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Decision support for social innovation enabling sustainable development

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ABSTRACT

This paper offers a unique and powerful bottom-up methodology for social innovation promoting and securing Sustainable development goals (SDG's) in a wide variety of social innovation contexts founded on a bottom-up approach : it identifies four sustainable development enabling factors, (SDEFs) that make social innovation contributions to sustainability in all its forms. We Employ three level (micro, meso, macro) model of social Innovation. In the first four sections of the paper, we show how the SDEF's constitute social innovation success factors at the micro level, underpinning in ancient history, the enduing success of the Silk Road network of trade and, in recent history we reveal their role underpinning entrepreneurial innovation clusters bottom up. Yje concluding section shows how social innovation achievements implementing the SDEFs at the micro level can inform successful expansion into new contexts via adaptation and exaptation at the meso level and top-down facilitation at the macro level. .

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1. Introduction

This paper offers a unique and powerful bottom-up methodology for social innovation promoting and securing Sustainable Development Goals (SDGs) in a wide variety of social innovation contexts, founded on a bottom-up approach.

Satterthwaite et al. (2018) and Jimenez-Aceituno et al. (2019) advocate the incorporation of 'local lens' or 'indicators for local action' for social innovation enabling the implementation of Sustainable Development Goals (SDGs). Dahl (2016) stresses

> We should not wait for governments to act, as they always do too little, too late. The United Nations process is essentially top-down, building a global consensus among governments, which is very important, but not sufficient. The SDGs need to be appropriated by individuals, communities and civil society to start a bottom-up process, translating the goals into local realities. (Dahl, 2016, p. 4)

In this paper, we develop of a unique and powerful bottom-up methodology for social innovation that promotes and secures Sustainable Development Goals (SDGs) in a wide variety of entrepreneurial innovation contexts: We identify four sustainable development enabling factors, namely

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(1) Presence a trustworthy trading system for both private and public goods, together with safe transportation routes and payment systems for transacted goods.
(2) Need for communication facilities for provenance exploration, authentication and demonstration.
(3) Ability to establish 'Caravanserai' and promote transaction-based sustainable tourism supporting social innovation within the local community.
(4) Ability to build and support entrepreneurial innovation clusters bottom-up.

We show how these four factors, when implemented together, constitute enduring social innovation success factors that, in relation to the UN's "Sustainable Development Goals (SDGs), particularly goal 8, can enable a strong bottom-up contribution to sustainability in all its forms within an environmentally safe and socially just space in which inclusive and sustainable economic development takes place Jimenez-Aceituno et al. (2019).

1.1 Three levels of social innovation cycles addressed bottom-up

The analysis in this paper is cast within the framework of in the three-level (micro, meso, macro) model of social innovation cycles described by Van Wijk et al. (2019). In taking a bottom-up approach, the primary focus in the first four sections of the paper is on the first cycle in this model, located at the micro level of social innovation. However, we show in the concluding section (Section 5) how social innovation achievements implementing sustainability-enabling factors, at the micro level can inform successful expansion into fresh territories and contexts via adaptation and exaptation at the meso level and via top-down facilitation at the macro level.

Van Wijk et al. describe how the first cycle in their social innovation model

> zooms in at the micro level on individual enactors, proposing that actors become more agentic through their interactions with others. In these interactions, they experience emotions which enable them to hear and understand others' viewpoints, stimulating reflexivity, challenging taken-for-granted perspectives, and partially (or wholly) dis-embedding them from their governing institutional environment, creating room for new, innovative perspectives to enter their thinking and acting. (Van Wijk et al., 2019, p. 890)

Section 2 explores how in ancient history a set of four sustainable development enabling factors was responsible for the enduring success of safe local and transnational trading relationships throughout the ancient Silk Road trading network: enabling local entrepreneurial innovation clusters to flourish at the micro level through the Caravanserai support facilities thus built.

