



# Technological Innovation and the expansion of Entrepreneurship Ecosystems

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## Abstract

To date much of the entrepreneurial ecosystems literature treated ecosystems as confined geographic locations with definitive boards. However, in the past decades, technological innovation and developments in social relationships (e.g., online platforms, social media, and the sharing economy) have extended and blurred the boundaries of entrepreneurial ecosystems. Thus, current research on entrepreneurial ecosystems often underestimates the reach and impacts of a given ecosystem. To remedy this, we advocate the use of a more holistic approach in modern entrepreneurial ecosystems frameworks which includes social relationships and technology, thus extending beyond geographical barriers. We discuss how technology has dissolved locational barriers and connected elements of ecosystems, how social relationships maximize advantages through greater resource access, and how the entrepreneurship ecosystem now exists on a plane that is both physical and cyber.

**Keywords** Entrepreneurship ecosystems · Technology · Online communities · Social exchange · Innovation · Social relationships

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## 1 Introduction

Scholars, policy makers, and entrepreneurs have steadily increased their interest in understanding entrepreneurial ecosystems (Acs et al. 2017; Beliaeva et al. 2020). The perspective of entrepreneurial ecosystems offers the constituents of a region the means to understand their regional entrepreneurial context. As such, the ecosystems perspective allows policy makers a framework for understanding why their location is succeeding (or failing) and guides entrepreneurs to recognize favorable locations or environmental limitations. Moreover, the perspective does not assume that ecosystems are fixed but ascribes a level of dynamism to the ecosystems such that invested constituents also have a means to rehabilitate the ecosystem (Isenberg 2010; Bouncken and Kraus 2021).

The study of entrepreneurial ecosystems stems from the biological concept of an ecosystem, in that a biotic community consists of a physical location in which living and non-living elements interact, exchange and flourish (Tansley 1935). Locations play a key role in building entrepreneurship because of the role of relationships and infrastructure in providing resources to entrepreneurs (Shane 2003; Spigel 2018). As such, scholars often work from a regional viewpoint where entrepreneurial ecosystems are conceptualized as being confined to a single location or environment (Stam & Spiegel, 2017; Terjesen et al. 2017). Scholars and policy makers working from the confined environment point of view may consider themselves as like ecologists who study topics such as productive versus desertifying grasslands. However, over the past several decades research in ecology has shifted away from studying environments in isolation and has accepted that a key challenge when studying natural ecosystems is the temptation to define the ecosystem too narrowly (Savory and Butterfield 1999). That is, ecologists often find it convenient to draw an arbitrary boarder around an environment such as a large pond, label it as a wetland, and then confine their study to the defined region. However, such a narrow approach overlooks how the large pond interrelates with all the other parts of the environment as a tangled web that forms the whole of which is affected by technology and society (Savory and Butterfield 1999).

Although ecosystems research in natural science has been compelled to take on a more holistic approach to understanding how technology and society affects the environment, entrepreneurial research has resisted such a shift. Much entrepreneurial ecosystems research still takes a comparative approach that rests on the assumption that ecosystems exist within the confined borders of a city, region, or country despite social and technological developments (Acs et al. 2017). Furthermore, the first two decades of the 21st century have brought vast social and technological changes ranging from the proliferation of social networks to the sharing economy which have played a role in extending entrepreneurial ecosystems beyond the conventional, geographical boundaries and blurred the lines with digital ecosystems (Matzler et al. 2015).

The purpose of the present manuscript is to serve as a springboard to propel modern entrepreneurial ecosystems frameworks to take a more holistic approach. To this end, we consider how our changing society, market, and world has extended entrepreneurial ecosystems far beyond the boundaries of their origin points (i.e., cities,

regions, or countries). We form three contributions to the topics of entrepreneurial ecosystems, social relations, and the impact of technology. First, we showcase how the spread of technology has caused the arbitrary boundaries of entrepreneurial ecosystems to further expand, as technological platforms can interconnect elements of ecosystems across the globe as digital ecosystems. Second, we integrate entrepreneurial ecosystems with social relations to further articulate how entrepreneurs in an ecosystem may gain access to resources and make the most of an ecosystem. Third, we discuss the potential downsides that members of an ecosystem can face as the result of growing technological platforms.

## 2 Entrepreneurship ecosystems

Entrepreneurship ecosystems refer to the “conditions that make ecosystems more or less favorable for entrepreneurship activity (Liguori et al. 2019, p.8).” Given entrepreneurial ecosystem research stems from natural phenomena, scholars have therefore conceptualized and measured entrepreneurial ecosystems as geographic regions (Liguori et al. 2019; Kang et al. 2021). Likewise, the aspects of the ecosystems such as material, social and cultural components are what define the region and influence entrepreneurial intentions (Spigel 2017).

