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The increasing prevalence of multi-sided online platforms and their influence on international entrepreneurship: The rapid transformation of entrepreneurial digital ecosystems

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Abstract

A set of diverse, evolving, and interactive forces are strengthening trends toward the digitization of firms business models and operations at a relatively fast pace and are affecting firms' operations at relatively micro levels. They are also changing the ecosystems at the macro level through rapid digitization, augmented by the forces of change in the environment, including the progressive developments in communication and information technology and the rapid development of artificial intelligence (AI), www3.0, and I 4.0 amongst others. A review of the change and the evolutionary trends in the past 2 decades is highlighted to enable a discussion and characterization of the rapidly dominating digital ecosystems and their impacts on firms, especially iSMEs. This article examines the entrepreneurial digital ecosystem (EDE) to bring it within our theoretical and iSMEs' easy operational reach with a few brief case-study examples of multi-sided online platforms and their increasingly disruptive impacts so far. Four schematic presentations portray the involved processes and are presented in Figs 1, 2, 3a and 3b; a comparative analysis of the top online multi-sided platform is presented in Table 1. They are operating within the macro entrepreneurial digital ecosystem, while modifying their own micro dimensions to their advantage and affecting the macro EDE. For ease of adoption and operationalization, the principal operating characteristics of a typical macro entrepreneurial digital ecosystem, each representing a distinct strategic function, are identified and re-articulated for SMEs' and internationalized SMEs' (iSMEs) ease of access and use for building their own corresponding micro EDE operations in order to exploit its advantages and avoid its emerging potential hazards.

Keywords Multi-sided digital platforms · Digitization of international entrepreneurial environments · Evolution of macro entrepreneurial digital ecosystems (EDE) · Case-study examples of digital ecosystems · Schematic represention of platform operations · Comparative characterization of platform's buyer and supplier relations · Indirect internationalization of iSMEs

Extended author information available on the last page of the article

Morse codes, telegram, and telephones changed worldwide communications at the time.

Ships and Trains changed transportation at the time.
Automobiles extended cities and urban living into suburbs over time.
Airplanes changed international and long-distance travel.
Internet digitized information and communication.
Digitization of business models is changing commerce to e-commerce.
Multi-sided platforms will revolutionize global business transactions.
Humanity is at the down of change.

Anonymous

Introduction

The world appears to be changing rapidly. Environmental, socio-economic, political, and technological issues of different kind and magnitudes are affecting different institutions and people differently. Localized- and internationalizes-SMEs (iSMEs) are more severely affected than others. Consumer behaviour and expectation have been also changing. Combined, change is providing advantages and opportunities for some and hazardous difficulties for others.

The main focus of this article is on exploring the impact of technological change on SMEs and internationalizing SMEs iSMEs and addressing the seemingly widening gap in the extent literature regarding iSMEs' exposure to change and corresponding consequences in general and technological ones in particular. In light of complexities of technological and rapid change, especially in the aftermath of COVID-19 global crisis, this article will be adopting a broad and taxonomical approach to the diverse topics affecting SMEs[1] and iSMEs. The post COVID-19 researched evidence suggests that these enterprises, their buyers, suppliers, supply chain and value net—their entire eco-system (i.e., influential actors and factors in their embedding environment)—came under pressure (e.g., Mason and Hruskova 2021[2], Eggers 2020, Ramachandra et al. 2021), and had to adapt (and is still evolving), which in turn, provided challenges to some and opportunities[3] to other SMEs (Eggers 2020; Mason and Hruskova 2021). The most notable change, requiring strategic re-formulation to accommodate the COVID-19 crisis[4] was to adjust to the ongoing technological change—e.g., rapid digitization, that the COVID-19 global crises intensified, which in turn deeply affected iSMEs, especially in the international markets. However,

[1] OECD has defined SMEs as enterprises with less than 250 employees in most advanced countries.

[2] For more information, see Mason, C and Hruskova, M (2021), the impact of Covid-19 on entrepreneurial ecosystems, Economics 2021, pp 59-72, https://doi.org/10.4337/9781800374607.00011, Accessed on February 28, 2023.

[3] In the aftermath of the 2007–2008 global financial crisis and the 2008–2009 recession, many new start-ups flourished and internationalized rapidly, including for example, WhatsApp, Lyft, Airbnb, Uber, Waymo, Pinterest, Credit Karma, and Git Hub, most of which grow and are global success.

[4] The COVID-19 prolonged lockdowns forced substantial and substantive change in buyer- and supplier behaviours requiring a remedial response, at time immediately to avoid demise.

some iSMEs appear to have slowly changed and adapted, mainly due to evolving change in their entrepreneurial ecosystem and their exposure to other major crises before—e.g., the global financial crises of 2007–2008, the Asian financial crisis of 2010 and 2011, and others (Eggers 2020). Despite SMEs' liabilities of "smallness" (Freeman et al. 1983) and "newness" (Stinchcombe 1965), and iSMEs' liabilities of "foreignness" (Hymer 1976) and "outsidership" (Johanson and Vahlne 2011), *they form the backbones of economic activities nearly everywhere*, and change affects them more than their larger counterparts. For example, more than 44% of economic activity and 49% of jobs in the US private sector are created and maintained by 33. 2 million SMEs, which account for 99.7%, of all firms in United States (Source https://www.oberlo.com/statistics/number-of-small-business-in-the-us reporting: US Small Business Administration as the original source[5]). In Canada, 99.7% of firms in 2022 were SMEs, while European Union SMEs accounted for more than 67% *all employed* in 2017[6].

Generally, change is the result of complex interaction amongst diverse forces of different origins. Occasionally, the larger institutions contribute and even stimulate change with impact, both positively and negatively, and consequently, their suppliers in their supply chain, buyers, and value-creation equations are affected over time. The COVID-19 global crisis, for example, caused massive damage from its on-setting in March 2020 and its consequent challenges that impacted SMEs, iSMEs and their respective economies. In less than three months from its deep adverse impacts on most economies, more than 20 million jobs were reportedly lost (Lambert 2020) in the USA alone, most of which were in SMEs. It also took more than *two trillion US Dollars in the United States* (Emma and Scholtes 2020), *more than €500 Billion in the European Union* (Riley 2020), and comparable amount in other countries (e.g., more than 40 Billion Dollars in Canada), to provide financial life-support to those who had lost their employment or other income sources, and to stimulate their economies in order to avoid further massive demise of their respective SMEs and consequent losses in employments and economic activities. In short, SMEs have consistently had significantly positive impacts on their economies, while they have been more exposed to fluctuations in their environment and ecosystems exposing them to risk caused by unexpected change. They have usually suffered more severely than others, which collectively *justify a focus on forces and factors that affect SMEs' ecosystems significantly locally and internationally.*

Aims and objectives

As stated earlier and in light of the initially gradual, but substantive, change in the past 2 decades and rapid change during and in the post-COVID-19 crisis, the

[5] The Original source of US figures were US Small Business Administration and were accessed through www.oberlo.com at: https://www.oberlo.com/statistics/number-of-small-business-in-the-us (Accessed in April 2023 and May 8,2023)

[6] Source for the EU figures is: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20200514-1

main focus of this article is to *explore the widening gap between the traditional and increasing digitized socio-economic environment of SMEs in general, and the increased pace of technological change, in terms of rapid digitization of their entrepreneurial ecosystems, which are impacting SMEs, and especially iSMEs, in particular*. This article aims to explore both the difference between the newly emerging entrepreneurial digital ecosystem (EDE) and the traditional one, *and discusses the transformation processes, which have already affected, while the evidence suggests an exceeding impact on SMEs and especially on iSMEs.*

The research questions

As briefly discussed earlier, this article will be building on and exploring the impact of change on the firm's supportive "infrastructure"[7], "ecosystem"[8], or the support environment(s), within which it is embedded, which influence the firm's path of developments over time. This article will also trace the development of infrastructural components of the evolving ecosystem in order to explore their evolutionary trajectory overtime and its changing impacts, while abstracting from the rich underlying historical and theoretical discussions in favour of time and for added clarity. Naturally, such support ecosystems may extend beyond home market to international environment(s) once the firm enters international markets with an entrepreneurial orientation. In so doing, we will draw upon the early research and developments by, for example, Van de Ven (1993)[9], Bahrami and Evens (1995)[10], Dubini (1989), Pennings (1982), amongst many others, who have contributed to the various concepts of a supportive entrepreneurial environment, or the entrepreneurial ecosystem, for explaining the crucial impact of different *agents, factors, and forces* that interactively affect regional and national economies' socio-political and regulatory dimensions, and in turn affect entrepreneurial activities. Naturally, entrepreneurs' ability, and willingness, to bear the risk of starting-up *nascent enterprises* and managing the long, and at times highly demanding, entrepreneurial processes to ultimate success through their efforts are enhanced or adversely affected by their receptive and supportive ecosystem[11]. Stated differently, capitalizing on change affecting the firm's embedding ecosystem, and in turn impacting its entrepreneurial

[7] Terminology used by Van de Ven (1993) suggesting that nascent entrepreneurship would highly depends on an "infrastructure" that was later called "ecosystems, by, for example, Bahrami and Evans (1995).