Section 3 reveals the role of these factors in recent history in underpinning the success of entrepreneurial innovation clusters of Small and Medium Enterprises (SMEs) and cooperatives when created and developed bottom-up at the micro level. We consider how they become dynamic, extended and platform-powered, paving the way for the future flourishing of platform-powered ecosystems, enabling participants to develop entrepreneurial innovation clusters focussed both physically at the local level, and virtually further afield.

Section 4 discusses the opportunities arising for building a Sustainability-Enabling Decision Support (SEDS) platform and identifies the features that can usefully be provided in four views linked to a sustainability enabling factors. We identify the opportunities for sustainability-enabling decision support (SEDS) that are thus opened up at the micro level together with specifications for decision support that can usefully provide within four sustainable development enabling views.

Section 5 examines how success stories, mediated by a SEDS platform at the micro level, can promote at the meso-level adaptation and exaptation into new territories, and support, at the macro level, top-down facilitation policies guided by these sustainable development enabling factors.

1.2 Current Need for innovative, creative and sustainable social innovation in emerging situations

Current developments during the period of the COVID-19 pandemic point to a future in which a sustainable global society will be powered increasingly by bottom-up efforts, enabling sustainable social innovation that do not rely on a top-down framework in which they would be positioned (and suffocated), but can work in the 'spaces in between'; existing, and now withering top down structures (for details, see Humphreys & Luk, 2022).

By 2021, many entrepreneurs who previously operated successful small business found that they were in a situation where they must completely rethink their business model to find success in the new world order. Steyaert and Katz (2004) define entrepreneurship as a 'model for innovative thinking, for reorganizing, and for crafting the new' but now we are faced with having to develop an understanding of 'liminal entrepreneurship" identified by Garcia-Lorenzo et al. (2018) as 'the organization-creation entrepreneurial practices and narratives of individuals living in precarious conditions in a "state" of "transition" where potentiality is at a maximum and actuality at a minimum'.

Garcia-Lorenzo et al. (2018) identify 'nascent necessity entrepreneurs' as people who previously had a career or employees in business sectors that contracted rapidly due to coronavirus-induced lockdown measures in 2020, no longer envisage a return to 'business as usual' in the foreseeable future.

> In the process of 'reaching out' to others to survive, they inevitably become aware and sometimes involved in addressing others' needs and a sense of 'Communitas' develops (Turner, 1977, 1995) that brings people of different backgrounds closer together. These networks and innovation clusters are developed by means of community exchange of goods and skills, and other creative survival responses. (Garcia-Lorenzo et al., 2018)

Thus, there is a strong potential for the growth of entrepreneurial innovation clusters in that can promote social innovation at the micro level in the new world order emerging after the COVID-19 pandemic. This builds on the increasing connectivity and related activities that the responses to lockdown engendered, and that entrepreneurship requires (Anderson et al., 2012). It enables the promotion of entrepreneurship a model for 'innovative thinking and crafting the new' Steyaert and Katz (2004) in a sustainable way.

This resulted in an increase of bottom-up making and sharing of creative media products that are not marketed for commercial gain but are distributed free of charge among and between friends and communities. These new public goods are designed and produced in order to provide useful information: sharing and telling 'how to', 'where to', 'what to' and 'when to' in order to help their viewers and readers succeed in a wide range social innovation of activities enabling sustainable development. This 'showing and telling' effort has led to increased use of creative and social media platforms for making and distributing, these kinds of products, made freely available by their creators. Magliacani (20202020) explains how:

> These online platforms could open a space for "decentralized dialogues" (Yu et al., 2013) extending the co-creation of value by engaging visitors, communities, citizens, entrepreneurs and other generic stakeholders.

This has resulted in opportunities for social innovation at the micro level following the bottom-up approach. With less pre-structured frames imposed on them, decision makers need to be built bottom-up innovative ideas and creatively to respond to the waves of disruptions impacting on traditional businesses and top-down management practices. Through experiencing the unprecedented situation, entrepreneurs become agile and creative in promoting activities enabling sustainable development bottom-up.