Scholars have been correct to place the geographic region as the forefront of the ecosystem. For example, geography plays a key role in determining an entrepreneurial ecosystem and economic development (Isenberg 2010). Silicon Valley benefitted immeasurably due to the presence of very prestigious institutions such as Stanford (Adams 2005). Likewise, the cultural aspects of a given region like Silicon Valley, e.g. play a crucial role in determining the entrepreneurial ecosystem (Saxenian 1994). Furthermore, even something such as weather can determine the interactions of an ecosystem. Silicon Valley’s location in a pleasant and stable climate plays a key role in gathering human capital. Likewise, the region also plays an important role with the establishment of government. In another case, part of the reason why New England was a center of trade during the Colonial period came from a combination of the government structures, but also the access to a large and easily navigable bay (Bailyn 1955). Similarly, Chicago, due to its prime location, became the meat packing capital of the world, because it is located in the center of a country (Walsh 2015).

Spigel’s (2018) description of an ecosystem, such as the material, social, and cultural attributes have a regional focus. For example, worker talent and universities are going to be key drivers in an ecosystem of the level of human capital. The presence of role models plays a key role in helping entrepreneurs by providing inspiration and increasing their entrepreneurial efficacy (Bosma et al. 2012). Likewise, Isenberg’s attributes such as policy, capital, culture, markets, supports, and human capital, have a very strong reference to a geographic region. In fact, Isenberg (2011, p. 9) is very clear about the geographic focus: “As we look around the world, entrepreneurship tends to be geographically concentrated in specific regions, cities, neighborhoods, and even buildings.” Furthermore, ecosystems include various attributes such as markets, finance, and access to various instrumental resources. (e.g., Liguori et al. 2019; Bendickson et al. 2020).

Part of the explanation is that economic activity is socially embedded within a larger network of relationships (Granovetter 2017; Fernandes and Ferreira 2021) as non-institutional drivers of entrepreneurship (e.g., networks and thus relationships) also play an important role in entrepreneurship ecosystems (Bendickson et al. 2020). For social relationships to be stable and productive, they must have a certain or consistent level of social interaction, and the more frequently they maintain this interaction, the better (Homans 1950). Traditionally, the only way to effectively interact was on a person-to-person basis (Homans 1961). As modern society emerged, ecosystems became larger and more diverse, but also remained focused on the regional feature due to the importance of social relationships (Stam, 2015; Granovetter 2017). These social relationships allowed for a wide variety of resources to be exchanged, both tangible and intangible resources (Foa and Foa 1976; Foa et al. 1993).

In part, the reason why these relationships are needed is because the market could not allow all types of resources to be exchanged (Granovetter 2017). Social relationships helped to reduce either the cost of using the market or gaining resources that could not be exchanged in methods other than through a social process (Fiske 1991, 1992). Love and social support, for instance, cannot be purchased, but instead can only come from someone willing to be vulnerable to someone else (Wilson et al. 2010). In addition, social relationships can be expanded from a direct relationship to an indirect relationship where weak ties can provide to be beneficial (Granovetter 1973). Basically, a person can interact with someone through a friend or associate. This type of social relationship allows for the exchange of resources. Even the establishment of an impersonal market has some geographic component to it (La Porta, Lopez-de Silanes & Shleifer, 2008).

According to Fiske (1991, 1992), there are four types of general social relationships, each of these relationships have different rules and roles in the exchange process through the types of bonds produced. The first type of relationship is market pricing, whereby people use the market to transact for goods and services with some type of payment, usually cash. Fiske (1992, p. 691–692) defines market pricing as “Market pricing (MP) relationships are based on a model of proportionality in social relationships; people attend to ratios and rates. People in an MP relationship usually reduce all the relevant features and components under consideration to a single value or utility metric that allows the comparison of many qualitatively and quantitatively diverse factors.” However, this type of relationship is limited in the types of resources being exchanged (Foa and Foa 1976). For example, resources that are primarily affiliation based, such as social support, or communally based, such as shared history, cannot be exchanged through the market, either because the resource is universal (everyone owns it) or because it is so highly personal in nature. Therefore, other types of exchanges are needed.

The next type of exchange is equality matching, which features equality of exchange over time. Fiske (1992, p. 691) defines equality matching as: “Equality matching (EM) relationships are based on a model of even balance and one-for-one correspondence, as in turn taking, egalitarian distributive justice, in-kind reciprocity, tit-for-tat retaliation, eye-for-an-eye revenge, or compensation by equal replacement.” These relationships do not define the terms of the exchange upfront and require both parties to have trust that their behaviors will be rewarded (Homans

1961; Blau 1964). These relationships feature reciprocity which enables them “to yield social stability” (Gouldner 1960, p. 161). This means that particular and close resources can be exchanged, and payment does not need to be upfront (Wilson et al. 2010). However, this exchange, much like market pricing, assumes relatively equal power and self-interest.

Fiske (1992, p. 690) defines authority ranking as “a linear ordering in which everyone’s rank can be compared with everyone else’s: In such a relationship you can always determine whether one person has a rank at least as high as any other given person.” Unequal exchange is where the dominant participant obtains resource advantages but, in the process, accrues an obligation to assist subordinates or provide support in the future. The central aspect of authority ranking is that a hierarchy exists and must be respected (Fiske 1992), however, both parties still have obligations towards each other. This type of arrangement is more common in traditionalist societies, but it also remains common when there is a power dependence in relationships, as there is between government and individuals. For example, with regards to regulations. Government regulations play a major role in determining how and where individuals can interact with each other as the government sets the rules of the game (North 1990).