[8] The emerging more popular terminology of "ecosystems", barrowed from biology, and initially applied to a specific support system for start-up enterprises and evolved to referring to the support provided by the entire embedding environment. Accordingly, we use both terminologies interchangeably.

[9] Van De Ven, AH, (1993), The development of an infrastructure for entrepreneurship, Journal of Business Venturing, Volume 8, Issue 3, May 1993, Pages 211–230, https://doi.org/10.1016/0883-9026(93)90028-4

[10] Bahrami, H and Evens, S (1995), Flexible Re-cycling and High-Technology Entrepreneurship, California management Review, V37, No 3, P.62–88.

[11] The ecosystem support may include the contributions of incubators, accelerators, venture capitalist, supporters and mentors to enable a nascent enterprise to travel through IPO and eventual internationalization.

internationalization strategy in a parallel, without losing their corresponding interactive affects, hold the potential of broadening and enriching this article's scope and discussion. Consequently, the three families of primarily operational (or managerial) questions, including micro and macro change(s), and their corresponding effects on ecosystems, involving various enterprises in different stages of their internalization life-cycle, give rise to the following questions in need of discussions:

i) Given a focal entity --SME or iSME, how should change be approached and what can be done when and where to start them, in order to avoid the emergence of potentially damaging hazards?
ii) How could the corresponding opportunities be seized at the end of process in general, and by the focal and support institution(s) of interest in particular? And,
iii) How an optimal strategy for achieving the most desired outcome at the time can be achieved while the forces of change unfold beyond the firm's control?

At the outset, however, the breath and depth of the involved issues seem both problematic and opportunistic and at times far beyond the scope an article or even a journal. However, ignoring the potential affects of higher-level-systems for expediency is unlikely to offer optimal solution at the end. Therefore and in favour of time and space, this article's primarily aim is to explore a family of topical changes that are likely to reduce, if not avoid, damaging hazards, and similarly increase the chance for exploiting promising opportunities within the emerging, if not prevailing, environment in the very near horizon. Specifically and from a theoretical perspective, the broad research questions before us include, but not limited to, the followings[12]:

RQ1: What evolving macro trends are likely to pose higher challenges to International Entrepreneurship ecosystem(s) as they are digitizing in the near and short-to-medium term, horizons? And,
RQ2: How should SMEs prepare and strategize to enter the digitized environment for operating effectively within the evolving trends for growing in international markets and also to avoid potential risks of adversities, and possible demise, overtime in general and within their changing respective eco-systems in particular?

The structure of this article

Following the above introduction, the background and further developments will present a discussion of interactive diverse forces that are strengthening trends toward the digitization of firm's business models and operations at the relatively micro levels within the macro digitized (and further digitizing) ecosystem. In order to comply with the emerging system and take advantage of opportunities in the changing macro ecosystem transformation in stages in the short term are required. A review

[12] Although we aspire to address and explore the adverse impact of the above questions in this article, some may form the agenda for other complementary discussion later-on.

of the change and the evolutionary trends in the past 2 decades are highlighted to pave the road for examining the digital ecosystems and their impacts on firms, especially on iSMEs. The next section examines the evolutionary developments of entrepreneurial digital ecosystem (EDE) to portray potential transformational processes within SMEs' and iSMES' easy operational reach. This process is complemented by brief case-study examples of multi-sided platforms and their growing disruptive impacts. Four schematic presentations (Figs. 1, 2, 3a and 3b) portray the complex set of involved processes. Furthermore, for ease of adaptation and operational transformation, a typical macro entrepreneurial digital ecosystem is broken down into its principal characteristics and functional task so that SMEs and iSMEs can build their own corresponding micro-operations to exploit the advantages of the emerging entrepreneurial digital ecosystem and avoid its potential hazards. For added clarity, Fig. 3a and b schematically depict various functions and their corresponding digital information and digital financial flows. An analytic comparison of the top multi-sided platform, operating within the prevailing macro EDE and their respective modifications of their own micro dimensions to their respective benefits are presented in Table 1. Discussion follows next and the conclusion with managerial, public-policy, and theoretical implications appear at the end.

The background and further developments

As stated earlier, this section intends to explore selective topics of importance with significant influential impacts on SMEs' and iSMEs' operations as they further grow internationally over time, including: (i) the increasing diversity of forces affecting iSMEs and influencing, if not creating, the emerging entrepreneurial digital ecosystems, (ii) an examination of mainly locally interrelated and evolving ecosystem contributing to the growth of nascent start-up, where younger and local SMEs experience them mostly locally and at micro levels affecting their functions and operations (e.g., especially at start-up phases), (iii) the interactive family of local, regional, and national elements contributing to the evolution of the prevailing ecosystem(s), which may or may not contribute to a given nascent SMEs to grow into iSMEs and global firms, such as E-commerce platforms over time, and (iv) an encompassing and evolving system capable of supporting growing enterprises, such as the multi-sided online platforms, that create, control and enrich their macro ecosystems to support their growing suppliers synergistically (Dana and Etemad 2001; Dana et al. 2000) as they expand globally.

The emerging diversity of effective forces

Generally, the significant forces of change arise from *environmental issues* and are *initially more macro in nature*, such as those caused by climate change, due in part to global warming, introducing unexpected instabilities[13] and consequent institutional

[13] Climatic occurrences, such as cyclones, hurricanes, heavy rains, floods, mudslides, etc., could be massively damaging, but their sever impacts extend beyond local and regional areas (e.g., Cyclone Gabrielle hit New Zealand's North Island in February 2023 and caused massive damages and more than 10 deaths).

change, for which they were not prepare, disturbing most *iSME's immediate micro ecosystem at the outset*. Although micro disturbances are easier to contain locally (or regionally); large or long-lasting macro disturbances causing functional difficulties of various kinds in different parts of the world[14]are more difficult to contain, as they disturb their respective ecosystems in both local and internationalized SMEs (iSMEs) with varied effects over time. In comparison to micro- (relatively minor and localized) and macro- (major and broadly internationalized) ecosystems, we also recognize the term "meso" to distinguish the extent of impacts and the severities of challenges that fall in between "macro" and "micro" effects, which in turn may have, for example, macro environmental impact on SMEs and from micro to meso impacts on iSMEs' ecosystems embedded in their respective environments. In short, impact on enterprises and their ecosystems may be: (a) relatively limited, be specific and micro in nature, (b) much broader and include all massive influential forces impacting even larger enterprises and regions severely, and alternatively, (c) where the consequent effects fall in the mid-range or "meso" in nature. However, in highly interactive systems, such as entrepreneurial ecosystem, the consequent impacts may be difficult to clearly categorize, as the true over time impact(s) on an enterprise's ecosystems may evolve, ranging from initially minor change (micro in nature and scope[15]) and with more encompassing and influential impacts to follow overtime. As opposed to micro and macro, this discussion allows for better classification of the evolving impacts over time both affecting the ecosystem and the consequent change on enterprises of different sizes discussed in a later section. (Please see discussions under the heading of *Evolutionary Trajectory of Ecosystems over Time* in the next section).

The complicating factor, however, is that socio-economic and political systems are also interactive and their interactions with forces of change are likely to introduce certain longer-lasting layers of uncertainty and instability reducing clarity of view and the extent of preparations for their associated impacts. Logically, the perceptions of the eventual impact of change may vary widely. That perception would initially be based on the firm's interaction with it relatively stable ecosystems that is evolving when the firm fails to detect the evolving change to properly adjust. As a result, the population firms are likely to perceive wide ranging impacts, from longer-term expectation of stability after a few short term crisis-like instabilities by some, to prolonged adverse impact experienced by others, who could not adjust like others; thus posing the puzzle of which combination of forces of change, regardless of their respective nature and magnitude of impacts, should occupy the attention of iSMEs over their span of life cycle (Etemad 2018).