In the following sections, we examine examples throughout history that highlight the sustainable development enabling factors that promote social innovation art the micro level and also provide a good understanding on how they can best be met through current developments in decision support systems, which have the ability to offer safe multisided trading and provenance building facilities.

2 Sustainable social innovation in ancient history: making and trading along the Silk Road

The Silk Road was an ancient network of trade routes that was formally established, in the second century B.C., by the Han Dynasty of China. It linked the regions of the ancient world in commerce, from China in the East to Venice and Rome in the west, until 1453 when the Ottoman Empire boycotted trade with the west and closed the routes at the boundaries of its territories. As well as commercial goods, privately traded between visiting and local merchants in the markets linked with the caravanserai along the route along the routes, ideas and know-how were informally and openly exchanged as 'public goods', free of charge, benefiting the development of entrepreneurial innovation clusters in the cities being established around caravanserai along the silk road routes.

Many kinds of commercial goods were transported on the Silk Road routes. Travelling from west to east, the goods included grapevines and grapes; horses, dogs and other animals, both live and as furs and skins; glassware; textiles; wool blankets, rugs and carpets. Travelling from east to west, the goods included silk; tea; dyes; pottery (porcelain, plates, bowls, cups, vases); spices like cinnamon and ginger; and paper.

During its long history, the Silk Road flourished when its territories had benevolent territorial rulers whose policies facilitated, rather than obstructed, the trading ecosystem (Barisitz, 2018). The Silk Road existed not just as a trading system but also as a system that

enabled entrepreneurial innovation clusters to innovate creatively sand socially and thus generate wealth. The caravanserai was the key to this synergy between trading along the Silk Road routes and wealth development at the way-stations along the routes.

2.1 Caravanserai as trading, communicating and entrepreneurial innovation hubs

Staying in caravanserai enabled the visiting merchants to exchange goods and ideas, meet local merchants, creative makers and entrepreneurs, and in doing so, as well as trading their wares, to exchange cultures, languages and ideas.

The internal structure of the caravanserai facilitated this process of interaction, between the visiting traders lodging therein and the creative makers, craftsmen and traders from the local entrepreneurial in cluster, who would visit the caravanserai: not least because of hamams and bazars that provided local makers, entrepreneurs merchants and travellers further opportunities to meet, relate to, and transact with one another. And, in doing so, support social innovation and community development in the area surrounding the caravanserai. In this way, the Caravanserai provided the facilitation spaces to display goods for transaction and establish their provenance and space for discussion (trading of public goods).

This enabled entrepreneurial innovation clusters to be built and flourish through finding new markets, near and far-away, for their products and services, establishing links with distant locations providing needed resources. Caravanserai also facilitated social innovation, enabling creative entrepreneurs (makers) to share and transact their created resources with those who could make good use of them.

Caravanserais were places where travellers could rest, transact and recharge[1]

Between the 10th and 15th centuries, caravanserais were continually being formed, attracting growing volumes of trade, energising social innovation through the growth of creative entrepreneurial activities the cities in which they were located, and providing the wealth underpinning the construction of private, commercial and religious buildings with fine architecture, combining elements originating in other cities located along the routes.

2.2 Transaction of private goods: initiation of a safe transparent payment system

In commercial transactions at Caravanserai markets along the Silk Road, through the transfer of ownership between merchants private bartering was more common than buying and selling for transfer of ownership of private goods. While many different currencies were employed in marketplaces along the Silk Road, only silver and gold coins that were familiar to the local merchants were generally accepted by them. Hence, buying/selling involved not only the commercial transfer of privately owned goods but also the need to exchange the currency the travelling merchants brought with them for currency that would be accepted in local transactions.