Fiske (1992, p. 690) defines communal sharing as a relationship which is “based on a conception of some bounded group of people as equivalent and undifferentiated. In this kind of relationship, the members of a group or dyad treat each other as all the same, focusing on commonalities and disregarding distinct individual identities.” Usually this would refer to a family, tribe or clan and would appear to be more of a pre-modern arrangement. Exchange within a communal sharing relationship is heavily socially embedded. In the modern world, arrangements could be related to a family-owned business. Resources that are non-rival and shared by everyone in the community are another example of a communal sharing.

## 2.1 Social relationship types and technology

Entrepreneurs must use society and their own social relations to gain access to resources to help overcome the liability of newness and smallness (Muldoon et al. 2018). The liability of newness is a threat to companies, particularly when they need to learn new activities or have a lack of reputation (Stinchcombe 1965). The liability of smallness comes from the idea that a firm lacks the resources to compete (Ko and Liu 2017). Both are direct threats to smaller and newer companies who face the gravest threats to their survival during the early phase of the business. Therefore, entrepreneurs must use the social networks embedded in the system to gain reliable and exclusive information and resources; reductions of transaction costs; collective social action and learning opportunities (Muldoon et al. 2018).

However, these networks only work when trust is present, so that exchange partners know the rules of the game. Muldoon et al. (2018, p 162) notes that trust is the extent to which “one party (a trustor) can rely on the other party (a trustee) to act in a benevolent way in a risky situation (Fukuyama 1995; Mayer et al. 1995; Welter 2012), as well as a willingness to be vulnerable (Rousseau et al. 1998).” Those who violate the trust of their exchange partners should expect social sanctions, as word

of their deviance will spread and impact their reputation—which in turn will harm other present/future economic and cooperative relationships (Midgett et al. 2018). Even at an institutional level trust is created through society’s formalized norms and rules that guide human interaction (North 1990). That is: certain “practices ‘are taken for granted as “the way we do these things”” (Scott 2001, p. 57). Accordingly, the behavior of partners is coerced into uniform acts which allows for standardization of behavior.

The reason why social and institutional sanctions exist is that they help to reduce information issues (North 1990; Scott 2001). Information is a critical resource in decision making. For example, in a market transaction, where price is the coordinating mechanism, how can an exchange partner understand that the price is efficient without access to appropriate sources of additional information? The market with its efficient price mechanism can lead to a lack of optimal results without access to other types of information (Spence 1973; Akerlof 1978). Even in the modern economy the lack of information still leads to a market for lemons (e.g., low quality product that is still sold) (Akerlof 1978). People form social relationships, in part, to reduce asymmetrical information in exchange. A social relationship that lacks consistent interaction may lack trust, the norm of reciprocity may be reduced, and the types of resources exchanged will be lessened. In the case of government regulations, without a clear documentation of the terms set out in the regulations (an additional source of information), obedience to government rules will be reduced. Finally, without a ‘commons’ (i.e., common pool resource), there is little in that way that communal sharing could occur (Ostrom 1990). However, such a viewpoint, although still important, ignores the crucial role of technology in moving past the limitations of geography and region. Even in the 19th century, before the advent of modern information technology, ecosystems received financing from outside sources, such as British or New England bankers (Chandler 1954; Eichengreen 1995). The telegraph made these types of transactions possible as it interconnected places.

In the modern world, information technology allows for new means of organization (Van Alostyne, Parker & Choudary, 2016) and modifies existing relationships. Information technology allows for the development of platforms which allow geographically dispersed individuals to gather with lower costs and operate with less capital driven processes. Information technology essentially creates, online, a farmer’s cooperative or other sharing arrangement in that people can get together, connect and exchange. Such a model can allow for different types of interactions, such as two-way markets, that would not as easily exist in a purely face to face exchange. The best of these types of exchanges also allows for buyers and sellers to rate each other, reducing the occurrence of information related problems (Van Alstyne et al. 2016). This approach alters the way we exchange (and the social bonds of exchange) but also allows for the development of new resources. Our contention is that ecosystems should consider the role of technology in changing these relationships.

## 2.2 Technology and online communities

Online communities are groups of people that interact primarily through the internet and who share a common interest (Davis 2016; Puschmann and Alt 2016). Online

**Table 1** Shift from regional ecosystem to regional/cyber

Type of Transformation
Increases exchange partners
Increase of resources and types of resources exchanged
Follows Metcalfe's Law due to Network effects
Reduction of costs
Increase of innovation

communities can be hosted, or autonomous in nature. In the sharing economy, most communities are hosted because there is an authority that is defining and monitoring the purpose of the community (Sundararajan 2016). In an autonomous community, users determine purpose and content. Platforms may be communicative like Facebook/Twitter or transactive such as Uber or Ebay (Acquier et al. 2017). Online communities have the potential to expand organizational and ecosystem boundaries and capabilities by providing access to resources, customers, suppliers, and general inputs that they would not previously have access to, as well as to impact culture (Heinze and Heinze 2020). One potential outlet is platforms which allow for more efficient information sharing (Albinsson & Perera, 2012; Schor and Fitzmaurice 2015). This could lead to an increase of potential knowledge, as users could freely share their innovations with the community (Jeppesen and Frederiksen 2006) and also lead to greater dissemination of information through customers' preferences, community descriptions and legal documentation. Another benefit of an online community is that mechanisms are created, such as reputation rankings, which could reduce asymmetrical information. In addition, a benefit of cyber commerce is that it eliminates the need for intermediators and allows for a direct relationship. Furthermore, through a rule known as Metcalfe's law, the increase of users, will lead to network effects whereby the number of users will sharply increase (Zhang et al. 2015).