[14] For example, shortages of drinking and irrigation water reduce food production in a region with serious adverse effects reaching beyond localities and extending to broader regions. Similarly, in the free trading areas, such as the North American FTA, and the European Union, more macro changes could eventually impact many after some time.

[15] It is noteworthy that different entities may view and attribute an impact to a highly micro (e.g., specific aspects of supply and value chain affecting local competition in a specific industry) when they are prepared or capable of controlling the causal forces. However, highly complex macro systems (e.g., global financial crisis of 2007-2008) and somewhere in between at the meso level (e.g., Competition in free trading area, such as the European Union) are beyond the control of smaller entities.

The evolutionary trajectory of ecosystems over time

This section will contain a taxonomy of ecosystem definitions in three evolving categories, as follows:

First, A Selective Sample of Earlier and Simpler Ecosystem Definitions: The following eight selected definitions have identified agents, factors and forces that have progressively described a supportive system's clear contributions to entrepreneurial initiatives and operations with a higher emphasis on early-stage start-up and nascent enterprises. They start as relatively simple definitions and have progressed into identifying specific and higher functional contributing to different agents with their respective *interactive impacts* (emphases are added but the broader embedding contexts are excluded for reduced clutter and increased clarity).

i) ……..“The universities and corporate and government research institutes are the most readily identifiable and …….the nutrient base of the ecosystem. Universities are also a catalyst for informal networking amongst future entrepreneurs”[16] (Bahrami and Evens 1995, p. 66).
ii) “The entrepreneurial system consists of a complexity and diversity of actors, roles, and environmental factors that interact to determine the entrepreneurial performance of a region or locality.” (Spilling 1996, p. 91)
iii) The entrepreneurial ecosystem consists of a set of individual elements– such as leadership, culture, capital markets, and open-minded customers- that combine in a dozen complex ways. (Isenberg 2010, p.40–43)
iv) There are four principles in entrepreneurial ecosystems: “1) Entrepreneurs must lead the startup community. 2) The leaders must have a long-term commitment. 3) The startup community must be inclusive of anyone who wants to participate in it. 4) The startup community must have continual activities that engage the entire entrepreneurial stack” (Feld 2012, p. 230)
v) The ecosystem is “the sets of actors, institutions, social structures and cultural values that produce entrepreneurial activity” (Roundy 2016, p. 233)
vi) A “set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship within a particular territory” (Stam and Spigel 2016, p. 1)
vii) “An entrepreneurial ecosystem refers to the set of elements, individuals, organizations or institutions outside the individual entrepreneur that are conducive to the choice of a person to become an entrepreneur, or the probability of his or her success following launch.” (Wadee and Padayachee 2017, p. 288)
viii) “The entrepreneurial ecosystem includes three dimensions: actors who form it and their interactions (formal and informal network), physical infrastructure, and culture.” (Theodoraki and Messeghem 2017, p. 50)

[16] Bahrami and Evens (1995) was a detailed qualitative research of the California's “Silicon Valley” Ecosystem. The context of their definitions was early 1990s entrepreneurial developments in “Silicon Valley”. Bahrami, H and Evens, S (1995), Flexible Re-cycling and High-Technology Entrepreneurship, California management Review, V37, No 3, P.62–88.

Second, A *Selective Sample of More Interactive Systems that Contribute to International Growth of iSMEs as well.* As compared to the first group of definitions, implicitly focussed on growth at home or a "particular territory" (e.g., Stam and Spigel 2016, p. 1), the followings seven selected definitions recognize a growing entrepreneurial venture's capability to leverage a *systematically interactive systems* to contribute to its growth spatially – regionally, and nationally and even internationally – overtime. They have gradually become more specific and inclusive, but their emphasis and orientation remained relatively unchanged (Similar to the above, emphases are added but the broader embedding contexts are excluded for reduced clutter and increased clarity):

i) "Entrepreneurial ecosystems represent a diverse set of interdependent *actors* within a *geographic region* that influence the formation and eventual trajectory of the entire group of actors and potentially the economy as a whole." ……..

"Entrepreneurial ecosystems evolve through a set of interdependent components which interact to generate and promote new venture creation" (Cohen 2006 p. 2 &3).

ii) The entrepreneurial ecosystem includes "economic, social, institutional *and all other important factors* that interactively influence the creation, discovery and exploitation of entrepreneurial opportunities" (Qian et al. 2013, p. 562)
iii) The "Four principles for entrepreneurial ecosystems [are]: "1) Entrepreneurs must lead the startup community. 2) The leaders must have a long-term commitment. 3) The startup community must be inclusive of anyone who wants to participate in it. 4) The startup community must have continual activities that engage the entire entrepreneurial venture creation." (Feld 2012, p. 6)
iv) The entrepreneurial ecosystem is "…an interactive community within a geographic region, composed of varied and *interdependent actors* (e.g. entrepreneurs, institutions and organizations) *and factor*s (e.g. markets, regulatory framework, support setting, venture entrepreneurial culture), which evolves over time and whose *actors and factors coexis*t and interact to promote new venture creation over time" (Vogel 2013, p. 6)
v) "A National System of Entrepreneurship is a dynamic, institutionally embedded interaction between entrepreneurial attitudes, ability, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures." (Acs et al. 2014, p. 479)
vi) "a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship within a particular territory" (Stam and Spigel 2016, P. 1).
vii) "Entrepreneurial ecosystems are *regionally embedded interactive systems* that drive the allocation of resources towards productive uses through the creation and scale-up of new ventures." (Autio 2017, p. 23)

Third*, A Selective Sample of more Comprehensive and Encompassing Definition.* The following sample of two comprehensive definitions identify interactions

amongst required tasks of each set of agents, factors and institutions for achieving higher entrepreneurial ambitions (Mason and Brown 2014a, p. 5) and desired outcomes (Similar to the above, emphases are added but the broader embedding contexts are excluded for reduced clutter and increased clarity):

i) The entrepreneurial ecosystem is "a set of interconnected entrepreneurial actors (both potential and existing), entrepreneurial organisations (e.g., firms, venture capitalists, business angels, banks), institutions (universities, public sector agencies, financial bodies) …… [that] take the risks of starting, funding, and otherwise assisting high-risk ventures." (Mason and Brown 2014a, p. 2) "……and entrepreneurial processes (e.g. the business birth rate, numbers of high growth firms, levels of 'blockbuster entrepreneurship', number of serial entrepreneurs, degree of sellout mentality within firms and levels of entrepreneurial ambition) which formally and informally coalesce to connect, mediate and govern the performance within the local entrepreneurial environment" (Mason and Brown 2014a, p. 5) …….towards productive uses through the creation and scale-up of new ventures." (Mason and Brown 2014b, p. 23)
ii) "Entrepreneurial ecosystems are combinations of social, political, economic, and cultural elements within a region [and larger firms] that support the development and growth of innovative startups and encourage nascent entrepreneurs and other actors to take the risks of starting, funding, and otherwise assisting high-risk ventures." (Spigel 2017, p. 2)

In short, as expected and stated earlier, ecosystem definitions (and their corresponding impacts) have evolved over the past three decades. Bahrami and Evens (1995) and Spilling (1996), building on their predecessors' work (e.g., Pennings (1982), Dubini (1989)), suggested a rather general definition, while the later definitions, such as those of Mason and Brown's (2014b) and Spigel's (2017), became more descriptive, inclusive, and specific as the field of entrepreneurship gained larger experiential knowledge regarding the *impact of the influential actors, forces, institutions, resources, and orientation of the embedding environment(s),* which moved towards digitization at increasing pace in mid 1990s in order to take advantage rapid technological developments in communication and information technologies (CITs). Similarly, an increasingly higher emphasis was attributed to mutual interactions of influential forces within the ecosystem and their respective (or interactive) relations with entrepreneurial ventures as the emerging field entrepreneurship solidified over time. Notably, however, the increasing range of complexities, entrepreneurial opportunities, competitive forces, and associated collective risk-reward equations, especially in the open and highly competitive globalized marketplaces, such as those of the multi-sided online platform, could not be easily incorporated into the earlier and simpler ecosystem definitions at the time. A schematic representation of the firm ecosystem's principal components and their interactive inter-relationships in firm's home environment are depicted in Fig. 1a. A schematic portrayal of a firm's home and international host

environments giving rise to a more complex and macro international environment and their corresponding mutually-interactive support ecosystem are depicted in Fig. 2, below.

