation. After seeing the value in new technology, organisations are quick to adopt it. On the flip side, when it comes to e-commerce, UAE SMEs' employees have a cloudy understanding of the term, which makes them wary and hesitant to embrace new technology that could improve their strategy [29].

Mittal et al. (2018) presents characteristics of SMEs and Identify the research gaps that need to be addressed in order to support manufacturing SMEs on their path to Industry 4.0. Among the most important takeaways is the fact that many SMEs still aren't digitally or smartly matured, and that the present norm for starting at "level 1" in most maturity models doesn't reflect this. Therefore, recommend a "level 0" that is specifically designed to reflect the "real-base level" for SMEs; changing one's mindset is part of the substantial work needed to go from this new base level, "level" to the existing standard, "level 1." Small and medium-sized enterprises (SMEs) should create their own distinct SM or Industry 4.0 strategy and plan, which can be accompanied by maturity models and readiness evaluations[30].

Sanny (2017). This study seeks to determine, using the UTAUT theory as a framework, which variables—trust as a moderating variable—affect online buying behaviour, namely effort expectancy, performance expectancy, social influence,

and factors that facilitate. For data analysis, SEM-PLS is employed. The results show that performance expectations, commercial expectations, and social impact are the three main variables influencing the intention to use an online marketing system, according to the 107 respondents. All the while, self-assurance, peer pressure, and enabling circumstances are moderated by performance expectations [31].

Table II is an overview of the recent research on the topic of multi-vendor e-commerce platforms, approaches, main findings, challenges, and implications amid the discussion of the SMEs applying these platforms in their business development.

TABLE II.   LITERATURE SUMMARY ON MULTI-VENDOR PLATFORMS AND SMES.

Reference	Methods	Objectives	Findings/Insights	Limitations	Research gaps
Fan et. al. (2020)	Kano questionnaire; Supply Chain Management framework (information, financial, logistics flows)	To identify SMEs' requirements for factors in cross-border e-commerce between Thailand and China	Thai Northern SMEs lack knowledge and readiness for cross-border e-commerce; identified different knowledge requirements across the process	Focused only on Northern Thai SMEs; limited generalizability	Need for broader studies on SMEs in other regions/countries and practical training programs for cross-border trade
Romadiana et al. (2020)	Functional analysis; Business model innovation; Prototype design	To facilitate SMEs in promoting and marketing products online via an e-commerce portal	SMEs still rely on conventional promotion; proposed a prototype e-commerce portal as solution	Prototype not tested with real SMEs; low adoption insights	Need for implementation and evaluation of e-commerce portals in real SME environments
Mthembo et. al. (2020)	Quantitative survey; SPSS analysis	To assess e-readiness of Namibian SMEs in adopting B2C e-commerce	SMEs ready to adopt e-commerce; call for government support in cybersecurity & financing	Only studied SMEs in Windhoek; did not explore other cities	Broader nationwide studies; investigation into sector-specific e-readiness
Almtiri et.al. (2019)	Quantitative survey; SPSS descriptive statistics	To analyze the obstacles to e-commerce technology adoption in UAE SMEs	Main barriers: managers' perceptions and employee distrust	Limited to UAE context; no comparative study	Further cross-country studies to understand cultural and managerial perceptions
Mittal et al. (2018)	Review study; Analysis of maturity models & frameworks	To identify gaps in Industry 4.0 readiness models for SMEs	Existing models don't reflect SMEs' real maturity; proposed "level 0" starting point; need SME-specific roadmaps	Conceptual framework, not empirically tested	Empirical validation of SME-specific readiness models
Sanny (2017)	SEM-PLS; UTAUT model; 107 respondents	To identify factors influencing online purchase behavior	Performance expectancy, business expectations, and social influence significantly affect intention; trust moderates relationships	Limited sample size (107 respondents); single country context	Larger samples across regions; exploration of other moderating variables (e.g., culture, technology access)

6. Conclusion and Future Work

Providing a scalable, technologically advanced, and cost-effective digital marketplace is an important role for multi-vendor e-commerce platforms in empowering SMEs. Allowing many vendors to offer products on a common platform gives SMEs access to a larger customer base, a global market, and greater visibility, while lowering the cost and complexity of their operations. Additional technological facilitators of integration, including AI, ML, online payment systems, supply chain management, and cloud-based SaaS services, bring further customer involvement, supply chain management, and operational effectiveness. SMEs can also use the analytical benefits of these platforms to make decisions, run personalized marketing based on data, and secure customer loyalty and long-term growth. In general, the multi-vendor platform serves as a catalyst for digital transformation, helping SMEs stay competitive and innovative in the rapidly changing e-commerce landscape.

Future studies may investigate integrating advanced AI-based tools, such as predictive analytics, voice and visual search, and augmented reality, into multi-vendor platforms to improve the customer experience. Moreover, the influence of the new technology, i.e., blockchain as a safe transaction tool, IoT-enhanced inventory control, and custom-made recommendation engines can be researched further. Research can also be based on mobile-first approaches, social commerce integration, and sustainability-based e-commerce solutions to maximize the SME growth and market reach.

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