We make the following arguments. Technology moves the entrepreneurial ecosystem from a geographic location to one that is both geographic and cyber based, thus larger. In the process, this will vastly increase the number of exchange partners that are available. In addition, to increasing exchange partners, the shift to geographic and cyber, leads to an increase of resources exchanged as well as the types of resources exchanged. For example, information technology allows for the establishment of two-sided markets, which means that even something like private property could be exchanged. The increase of resources will adhere to Metcalfe's law due to the influence of the network effect. The cost of exchange will lead to a reduction of costs for products due to economies of scale. For example, seeking advice from outside consultants will be easier and more efficient. Finally, the net result will be an increase in innovation due to an increase of information. To summarize, the role of cyber commerce is to move up the resources of the ecosystems (finance, customers, employees) to a higher level, which in the process expands upon the options that an entrepreneur can utilize (Liguori et al. 2019; Bendickson et al. 2020; Lange et al. 2021).

There is considerable disagreement about definitions, effects, and even the benefits of online platforms (Acquier et al. 2017; Reischauer and Mair 2018), and there are also disagreements on whether platforms such as the sharing economy reduce or increase consumption, whether platforms are capitalistic or socialistic in nature (Acquier et al. 2017; Midgett et al. 2018). After much promise, the technology boom,

**Table 2** Social Relationship Types and Outcomes

Type of relationship	Definition: This type includes:	Technological impact	Disintermediation
Market pricing	<ul style="list-style-type: none"> <li>♣ Strangers haggling over the price of an item who do not intend to meet again</li> <li>♣ competitive negotiating tactics</li> <li>♣ instrumental and impersonal exchanges without self-disclosure</li> </ul>	<ul style="list-style-type: none"> <li>♣ reduces asymmetrical information, promoting greater efficiency.</li> <li>♣ creates two-way markets—bringing people together</li> <li>♣ shifts resources to the market</li> <li>♣ encourages competition</li> <li>♣ increases efficiency</li> </ul>	Buyers and sellers do not need a distributor but can have direct commerce.
Equality matching	<ul style="list-style-type: none"> <li>♣ equality of exchange over time</li> <li>♣ repaying favors while accepting new favors, all the while trying maintain a balance between the two actions</li> <li>♣ “Tit-for-Tat”</li> <li>♣ The typical rules of common courtesy</li> </ul>	<ul style="list-style-type: none"> <li>♣ brings people together regardless of geography</li> <li>♣ increases exchanging.</li> <li>♣ more information</li> <li>♣ more emotional support</li> <li>♣ spreads history</li> </ul>	♣ Entrepreneurs can use the internet to find mentors and contact them directly rather than using weak ties.
Authority ranking	<ul style="list-style-type: none"> <li>♣ Negotiated inequality</li> <li>♣ one party is given dominance or status over others.</li> <li>♣ the dominant party exchanges a preferential access to resources and takes on the responsibility to care for the non-dominant parties.</li> </ul>	<ul style="list-style-type: none"> <li>♣ greater access to the rules</li> <li>♣ opportunity to undermine or find better jurisdiction.</li> <li>♣ opportunity to gain or place protégés</li> </ul>	♣ Websites can have regulation which eliminate the need for paying for basic legal advice.
Communal sharing	<ul style="list-style-type: none"> <li>♣ people contribute what they can and take what they need</li> <li>♣ usually constrained to a type of inclusive group or a nuclear family (also extended family in some situations), rarely beyond</li> </ul>	<ul style="list-style-type: none"> <li>♣ allows for the connection with distant family members.</li> <li>♣ gaining legitimacy from outside groups to overcome the liability of newness</li> </ul>	♣ Allows for the sharing of stories with aspiring entrepreneurs more directly and correctly.

which was introduced during the 1990s has become reality, today (Weissman 2021). People use platforms to transact, gather information, interact, and even find romantic partners. The fastest growing section of the economy has been the sharing economy. Companies such as Uber, Amazon, and E-bay, which feature peer to peer interactions, are worth billions of dollars. Firms also often use job platforms such as monster.com or indeed.com to post jobs and search for applicants. These online sharing platforms have transformed the way we do business and, as a result, should change the way we perceive ecosystems.

### 3 Social relationship types

Relatedly, the four types of general social relationships, as identified by Fiske (1991, 1992) and previously introduced, are relevant to these exchange situations and provide an insight into social relations and technology located in entrepreneurship ecosystems.