As discussed earlier in the introduction, the continued evolution of, and change in, the environment due to increased competition (e.g., the globalization stimulating foreign-based firms to enter and compete in firms' national and regional markets), the exceedingly higher digital transformations in communication, information, and transactions have been transforming the effective nature, and impact of, the evolving

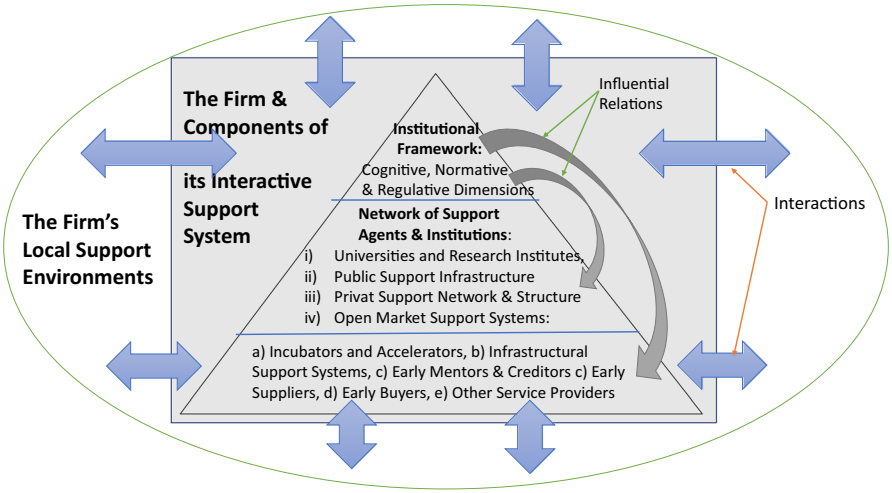

Fig. 1 Firm's principal support components and their interactive inter-relationships in its environment

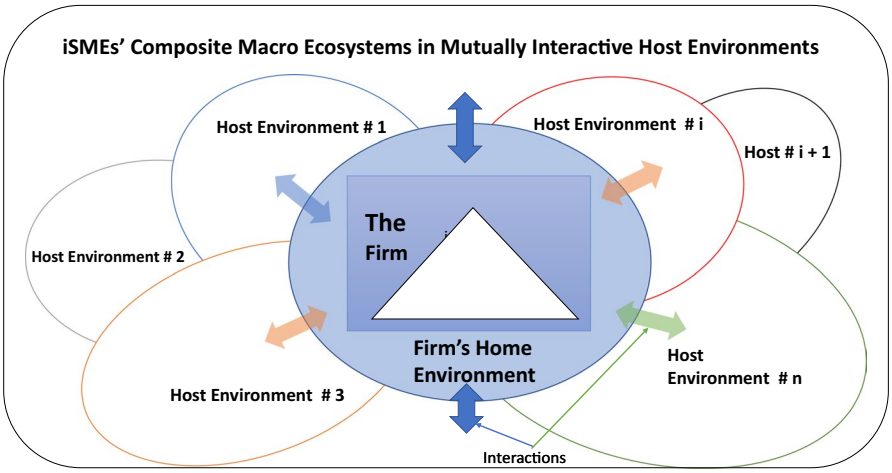

Fig. 2 Interactive environments internationalizing iSMEs' macro entrepreneurial ecosystems

ecosystems from their traditional pre-Internet counterparts to the increasing more prevalent digital system. This system provides, for example, for taking advantage of the increasing adoption and use of the Internet, I 4.0[17], www 2.0 and www 3.0[18], which are operating in their own respective digital environments. However, such information and technological advances in (and from) different environments have begun to interact, and would be creating composite interactive *macro environments extending beyond their respective digitized ecosystems and affecting nearly all international market worldwide*. They have been affecting, and will continue to influence international entrepreneurship's nature and path of growth locally, nationally, and internationally over time, if not already. Notable examples of massive advances in the technological environment of entrepreneurship are the explosive growth of digitalized operations and transactions that have not only *affected consumers' behaviour and expectations*, but they have also further stimulated the rapid internationalization of small digitized new ventures (ISDVs) (for a discussion of ISDVs, see Etemad 2022a, b) using online international marketplaces, such as those created and operated by *online multi-sided platforms creating complementary ecosystem of their own,* where the previous separation between local and international has nearly disappeared (Etemad 2022a, b). In short, digitization is becoming an emerging foundation of internationalization, as online multi-sided platforms have been, and are, affecting nearly all on-line buyers, suppliers, system-providers, and their respective mutual transactions (discussed earlier and schematically depicted in Fig. 2, above). Such transactions are extending beyond individual enterprise, national, and even international institutional frameworks (especially the cognitive and the regulative aspects) affecting international competition. They are also challenging the distinction of earlier spatial—local, national and international— relations in their respective competitive environments with emphasis on national consumer behaviours[19]. Stated differently, environmental change in general, and technological evolution in particular, have affected entrepreneurial ecosystem, and a more technologically based and supported international ecosystem is rapidly emerging. A schematic portrayal of potential overlaps between local and international markets and their pathways from local to international ecosystem(s) and their mutual overlaps were presented in Fig. 2, above (we will further discuss the evolving effect of these developments in a later

[17] Industry 4.0 (I 4.0) refers to the highly advanced and evolving ways by which companies manufacture, improve upon, and distribute their products. Manufacturers are integrating new technologies, including Internet of Things (IoT), cloud computing and analytics, and Artificial Intelligence (AI) and machine learning into their production facilities and throughout their operations (modified content of the original definition by Google.com).

[18] Google.com defines a www 2.0 website as a copy of the original www website hosted on another server. Overloading traffic can be redirected to www 2.0, www 3.0, or even the www 4.0 in case the original site is overloaded or experiencing temporary maintenance works. Such network of websites have facilitated communications and reduced both the limitations of document size and speed of transmissions.

[19] Even a casual observation of the multi-sided digital platforms online offerings indicate that they offer massive number of choices on their websites for every one's information, decision, and possible purchase, regardless of one's location. The information regarding location is added for delivery and logistics at a later stage after the purchase decision.

sections entitled as toward the developments of digital and platform ecosystems, and the online multisided platform's infrastructure).

Exploring digital developments and their evolving impacts on international entrepreneurship

Generally, the rapid change in digitization from its earlier and relatively micro-state in late 1980s and 1990s to the ever-expanding and increasingly more encompassing macro-state in the second decade of the twenty-first century have been transforming the digital environment to its near state of dominance in international transactions. As a result, various entrepreneurial functions and operations, if not the traditional entrepreneurial ecosystems, have been changing and evolving. It is noteworthy that the rapidly advancing digital environment has created its own rapidly evolving *digital ecosystem*, which are also an *interactive network of agent, factors, and related subsystem using their respective digital infrastructure that are conversant with others*. Collectively, they are significantly affecting nearly all influential dimensions of international entrepreneurship, especially iSMEs with global supply chain and buyers in the open and larger international markets. Accordingly, the next section of this article will explore the impact of digitization and transformation of the traditional ecosystems, which have in turn given rise to newly emerging concepts and progressively advancing operations that are affecting internationalization and also expediting the on-going international transaction in international entrepreneurial enterprises.

Toward the developments of digital and platform ecosystems

Example and discussion of the multi-sided online digital platforms

At the outset, we collectively feel familiar with the advancing digital environment as we are mostly using it, or are at the receiving end, of digital operations, and yet, the details of the digital infrastructure, operations, and evolving ecosystem(s) remain somewhat opaque and unclear to most of us. For example, all online platforms, with some of which we conduct online transactions are based on, and are supported by, *technical digital foundations* that enable their *Schumpeterian entrepreneurs to create and operate innovative and efficient business models with much richer and flexible value-generation equations than those of two to three decades ago.* Such *digital technical foundations* enable them to accomplish objective that could not be achieved through the older traditional business models. Air B&B's, eBay and Uber's digital platforms, for example, have created much richer, more flexible, far-reaching, *and popular international alternatives* to the traditional temporary lodging accommodations, consumer to customer (C2C) transactions, and ride-hailing (as competing substitutes for hotel rooms, purchases from physical outlets, and hailing local taxis, respectively) that their non-digitized predecessors, such as the traditional international hotels and local taxi service, could not accomplish. Air B&B has established an expanding list of accommodation (i.e., 12.1 million listings

in 100,000 cities in 191 different counties in 2022) on its platform that far exceeds the five largest international hotels combined (Hartmans 2017). eBay has created the possibility of online transactions, mostly C2C, between many sellers and potential buyers (about *18 million, and 138 million in 2022*, respectively[20]) regardless of their location, time and type of product offered for sale. Similarly, Uber has established an international network of close to *five million drivers* that provide on-demand alternatives to local taxi services in 10,000[21] cities, or on-demand short-distance travel, worldwide through Uber. More importantly, Uber is present and engaging drivers in any corner of the world to provide a ride at a specific time and place there through the Uber's digital online platform. In contrast, a local taxi company's central dispatcher may not be able to arrange for a taxi-ride on a timely basis in their region by their network of associated (or employed) drives and registered (or owned) taxis. Furthermore, one taxi company could not reach other company's idle drivers and taxis to generate revenues for both. On the other side of the transactions, people in need of specific transportation at a given location and time locally, regionally or internationally can arrange them easily online through, for example, Uber, Lyft, DiDi (Chinese), amongst other competing online ride providing companies.