### 3.1 Market pricing

Market pricing is an exchange mechanism based on people using the market to buy and sell their products and services usually through a single value or utility metric (e.g., price) (Fiske 1991). The most common method of market pricing is monetary exchange which is determined through the effect of supply and demand, which determine the utility metric of the product. Markets are generally efficient since they operate under impersonal conditions (Stigler 1987). The prototypical economic exchange is the mortgage; as the timing, value and type of payments are clearly stated upfront. An advantage of this exchange type is that there is little of a personal nature in the exchange (Blau 1964). People who hate each other can become exchange partners. Yet, it is also crucial to recognize that prices, while efficient, often require more information. Embeddedness is an important concept to help eliminate issues such as imperfect information (Granovetter 1985).

The use of platforms can greatly transform mechanisms of market pricing. One of the ways is in the reduction of asymmetric information through the creation of two-sided markets (Sundararajan 2016). Asymmetric information occurs when one party has more knowledge than the other party, placing them at a grave disadvantage (Spence 1973). One of the outcomes of asymmetric information is adverse selection, which occurs when one party selectively participates in trades that only benefit them, while disadvantaging the other party (Mailath and Samuelson 2001). One of the key examples of asymmetric information is car selling. Because buyers do not have ready access to the information in its entirety, they could be placed at a disadvantage. Another example would be the job applicant market. How does a human resource firm effectively judge each resume? How do they know that the information on the resume is accurate? How does the applicant know that the company is a good place to work? Asymmetric information is a common problem with market transactions (Spence 1973).

However, there are remedies to asymmetrical information. The first is signaling, which occurs when people can signal information about themselves, product, or company. Spence (1973) gives an example of education as an example of signaling. Educational experience can provide signals related to intelligence, conscientiousness, integrity, and other characteristics that employer's desire. The second strategy is screening which occurs when one party seeks to learn as much as the other party by getting that party to reveal their preferences (Spence 1973). Sharing platforms can aid in this because both parties can leave a trail of their previous actions (Sundararajan 2016). For example, employers can review Facebook to find out about potential job applicants. Or employees can find out about employers by potentially seeking out current or previous applicants? Likewise, platforms can also provide information about the integrity of members within the ecosystem by listing distinctions such as the Better Business Bureau.

Another important aspect is that platforms allow for the creation of two-way markets and the sharing economy (Sundararajan 2016). Both factors can greatly increase the size of resources within an ecosystem. A two sided-market occurs when both exchange partners receive the benefits of network effects—when they can directly interact with each other. Thus, a two-sided market can lead to a reduction of infor-

mation issues because both parties take an active role in interacting with each other. Sharing platforms allow for these interactions to occur and also provided social sanctions to partners who do not adhere to certain standards, reducing potential misconduct (Pinelli et al. 2022).

A significant benefit of information technology is that it allows for the creation of a sharing economy. A sharing economy occurs when participants borrow resources from each other (Sundararajan 2016). This type of economy originally occurred mostly between friends, but it has since moved into market transactions as well. According to Belk (2007; 2014), sharing occurs when one party values something from the other party, and wants to exchange with them. Typically, this type of transaction was based on a social exchange, between friends, associates and families. However, the emergence of online platforms allowed for the transformation of sharing into a monetary exchange. In terms of supply, individuals can rent out property that would not have been in use without sharing. People can thereby gain access to cheaper resources (Davis 2016).

Sundararajan (2016) points out five features of the sharing economy. First, the sharing economy is market-driven because information technology allows for the construction of two-sided markets. Buyers and sellers can evaluate each other, enabling from an increase of resources that could be exchanged. Second, high impact capital such as cars, homes, or human capital can be exchanged. Third, the relationships have a social incentive, if one exchange partner does not follow through, there is a social record of the issue, meaning that their reputation is damaged. This is especially salient because online communities are shared by like-minded people (Inglehart and Welzel 2005; Hamari et al. 2016). Fourth, the relationship is now more personal, because renting a home or someone driving you to the airport is a bit different than renting a car from a faceless company. Fifth, the sharing-economy moves past markets and hierarchies in that it creates relationships that are both market and social in their action, creating a more dynamic economy (Botsman & Rodgers, 2010).

The benefit of the sharing economy is that it could allow for spillover effects on other actors within the entrepreneurial ecosystem. For example, a town such as Augusta Georgia, home of the Master's Tournament, can increase the number of tourists that Augusta and surrounding towns such as Aiken South Carolina are able to handle, because it increased its hotel capacity. This capacity has been increased because it is taking existing resources and transforming their purpose. In addition, to increasing capacity, the sharing economy also allows for the reduction of cost, due to increased competition and potential economies of scale, which lead to additional people interacting with the ecosystem.

Customers and suppliers can come from outside the ecosystem, or the exchange can occur outside. For example, a company can find employees from a web board of people who might not have been connected when the ecosystem was only regional. Likewise, customers might hear of an excellent restaurant, entertainment center or business, and travel to join in the experience afforded by those businesses. Also, a used book seller might do most of their business completely online. Therefore, sharing platforms can expand the ecosystem greatly.

### 3.2 Equality matching

Equality matching relationships occur between peers that are equal and can confirm tangible and intangible benefits. One of the major aspects of equality matching are social exchanges, which are relationships where partners have a “general expectation of some future return, [although] its exact nature is definitely not stipulated in advance” (Blau 1964, p. 93). This implies that the relationship is going to be long lasting, confer benefits on both parties, and lead to social stability. The benefit of this type of exchange is that these relationships allow for particularistic resources to be exchanged. In market relationships, resources are universal, in that anyone could exchange them. Money is the prototypical example as it does not matter who exchanges it. A particularistic resource refers to situations where the identity of the those involved in the exchange is a key aspect of the transaction (Wilson et al. 2010). Affiliation, friendship, love, mentoring, are examples that are only of value to the exchange partners.

To borrow an example from Homans (1961), a social exchange occurs when an entrepreneur asks his college professor for advice on the legal aspects of his startup business. The reason why the entrepreneur would ask his professor is because the monetary cost is less, they trust their professor, and the prior relationship means that they shared history and knowledge. Spigel (2017, p. 54) demonstrates the benefit of this type of relationship: “Having a mentor increases an entrepreneur’s performance (Bosma et al. 2012; Ozgen and Baron 2007) and their presence in a region increases overall firm formation and survival rates (Lafuente, Yancy, & Rialp, 2007).”

Spigel (2017, p. 54) also demonstrates the importance of the geographic component of the relationship: “actors with high levels of social capital who proactively build new connections between entrepreneurial actors, helping to improve firm formation and growth within regions.” This is partly due to actors who may seek to promote within their region. As well, equality matching, which requires behavioral interaction for two reasons. One, consistent exchanging reduces the power difference between exchange partners and creates greater sense of obligation. Two, individuals who consistently interact tend to develop strong, personal feelings. These types of relationships have historically required physical interaction and it has been difficult to have a long-term relationship with someone long distance due to cost and lack of interaction.

However, the establishment of online communities allows for people to interact without being in the same physical location and can create strong levels of trust, social exchange, and reciprocity (Faraj and Johnson 2011). Zoom, skype, email, and other virtual communication systems that have reduced long distance costs allow for relationship partners to be in vastly different locations while still enjoying most of the benefits inherent in equality matching relationships. From an entrepreneurial ecosystem perspective, this means that exchange partners can still exchange resources, thereby strengthening the ecosystem (Hagel 1999). References outside the ecosystem can be used to support someone within the ecosystem. A person applying for a job could appeal to a contact outside of the system but know people within the ecosystem. Likewise, mentors, friends, family, and acquaintanceships can provide support

for people within the ecosystem. Entrepreneurs can vicariously model the successful by interacting with successful entrepreneurs in a completely different locale.

For example, an entrepreneur may move to a new ecosystem and launch a product developed in the entrepreneurial management class from a university in a different location. Through email and zoom, they could still be in contact with their professor. They could also have mentoring relationships with entrepreneurs they had encountered at their old institution. Likewise, they could use online communities to gather information and social support to aide in starting their business by interacting with people on platforms such as Reddit or Facebook. They might find additional customers and suppliers through a Facebook search. They could sell their products on E-bay. They will be able to learn from competitors in other ecosystems through Facebook. Therefore, information technology can expand and enrich the equality matching within an ecosystem.

### 3.3 Authority ranking

Authority ranking is seen mostly in traditional societies, where social rank is extremely important (Fiske 1992). A modern example of authority ranking would be the acceptance of orders in the military or the procession of officials during a ceremony such as a coronation. Superiors are to be respected by their subordinates. However, superiors must also protect their subordinates. According to Fiske, the relationship is not based upon outright coercion, which would be a null relationship. Rather there is a give and take component to this relationship, whereby there is no haggling, authority is considered just and legal, both parties have obligations and there is a hierarchy. While primarily found in traditional societies, authority ranking does have an impact in entrepreneurial ecosystems. Organizations often copy other firms, associations or government to maintain legitimacy and avoid social or legal sanction. The taken-for-grantedness of institutions means that they constrain societal actors to act in accordance with “the way we do these things” (Scott 2001, p. 57).

Even entrepreneurship, as potentially disruptive as it can be, requires certain institutional support. Scholars and politicians often look to public programs and policy as a means to support entrepreneurship through offering subsidies, tax benefits, funding, and removing cumbersome regulations (Huggins and Williams 2011; Mason and Brown 2013, Spiegel, 2017). In Isenberg’s (2010; 2011; 2014) framework, as previously introduced, governments play a crucial role through regulation, financial support, and legislation. Corporations cannot sell illegal drugs, must pay their taxes, must adhere to safety, discrimination, and harassment policies, and adhere to the norms of the community. Failure to do so will lead to sanction with fees, jailtime dissolution of the company, lack of support, or driven into the underground economy. Therefore, authority ranking plays a key role, even in entrepreneurial settings.