The above examples and a selected list of typical of digital platform operations (discussed in Table 1, below) point to the presence of different business models and value-creation processes that extend beyond an enterprise's own assets, capabilities, and resources and involves others' assets, capabilities, and other factors outside of the firm. They are activated and used by autonomous agents[22], *whose complementary synergistic activities and participation are instrumental to generating revenues for the online platform firm*. Nearly all listed rental properties on Air B&B platform are not owned, nor controlled, by Air B&B. The online digital Air B&B multisided platform generates its revenues by promoting and nearly matching supplies of rental resources by *connecting buyers (users/renters)* and potential accommodation suppliers to generate rental revenue, a percentage of which AirB&B takes for its listing, promotional and matching, amongst other, service[23]. Similarly, Uber could not generate its revenues without participations of independent drivers[24]. Some online platforms also allow for auctions, where customers can bid online for a given product (e.g., eBay.com[25]); while others offer incentive, or occasional discounts, to encourage sales to selected buyers (e.g., Amazon offers discounts to its "Prime" customer, who are charged a fixed monthly fee of about $10 USD in USA and Canada to remain as a "Prime members"). In contrast, others offer a percent of purchases as credit points at no charge (e.g.,

[20] Source: Statista https://www.statista.com/statistics/242235/number-of-ebays-total-active-users/
[21] Source: https://therideshareguy.com/how-many-uber-drivers-are-there/

[22] Such autonomous Agents are generally called *"autonomous complementors"* (Hein et al 2020, p. 87) and not a part of the firm.
[23] For example, consumers, or renters, looking for specific temporary or short-term rental accommodations are nearly matched with properties offering the desired or better characteristics and both are informed of the upcoming potential transaction.
[24] It is note worthy that both Air B&B and Uber have created some value-creation processes of their own to fill-in potential gaps.
[25] In a sense, Air B&B and Uber resemble the Classic Auctioneers in Walrasian Austrian economics.

Rakuten.com—see Table 1). The noteworthy point is that such specific arrangements focus on individual (or selected target) *customers that could not be easily reached in the tradition environments*; *while are readily feasible in the digital environment, where each individual customer's sales records can be kept and directly reached.*

In addition to the above, there are many significant other examples of digital platforms in nearly all business sector (See also Table 1 for a comparative analysis of selected sample). In communication, for example, Facebook's digital platform is capable of reaching and coordinating postings amongst *two billion individual users each month*[26]. In technical services, SAP can coordinate amongst its *13,000 worldwide partners* to facilitate corporate international operations in achieving higher international growth. In consumer entertainment services, Netflix in streaming full-length films reached more than 230 million subscribers in 2022 and Spotify in streaming music and other creative arts of 11 million artists, authors, and creators of, for example, podcasts, reaches more than 480 million listeners and viewers worldwide, majority of whom use Spotify offerings free of charge, while close to 200 million of whom are subscribers and pay for receiving Spotify's services free of advertising[27]. In other services, such as retailing of countless number of products and high-level service, including cloud computing, credit card financing, and film and video streaming, amongst many others, Amazon.com has become the largest and dominant online mutisided platform in less than 30 years from its start-up in 1994[28]. However, Amazon is not alone, many other competitors, including Alibaba group, Otto groups, Shopify, and even Walmart, are amongst more than 100 other relatively large digital platforms that have established active regional and international marketplaces, some reaching very large numbers of citizen world wide in a large number of national markets. Their digital ecosystem enables them to compete for international buyers' buying powers and efficient worldwide suppliers of different goods, service (and even creations) that are heavily dependent on, and contribute to advancing, such online multi-sided platforms (Etemad 2022a, b). The significant characteristics of selected sample of large online digital platforms are compared and presented in Table 1). Their high growth rates have contributed to their near dominance of the local, and even international, markets (e.g., Amozon.com). Their near dominance and extensive global reach (e.g., see selected examples in Table 1) raise a few logical questions that correspond with this articles research questions presented earlier in the Introduction, including but not limited to: (a) what are the principal characteristics of the infrastructure that enables and supports digital platforms' high international growth and performance, despite international operations' inherent difficulties, and (b) what characterises of their digital platform operations distinguishes them from their traditional counterparts?

[26] Facebook Chief Product Officer Chris Cox is quoted: "Thirteen years after launching and less than five years after hitting one billion, Facebook now has two billion monthly active users". https://techcrunch.com/2017/06/27/facebook-2-billion-users/ Accessed on December 2022.

[27] Spotify started-up in 2006 in Stockholm, Sweden. It offers 100 million songs and five million podcasts. It generated €11.72 billion revenue in 2022. Source: https://www.businessofapps.com/data/spotify-statistics/

[28] Amazon's sale Revenues in 2019 (Pre COVID-19) exceeded 250 Billion US Dollars and more than doubled to 514 Billion US Dollars in 2022 (Source: https://www.statista.com/statistics/266288/annual-et-income-of-amazoncom/).

Table 1 Selected significant characteristics of a sample of the largest online digital multi-sided platforms

Order	Name	Establishment Date & One line US market share	Sales Revenues 2022/2023 & Number of Sellers/Suppliers	Pricing, Branding and Relative Charges for Selling Online	Primary Markets & Number of Other Markets	Approximate Size & Number of SKUs	Extent of Global Reach & No. of Customers
1	Amazon.com (Largest world Retailer)	1994, Bellevue, Washington State; 38.7%	$502 Billion USD and 2 million sellers / suppliers	Fixed Prices (Discount for Prime members) / relatively high charges at posting/Very quick deliveries	B2C & B2B present in in 20 countries with more tan 100 million visitors	Very Large installed base and 12 million SKUs	2.4 Billion Visitors & 2.4 million sellers -
2	eBay.com	1995, San Francisco-Bay Area, 4.7%	$9.89 Billion USD	Auctions and fixed (buy now)/relatively low charges	C2C and B2C, Delivers to USA + 190 countries, 138 million Buyers worldwide	Varying and relatively large	Worldwide (138 countries in 2022)
3	Walmart & Walmart.com (Second World Retailer	1962/2009 6.3% Rogers Arkansas	$573 Billion USD / 70,000 sellers	Hybrid: Physical Stores & Online marketplace (20–09). Discounted @ Walmart & low selling charges once sold	Mainly USA and also 24 International Markets	Very Large (70-80 K)	10,593 Discount establishment in 24 countries
4	Flipkart with four Online-arms	2007, Baengaluru, India	7.7 Billion USD (2022) Partnership with Walmart and Largest competitor of Amazon	Lowest in India's Online; 7 million sellers; allows for seller's store front	Mainly India with 50% market share	Relatively large and reaches 450 million registered users	Mainly India and South East Asia

Table 1 (continued)

Order	Name	Establishment Date & One line US market share	Sales Revenues 2022/2023 & Number of Sellers/Suppliers	Pricing, Branding and Relative Charges for Selling Online	Primary Markets & Number of Other Markets	Approximate Size & Number of SKUs	Extent of Global Reach & No. of Customers
5	Alibaba Group Alibaba.com	1999, Hangzhou, China	134.56 Billion USD (2022)	$2,399/annum & $4,199/annum and "drop shipping" to customers and create their own storefronts	10 million visitors B2C (Taobao) and B2B, mainly in 18 Languages & 200 countries	B2B and B2C / 100 million products	China + 40 countries
6	Otto Group	1949/1995, Hamburg	54.4 Billion USD (2022/2023)	Competitive prices and sellers' charges	Mainly Europe and USA	Mainly B2C (electronics + Household products)	
7	Jing Dong (JD.Com)	1998 Beijing, China	154.7 billion USD (2022); Largest Competitor to Alibaba's Tmal.com	Highly Competitive Prices Low selling charges (Buys in Bulk) with best logistic support in China/open to foreign sellers	Mainly China + S. Korea, Taiwan	570 million customers and large number of SKUs	
8	Shopify	2006, Ottawa Canada	5.6 billion (2022)	4.4 million Websites (B2B) in 175 countries (3 Million in USA); 700 Million buyers	Mainly USA + 174 other countries		

Table 1 (continued)

Order	Name	Establishment Date & One line US market share	Sales Revenues 2022/2023 & Number of Sellers/Suppliers	Pricing, Branding and Relative Charges for Selling Online	Primary Markets & Number of Other Markets	Approximate Size & Number of SKUs	Extent of Global Reach & No. of Customers
9	Rakuten	February 1997; Tokyo, Japan	991 million USD (2022)	Flexible pricing in general, Competitive prices for Rakuten products and services Low lower charges for suppliers/Loyalty Program with $2 billion rewards-$39/month for suppliers and $0,099/item	1.2 billion customers worldwide	Relatively large SKUs in banking & payments, Streaming, Telecoms &TVs, B2C-	Mainly Japan
10	Air B&B	2007/8 in San Francisco; 20% market share of vacation rental industry worldwide	8.4 billion USD (2022); 12.7 million listing in 100,000 cities &191 countries; 150 million users worldwide	In USA: Average room cost is $163; average host earns $13,800; takes lees that 12 min to book a rental accommodation at no cost	Worldwide (about 100,000 cities &191 countries)		

First, the online multisided platform's infrastructure

Sussan and Acs (2017) suggest that the entrepreneurial digital ecosystems of the online digital platforms distinguish them from their traditional counterparts. Generally, platforms are the primary creators and largest users of such entrepreneurial digital ecosystems (EDEs). Such systems are based on three "core building blocks [that differentiate them from others]: (1) platform ownership, (2) value creating mechanisms, and (3) complementor autonomy" (Hein et al. 2020, page 87), while Sussan and Acs (2017, p. 55) propose that what is common to platforms, and distinguishes them from others, is the platform's core competences and "their ability to match one group of customers [(e.g., buyers)] with another group of customers [(e.g., supplier)] by reducing the transaction costs (Coase 1937)" through the extensive capabilities of their highly supportive *micro and macro digital ecosystem (DE)* and the digital infrastructures created, controlled and owned (Hein et al. 2020) by digital platform enterprises. Stated differently, large digital multi-sided platforms have created, control and advance their own ecosystems to gain incremental global competitive advantage with low reliance on the traditional ecosystems. Furthermore, their respective digital infrastructure has been advancing with technology, and continues to advance, entrepreneurially[29] and innovatively, which give them higher capabilities for reaching higher regional and global markets that further increase their competitiveness. Importantly, and as compared to the non-digital traditional seller, their digital environment has empowered them to override some of limitations of the traditional operations (e.g., drop-shipping by suppliers to lower costs, minimize inventories in physical warehousing and logistics in contrast to bulk-shipping by suppliers, amongst other costly traditional operational). Furthermore, they can reach to, and offer selected incentives to certain parts of the global markets at the individual, segments and locations, without affecting others, which has *transformed the traditional macro marketing to micro and focused marketing giving them additional advantages.*

Second, characteristics of digital enterprises and entrepreneurial digital ecosystem distinguishing them from their traditional counterparts

The above discussions point to a dynamic and continuously advancing system reflecting platform enterprises, which are mainly based and supported by their entrepreneurial digital ecosystem (EDE) consisting of *inter-related and synergistic*

[29] Consider, for example, Amazon's monthly charge of about $10 raises $120 of capital from each prime member at no additional corresponding cost, which can finance substantive advances, or expansions, that further contribute to their scale and scope economies. Similarly, Cost Co's innovative and entrepreneurial initiatives of charging more than $100 annual fee (which it returns fully to buyers when they buy more than $2000 annually) is a costless entrepreneurial initiative; and its bulk-buying create strategic flexibilities that traditional enterprises, such as Walmart, had not enjoyed before and find it difficult to impose them now. Jing Dong (JD.com) is also replicating Cost Co by buying in bulk to pass its saving through lower prices to its customers in China and elsewhere.

(and possibly symbiotic – Dana and Etemad 2001; Dana et al. 2000*) complementary micro, macro and modular subsystems* operationalizing most of the platforms functions. Hein et al. (2020) suggest the following three specific operational aspects characterising and reflecting their operations: 1) "Platform ownership", 2) "Value creating mechanisms", and 3) "Complementor autonomy", which are further expanded below for higher clarity, emphasis and contributions to platforms daily operations. Collectively, they portray a digital platform and related operation to their corresponding aspects of their entrepreneurial digital ecosystem, as follows:

i) A self-sustaining digital network (Li et al. 2017, p119) that connects many ***Agents*** (e.g., *The People*: buyers, suppliers and service providers), ***Factors*** (e.g., Resources, goods and services), and ***Forces*** (e.g., institutional and environmental advantages, incentive and deterrent) capable of *generating network externalities*.
ii) Incremental values creation *outside the platform enterprise by "autonomous complementors"* (Hein et al. 2020, p.77), mainly suppliers to the platform operations, which are smaller international digitized suppliers (or ISDVs – Etemad 2022a; b).
iii) Presence of *synergistic and symbiotic interdependencies* (Dana and Etemad 2001; Dana et al. 2000) amongst the different sides and types (i.e., B2C and B2B) of platforms operations binding them together within the platform digital marketplace (see Fig. 3a depicting the predecessors of multi-sided platform characterized by the traditional International trading enterprise).
iv) The expanding installed base of *actors, agents* (e.g., buyers and suppliers) *and factors on one side of the platform's marketplace increasing the value for other sides as each side's number of actors, agents, and deployed factors increase over time, which in turn give rise to higher network externalities* (Schilling 2002) for all side.
v) The platform's network of installed base of active and collaborative agents and actors indirectly co-creating higher values through information exchange between all sides, including both in B2C and B2B transaction (See the schematic representations of such information feed backs exchanges and interactions in Fig. 3b, based on Fig. 3a, below).
vi) The required *use of platform's operating "interface instruments"* (e.g., mostly information and operational software) by all agents and actors on different sides for saving time and efforts for the system as a whole, in addition to providing for higher reliabilities and traceability.
vii) *Increasing scale- and scope-economies* through the platforms' growth, expanding installed bases (e.g., increasing buyers and suppliers on all sides) demanding larger assortment of offerings to provide larger choices and modifying existing merchandise for buyers' feed back and ratings.
viii) Increasing efficiencies associated with the use of common foundation that support commonly shared and used functions, and their corresponding network externalities, associated with platforms' complementary modular, and upgraded software applications (Garud and Kumaraswamy 1993 and 1995), by all buyers and supplier on all platform sides, and
ix) Leveraging Entrepreneurial (Miller 1987 and 2011, Lumpkin and Dess 1996 and 2001, Etemad 2015), Strategic (Teece 2007) and Technological capabilities for