However, this relationship is modified by information technology as licensing, legal obligations, and access to government resources can be increased as either it increases access to experts or makes them more accessible (Zavattaro et al. 2015). For example, an entrepreneur can, either directly or indirectly, get information on government funding and aid for their business for deprivations suffered by the COVID-19 crisis. They can receive information about their tax status, lookup laws and gather

information from an online platform. In addition, businesses can address or be addressed by social media. Facebook, Twitter, Instagram, and other online platforms have given a voice to communities. A business that has an issue with the government, such as the government requesting an illegal tax, can air their grievance on social media (Ceron 2017). Members of the geographic and online community can address the government by supporting the business owner. Likewise, the business owner may face sanction if they commit a negative action. Someone who discriminates can face backlash, online boycotts, and even cancellation. Technology can lead to increased conformity which has the potential to limit entrepreneurial options (Weissman 2021), however it has also provided entrepreneurs with information about other ecosystems that may have more friendly business institutions.

### 3.4 Communal sharing

Communal sharing mostly has a socialistic feel (Fiske 1991). People generally contribute to a group in some form and take from the group what is needed. Unlike equality matching, there is no expectation of return or a concept of private property. The primary focus is the group, or what we could call the commons. This type of relationship is more typical in traditional societies than more modern societies. However, it can exist in modern society, such as when multiple people share the use of a printer. A non-rival resource is a resource that does not diminish when other people use it. An anti-rival resource becomes more valuable as it is consumed. Examples of these could be issues such as knowledge, culture, accreditation, or network size. Spigel (2017, p. 53) provides an example of a non-rival resource when he writes about the shared history within an eco-system: “Examples of successful entrepreneurs within the community provide a central focus for discussing the benefits and possibilities of entrepreneurship.”

An obvious value of online communities is that they can spread information and culture easily and rapidly. For example, an online community such as the official website for the city of Wichita, Kansas might include the rich aviation history of the Wichita ecosystem. They could provide biographies of the Beeches and Clyde Cessna or a university could list alumni who have been successful entrepreneurs as well. A community could also place information about the community such as economic, demographic, and social conditions in an online forum. Online communities could also encourage another way for individuals within the community to interact with each other. Even social gatherings could be listed. Part of the strength of an online community is that it provides people with similar interests a chance to interact. Potentially, cooperation could be greatly increased as there are more opportunities for interaction (Axelrod, 1984).

In addition, entrepreneurial start-ups can gain legitimacy from actors both inside the ecosystem and outside the ecosystem. One of the aspects of a liability of newness is that a corporation does not have a history or reputation to fall back upon. Without existing customers to spread word of mouth, a start-up may have a difficult time getting consumers to try the product. Some help could come from the social network of the entrepreneur. One way a corporation might mitigate this threat would be to use the internet to gain legitimacy from an outside or inside institutional actor who is

well-regarded. For example, it would make a lot of sense for a dog-training business to gain recognition from the American Kennel Club, which is well regarded in dog training circles, as they determine various ranks and list acceptable trainers. A trainer could then pass an online test and gain respectability due to this mark of distinction. It could signal to potential customers that they could expect a certain level of quality and increase the odds of survival, thus minimizing the liability of newness and using a sort of authority ranking to their advantage.

## 4 Discussion

Entrepreneurship ecosystems and the study/understanding of these ecosystems require a shift to a more holistic approach, thus we have indicated that ecosystems are much more than a geographical context and the understanding of the other components is necessary. Innovations in technology and the development of social relationships have allowed ecosystems to grow beyond their geographical locations and barriers. Perhaps the reason why researchers have found inconclusive (Tavoletti 2013) and contradictory findings (Bandera and Thomas 2019) in ecosystems research is that the arbitrary demarcations by zip codes and the like ignore how entrepreneurs really act. Indeed, given how ecommerce has changed business, scholars should have longer considered the influence of technology (Saura, Palacios-Marques, and Ribeiro-Soriano, 2021). While we do not suggest that technological has completely replaced geography as the basis of an ecosystem, we do acknowledge that cyber commerce extends and competes with geographical ecosystems.

As noted, entrepreneurship ecosystems cannot exist without social relationships as these relationships make up a needed component and bring along many advantages including lower market costs and the opportunity to exchange resources that cannot be exchanged outside of relationships (Fiske 1991, 1992). These exchanges are then defined by four social relationship types (market pricing, quality matching, authority ranking, and communal sharing) (Fiske 1991, 1992), and the process of exchange depends on the relationship type.

Market pricing as an exchange mechanism is largely impersonal and concerned with the cold monetary exchanged as determined by supply and demand. However, the availability of online platforms and the sharing economy has transformed this exchange type by reducing asymmetrical information, allowing for two-way markets, and the creation of the sharing economy (Sundarajan, 2016). The equality matching exchange type takes place between individuals of equal value (in some way), is behavioral and includes known tangible and intangible benefits (e.g., mentoring relationships). The geographic dimension is important in this type and technology development through online communities has allowed for greater exchange opportunities, thus the formation of larger networks as well (Faraj and Johnson 2011; Hagel 1999; Andrade-Rojas et al. 2022). Authority ranking is a more traditionalist exchange mechanism in that the social exchange occurs in a hierarchy (e.g., regulation from the government on ecosystems). Information technology has magnified this exchange type as it allows for access to a vast number of resources pertaining to legal obligations and to government agencies (Zavattaro et al. 2015). The fourth mechanism of

exchange, communal sharing, is somewhat socialistic (Fiske 1991) in that it includes social exchanges for the greater good without the expectation of returns. This can be illustrated by the passing of knowledge or cultural resources and online communities foster this exchange type by increasing interaction opportunities. Exploring the four social relationship types, the implications of technology development for these types, and the exchanges involved, exposes the complicated nature of ecosystems.