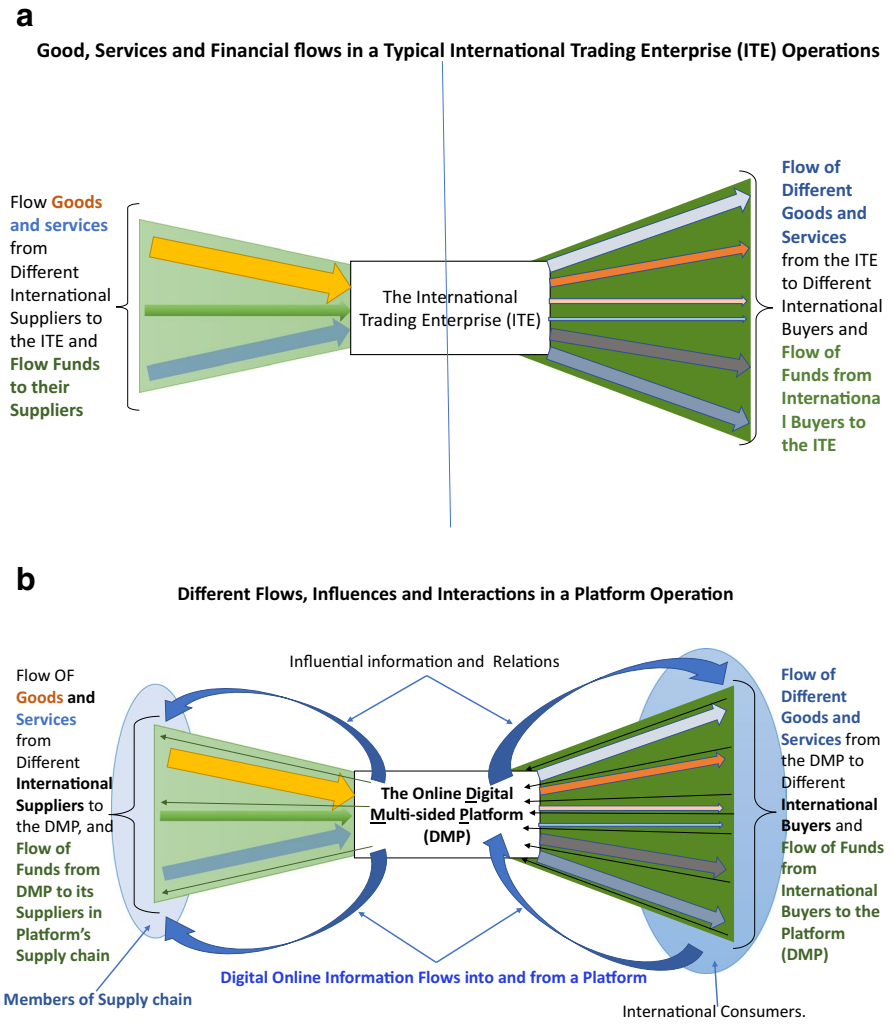

Fig. 3 **a** Schematic presentation of different flows in an international trading enterprise (ITE). **b** Schematic presentation of different flows in an online digital multi-sided platform (DMP)

higher growth and to the benefit of all involved stake-holders, including buyers and suppliers.

The above characterization of significant characteristic of typical platform operational, based on and within its digital ecosystem, can be rearticulated for defining an Entrepreneurial Digital Ecosystems (EDS). Although different perspectives (e.g., economics, strategy, Information systems, etc.) have characterized EDEs differently, they share a few common distinguishing pillars, which are also supporting

multisided platform's operations. Descriptively, an entrepreneurial digital ecosystem can be defined next, below.

Towards a definition of the entrepreneurial digital ecosystems (EDEs)

EDS is *a systematic network of interconnected agents* (e.g., *The people* in the platform and other collaborating enterprises in their supply chain and value net), *factors* (e.g., *Good, service, financial and information flows*, etc.), *and forces (e.g. institutional and environmental incentives or limitations), whose collective interactions, inter-relations, and mutually beneficial transactions are supported by a system of macro, modular, and micro digital infrastructure*[30], *created, maintained, continually advanced, and operated by the digital operator(s), such as a digital muti-sided platform, which are embedded in their EDS , using the system, and support it over time*[31].

Discussions

This discussion will examine four related topics, as follows:

1. ***The entrepreneurial ecosystem's definition and the online digital platforms.*** In light of the above definition based on earlier discussions, including the earlier examples of collaborative consumptions (e.g., AirB&B, Uber, eBay, amongst many others), and the core pillars of the EDE definition, corresponding with the platforms' significant operational dimensions in a selected list of multisided digital platform with different characteristics, comparatively analyzed and presented earlier in Table 1. This comparative analysis portrays both the commonly shared and differentiating aspects of platform operations reflecting the evolving digital entrepreneurial ecosystems, underlying platform operations, some of which are dynamically changing and evolving overtime, as most entrepreneurial initiative affect their micro ecosystem in their own ways. However, the large and dominating digital platform appear to directly influence their own and indirectly the overall macro entrepreneurial digital systems through competition much more than their traditional counterparts (e.g., By firms in a traditional oligopolistic environments), as what, for example, Alibaba group and Amazon initiate were soon replicated by others to preserve their relative competitive position and in turn they are soon adopted as the new operating standard.

[30] It must be noted that *most of such micro, macro and subsystems are proprietary,* and owned by the platform operators and continually updated to contribute to their overall efficiencies and effectiveness for increasing operational competitive advantages.

[31] The principal difference between EDS and the traditional ecosystem is the entrepreneurial orientations (Miller 198X and REF, REF) and the strategic capabilities (Teece 2007) of the users that underlie and support both the principal digital enterprise, and possibly all complementors' (Hein et al 2020) competitive operation(s), which in turn, advance the capabilities of EDS and further distinguish them from the traditional ecosystems.

On the receiving side of platform operation are enterprises, people, (e.g., buyers and suppliers in both B2C and B2B relations) and their respective institutional environments, which change dynamically and evolve faster than their traditional counterparts in the past. Although platforms are in much stronger position to control the direction and path of change, people (both in their buyers and suppliers capacities) also play influential roles (as shown in Fig. 3b, above), which are much more effective than their counterparts in the past non-digital ecosystem. For example, a poorer (of slower) consumer ratings of the early buyers of a product from a platform can influence the sales' growth rate of a product and may cause its possible discontinuation eventually, as the platform's modular micro programs process and post the rating as they are submitted, regardless of their nature.

From a different perspective, the COVID-19 restrictions influenced consumer behavior and strengthen some ongoing trend toward, for example, higher online purchases, which in turn stimulated the growth of *collaborative consumption* and *collaborative production (CC and CP, respectively)* as well as multiplying the growth of *sharing economy, which had started much earlier by earlier platforms such as eBay* (eBay started in San Jose, California in 1995). However, the prevailing *institutional frameworks at the time, especially the cognitive, regulative and normative aspects in the newly emerging economies*, were not initially supportive of the required change, while the rapidly evolving global trends favoured the change, which were adopted later-on nearly everywhere[32]. (For a deeper and more detailed discussions, see Mercedes García-Cabrera and Gracia García-Soto 2023[33]). Consequently, the normative aspects of the prevailing institutional and legal frameworks gradually adapted the ongoing popular practice(s) in the direction of the on-going change, stimulated, if not expedited by, technological advances (For a deeper and more detailed discussions, also see Anwar 2023[34]).

2. ***Differences and similarities.*** A cursory examination of Table 1, and preceding discussions point to certain significant commonly shared and differing characteristics. Despite their initial business models in home-practices, the adoption of a global–local orientation (i.e., glocal – locally adapted global practices) of their operations is notable. Except for a very few with extremely large home markets, platform firms have aggressively internationalized for reaching many local markets *to further capitalize on network externalities for gaining higher global competitiveness against other highly competitive and large internationalized platform,* some of which have been on the verge of reaching the upper

[32] A brief examination of Table 1 shows that the size of B2B transactions of online digital platform, such as Shopify.com, doubled in less than three years starting in early 2020 due to COVID-19 forces of change.

[33] Mercedes García-Cabrera, A., Gracia García-Soto, M. (2023), Subnational institutional configurations and international expansion of SMEs in emerging economies, Journal of International Entrepreneurship, V21: 1 (Included in this issue of the journal).

[34] Anwar, S. T. (2023),The sharing economy and collaborative consumption: Strategic issues and global entrepreneurial opportunities, Journal of International Entrepreneurship, V21: 1 (included in this issue of the journal).

limit of county market potentials (i.e., 191 countries in cases of Alibaba group, Shopify and Spotify, amongst others). As expected, and documented, however, not all young entrepreneurial initiative succeed, grow internationally, and rarely dominate their industry (For a more detailed discussion of entrepreneurial decision in an experimental context, see Seloni et al. 2023[35]).

3. ***Functional, Strategic and Resource Difference.*** Some significant aspects of the platform operation are not observable and possibly not functional in smaller enterprises, including: (i) The presence of large network of installed base (e.g., Base of both buyers and suppliers) and the corresponding large network externalities, especially in markets and industries dominated by much larger and older platform operations (e.g., Ride hailing and rental accommodations have been dominated by Uber and AirB&B, respectively, which have effectively reduced potential market size for smaller and later platform in the local and international markets),(ii) The extent of the co-creation of value by autonomous complementors (e.g., Innovative independent suppliers) (Hein et al. 2019, 2020, 2016), especially the creation of incremental value based on consumer expectation and feedback in increasing CCV differed across the analyzed platforms[36]; and (iii) Relying on partners' and collaborators' proven capabilities to create strategical synergies and create incremental values out side their enterprise have not been a typical practice in the traditional smaller iSMEs in the past.
4. ***The Need for Learning and Emulating by iSMEs.*** Table 1 also documents the rapid international growth of the digital platforms to their dominance, making competition for smaller iSMEs more difficult than before. Their rapid growth, however, has documented effective international growth pathway(s) for other to follow, which should not only be emulated, but also modified and updated dynamically by aspiring iSMEs to compete and grow internationally. They can, for example, capitalize on the ongoing evolutionary change in both their local and regional markets, as digitization reduces dependence on a particular market and the digitized enterprise need not follow the traditional growth paths[37]. Logically, the evolving change in the entrepreneurial digital ecosystems will inevitably open-up new opportunities, on which new start-up platforms can capitalize[38]. Such potential opportunities would in turn open-up rich potential markets ahead, where the learnt lessons of digital platform operations and the entrepreneurial digital ecosystems could facilitate starting up new digital iSMEs as the internationalized small digital venture (ISDVs) have done already (Etemad 2022a) and at the same time avoid

[35] Seloni, G., Kusrohmaniah, S.,Lufityanto, G. (2023),The perils of acting rashly: Risk-taking propensity impeding emotion-based learning in entrepreneurs, Journal of International Entrepreneurship, V21: 1 (included in this issue of the journal).