#### 4.1 Theoretical and practical implications

We expand upon entrepreneurship ecosystems research by connecting technology and social exchange in the innovation of the ecosystems, which provides greater insight into how entrepreneurship ecosystems function and are constructed. It is unquestionable that information technology enhances social relationships and the forms of social exchange mechanisms, by overcoming the barriers that geography poses and increasing the possibilities of interaction. As such, the players in entrepreneurship ecosystems and researchers should consider the impact that technology has on these ecosystems and the social relationships and deeper exchange mechanisms within. We suggest that, with technology (e.g., online communities and platforms), the entrepreneurial ecosystem is no longer purely geographic, but instead both in cyberspace and geographically located. This, in turn, increases the potential of resource exchange, in terms of the amount exchanged or number of exchanges, and as such also increases the size of a network (i.e., the number of appropriate exchange partners available). The access to various resource types is also increased and production costs may be decreased. Technology has transformed entrepreneurship ecosystems and through understanding the function of both technology as well as the complicated social relationships and exchange types in ecosystems, both researchers and individuals involved in an ecosystem can only benefit. The opportunity for players in an ecosystem is great in that they can use this understanding to maximize the advantages from connections and exchange opportunities as previously mentioned.

#### 4.2 Limitations and future research

Despite the salience of the emergence of online sharing platforms, there are multiple issues with this format. For instance, the potential for various cultural differences in online communities can be great in some instances. For example, an Indian entrepreneur attempting to learn from an American one may not receive adequate or acceptable information due to the social, cultural, and political differences between the two countries. Another issue is whether Jevons Paradox could occur, thus leading to more rather than less resources being consumed, through the reduction of cost and increase of efficiency. However, in the context of AirBnB, there is some evidence to suggest that it could lead to a reduction, since it is using existing buildings (Midgett et al. 2018). Another particular issue is that online communities can move away from production of community to a form of market relationships and neo-liberal ideology. Therefore, people within the community may find their expectations dashed. Likewise, there could be a conflict between local and non-local producers. A company that hires workers from outside the ecosystem may face issues. Another issue is that

online communities may disseminate false information, inspire higher conformity, and may provide even greater levels of controls. Finally, online communities require the support of the community. Too often members of the community fail to support the community.

To be clear, we are not arguing that geographical ecosystems will disappear. There are also considerable arguments showing that the promises of the sharing economy and online communities may be vastly overstated (Murillo et al. 2017). Partly for the reasons mentioned in the previous paragraph, there are downsides with online sharing communities that must be resolved. However, we, as a society, are clearly going through a significant transformation with how we handle business relationships. Covid-19 has exacerbated some of these long-standing issues by forcing businesses to mostly move to online platforms or go online entirely (Gianiodis et al., 2022; Cumming and Reardon 2022; Smith et al. 2022; Sharma et al. 2022). For example, universities, governments, and businesses have been using platforms such as Zoom to conduct operations. Business relationships are likely to continue in this transformation for the foreseeable future.

Future research could center on digging deeper into the four social relationship types, and how to reap the maximum advantages from each type with information technology. In particular, how cyber relationships communicate culture. Traditional ecosystems research with a well-defined geographic region should have a common culture (Hofstede et al. 2010). However, we could have a culture clash or differing model when entrepreneurs consider an ecosystem above a geographic region. Another outlet could be analyzing how successful entrepreneurship ecosystems are conducting each type of social exchange as enhanced by information technology. The paths for future studies are seemingly endless due to the complex and interconnected nature of entrepreneurship ecosystems through the lens of social relationships and technology developments. However, as mentioned previously, it is necessary that future studies take a more holistic approach to research on entrepreneurship ecosystems, while also keeping in mind the importance of the geographic location along with the other aspects.

## 5 Conclusions

Entrepreneurial ecosystems like natural ecosystems may encompass wider and more permeable borders than originally conceived. Although researchers and policy makers may be tempted to draw hard borders to delineate entrepreneurial ecosystems in the name of simplicity, entrepreneurship, like nature, does not innately recognize the borders or city limits drawn on maps. Furthermore, we shed light upon how technology plays a role in extending and facilitating social relationships which serve as the mechanism that conducts commerce within an ecosystem. We remain cautiously optimistic that the positives of connective technology will build richer, more varied ecosystems and will ultimately outweigh the limited set of negatives.

We agree that entrepreneurial ecosystems do have meaningful geographical locations, however, we contend that future researchers and policy makers should treat these locations differently as they have in the past. The geographical location should



be conceptualized as an epicenter, rather than a confined location, capable of far-reaching effects which may overlap other ecosystems' epicenters. Furthermore, we advocate that it is important to recognize that entrepreneurial ecosystems have both a physical and cyber side to them. While cities and regional economies may develop and grow, it is on the cyber side where we expect entrepreneurial ecosystems to grow exponentially in the future as the role of online platforms becomes an increasingly large force in commerce.

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