[36] The comparative analysis presented in table 1 is a part of an ongoing research, a part of which is found in Etemad (2022a, b, c and d).

[37] The traditionally constraining local experiential knowledge (Johanson and Vahlne 1977) can be provided by local collaborative suppliers on their own way to become international small digital ventures – ISDVs (Etemad 2022a).

[38] Many local taxi and transportation enterprises have emulated the Uber's original business model that was based on the early version of the collaborative consumption (CC), which has been modified in different ride-sharing, car-sharing, and very short car-rentals based on, for example, annual memberships.

glaring mistakes of the past (For a more detailed discussion of processes helpful to mitigating uncertainty, see Seloni et al. 2023). Furthermore, and based on the past experience and research, entrepreneurial opportunities are not available in wide open views, from which to readily select and easily exploit. They are created (Schumpeter 1934), alerted, recognized (Kirzner 1999/1973), or identified (Hayek 1945), and then ceased (Teece 2007, 2010 and Teece et al. 1997) with efforts of those who invest time and efforts to search deeper and far-beyond what meets the ordinary eye in open view or what is practiced routinely by others in the common environment.

The above arguments suggest that: i) when and If *opportunities happen to be easily identifiable*, start-ups seeking to exploit them will not only be numerous and facing more intensive competition, but they are also unlikely to be highly disruptive; while ii) When *opportunities are created*, they are less likely to face stiff competition at start-up phases and are more likely to disrupt the currently prevailing industries and lead to further expanding opportunities over time (as they will be closer to become a disruptive innovative enterprise—Schumpeter 1934). Viewed differently, larger opportunities can be created by innovative goods and services in the prevailing environment with potentials of disrupting the industry or disrupting the prevailing institutional framework and policy environment. However, the design of such strategies for yielding the most desired outcomes seem to be much *closer to opportunity creation* through innovative designs and strategy formulation than otherwise (for more details see Marjovi and Zarei 2023[39]). In short and in the context of this article, the early inceptions of the Internet and the world wide web served as the online foundations that created new environment open to opportunities, which enabled entrepreneurial visionaries, such as Jeff Bezos of Amazon, and Jack Ma of Alibaba groups, to conceive and construct the early foundations of their growing empires. Naturally, their early designs did not come-about easily and faced much operational challenges and difficulties, but disrupted the prevailing policy environment at the time. Their entrepreneurial, disruptive and innovative initiatives gave them the foundation for rapid and substantive international growth in a relatively short span of time (For mor detailed discussions, see the article by Marjovi and Zarei (2023) exploring the policy design counterparts of the above arguments).

Conclusion and implications

This conclusion will briefly highlight topics helpful to bringing closure to this article's two research question posed in the introduction and as well as clarifying related topics, as follows:

1. ***The evolving change in consumer expectation, behaviour, and marketing.***

[39] Marjovi, A., Zarei, B. (2023), Design-oriented policy interventions: The case of technology-based international entrepreneurship in emerging context, Journal of International Entrepreneurship, V21: 1 (Included in this issue of the journal).

Massive technological advances in communication and information have amassed a lot of information at little to no cost to consumers for their comparative analysis and consequent decisions. Not all buyers take advantage of the mass of available information available to them, but the discriminating and value-oriented consumers seek the get relevant information with a few strokes on their computer keyboards for assessing the comparative values of goods and services they intend to buy. This process will have two implications and an increasing important conclusion, including: (i) logically, discriminating consumers seek to maximize the overall value their purchase (i.e., the perceived value of product's core attributes and the value of all associated services) by analyzing most, if not all, information at their disposal, including consumer ratings, and (ii) they are more likely than others to provide their assessment and rating (even ranking) to the supplier for posting and publishing on its website; and (iii) more importantly, such consumer ratings may exert significant influence on consuming products to the higher success of some and demise of others. Consequently, principal enterprises must solicit consumer rating information and convey them to their own R&D department for improvement and subsequently to suppliers for producing improved and more valued products. In the context of Entrepreneurial Digital Ecosystems such collection and conveyance of the consumer information to the suppling iSMEs and ISDVs (Etemad 2022a and b).

2. ***The consequencs of consumer feedback and information in open information loops amongst the buyers and suppliers***. There is ample evidence to suggest that consumers acquire what offers them the highest consumer centeric value (CCV) if and when they can find goods and products with nearly matching their expectation in terms of their desired attributes. Regardless of what they purchase, most consumers provide evaluation and feedback in terms of direct replies to sellers, blogs and voluntary postings on the social media that promote some suppliers at the cost to others, even when it is not required of them. Ideally, such invaluable information should be forwarded through *an open information loop and fully used to improve upon the value of sellers' offerings, especially in the information-intensive emerging digital ecosystem (See* Fig. 3b*, where such open feed-back information loops are represented by curly arrows from consumers to sellers for conveyance to members of their supply-chain for improvements over time).* However, it is not clear if all suppliers examine consumer feedback for improving upon their offerings in general, and by iSMEs facing diverse consumers and environments with varying consumer tastes and expectations in particular.

In contrast to the above patterns, digital platform actively seek consumer feedback and analyze them for at least three purposes, including: i) Providing blind consumer evaluation ratings as measure of quality, reliabilities and value, which are bond to influence consumer decisions, ii) Indexing and positioning products on the basis of their consumer ratings reflecting consumers centeric perceived values, where offerings with higher ratings are presented earlier, and lowly rated products may be presentd later, and even dropped, and iii) Convey the received

information to their supplier to improve upon their respective product and services over time, which in turn is likely to result in higher valued co-creations by all parties involved. While such open feedback information loops have resulted in improved and higher values in digital platforms, it is not clear to what extent SMEs and iSMEs have actively utilized such consumer evaluation to improve upon the perceived value of their respective offerings. By Implication, a *fully open information loop of consumer feedbacks used by platforms should be emulated and adopted by iSMEs to compete more effectively, regardless of their location, time and size.*

3. ***In house value creation versus co-creation in collaboration with autonomous complementors.*** The emerging entrepreneurial digital ecosystem is providing for tow value creation options, including: i) Outsourced Supplies are mostly outsourced through sub-contractors who have no access to consumer information, and only supply what their supply contracts stipulates; ii) Firms' own received consumer feedback can be used to improves upon them through the firm's its internal R&D with improved formulation of components or the whole products, to be then internally or jointly sourced, and iii) the consumer feed back is shared with specialized supplier to improve upon their offerings as autonomous complementors (Hein et al. 2020) (i.e., that is what some platforms require from their suppliers), which opens the possibility of higher co-created values by autonomous complementors solely or jointly with the platform. Regardless of the utilized procedures, the processes highlighted above involve multiple constrained dynamic optimizations—maximize vale and minimize costs to increase CPV or CCV constrained only by the firm's capabilities and resources, which stands a higher chance of achieving better results by co-creatin as opposed in hose value creation.

The overriding managerial implication of this article and the prevailing entrepreneurial digital ecosystems in general, and the above discussion are that the multi-sided digital platform operations are offering highly efficient and effective processes and procedures that are well worthy of emulation and learning by all enterprises and especially by iSMEs, who aspire to grow internationally while forced to compete with them. The scholarly implication of this article is that the topics of multi-sided digital platforms, operating within their own entrepreneurial digital ecosystem(s) is under explored and deserve extensive scholarly research attention. The public policy implication of this article is that SMEs, and especially iSMEs, need a highly conducive and supportive environment(s) to adopt new technologies for gaining higher capabilities to compete globally effectively.

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