Coins made of gold or silver were preferred for this exchange. The weight of the pure gold or silver metal that a coin contained served to establish its value in transactions for goods and services. While the use of coins was convenient for merchants in paying for accommodation and living expenses and transactions, involving of goods with relatively low value, in exchanges of goods of high-value merchants preferred to use a transitive method of payment that did not involve paying with quantities of gold and silver coins that were difficult for merchants to carry in their possession without risk of theft (see Whitfield, 2015).

In these exchanges, a tally system would be employed whereby both parties (buyer and seller) first agreed the total value of the quantity of goods offered by the visiting merchant, then matched their declared value with a quantity of goods of equivalent agreed total value offered in exchange by the local merchant. No money changed hands, but details of the transaction would be entered in a shared ledger that was generally accessible at the caravanserai where the transaction took place. During the transaction, the entry in the ledger became a unit of account, a medium or exchange and a store of value, constituting a transitive form of currency, tied to the transaction, and thus safe from theft, exploitation or devaluation.

2.3 Transaction of public goods: sharing and extending ownership in order to promote social innovation

The Silk Road trading and exchange system involved much more than just buying and selling transactions. An enormous range of information and know-how about art, religion, philosophy technology and architecture promoting social innovation in new contexts was exchanged along these routes, alongside the commercial goods the merchants traded from country to country.

For example: Mechanical woodblock printing on paper started in China during the Tang dynasty before the eighth century. The Chinese were happy to share this technology as a public good along the Silk Road and so the use of woodblock printing quickly spread to other East Asian countries. The movable type system was first developed in China around AD 1040. In the 13th century, many European travellers reached China through the Silk Road and brought back Chinese printing techniques to Europe. In 1444, Gutenberg employed these techniques to pioneer the social innovation of letterpress printing in Germany.

Thus, the existence of this network of caravanserai provided a fount of sustainable development information and activities enabling social innovation of great economic, social and cultural significance, enabling sustainable development to the regions in which the Caravanserai were based.

2.4 Lessons on sustainable development enabling factors learned from Silk Road history

We can learn a lot from the social innovations in Silk Road history explored above that serve to identify this set four key sustainable development-enabling factors:

(1) The presence of a safe direct trading system for both private and public goods;
(2) The need for communication facilities for provenance exploration, authentication and demonstration;
(3) The ability to establish 'Caravanserai' and promote transaction-based sustainable tourism supporting social innovation within the local community;
(4) The ability to build and support entrepreneurial innovation clusters bottom-up, like the creative makers' clusters that flourished in the cities along the Silk Road.

Each of these four factors is considered in detail in the following sections.

2.4.1 Presence of a safe direct trading system for both private and public goods

The growth of craft expertise and entrepreneurial innovation clusters along the Silk Road depended crucially on the continuing safe functioning of the Silk Road trading system clusters linked with caravanserais. They were successful so long as they could transact to receive for the resources and goods needed, and find markets for their products from elsewhere along the Silk Road (Whitfield, 2015).

Within the Silk Road trading system, the actual transactions by which goods changed hands between the buying and selling merchants were carried on face-to-face in protected markets in Caravanserais that often appeared like fortresses from the outside. The Caravanserais provided safety, supplies and lodgings for the merchants while trading there. The merchants travelled between their trading places and their home-towns in caravans transporting their merchandise goods along routes where they were protected by accompanying guards to prevent plundering by bandits. This was an additional cost for the merchants making the trip (Haksöz et al., 2011). They took precautions against leakage of goods or currency. The caravaners kept lists of goods carried with specification such as variety, weight and volume (equivalent to present-day bill of lading).

The merchants limited the amount of cash that they carried with them to cover payment of day-to-day expenses and small transactions (accommodation, etc.) in case it was stolen or depleted in value by unscrupulous moneychangers. Merchants were also able to use a transitive, shared, ledger-based tally system (as described in Section 2.4.2) or barter for larger-value transactions to prevent leakage of value during these transactions.

There was a distinction between how private goods were formally traded by barter or buying–selling transactions, according to well-defined rules of exchange and payment, compared with how public goods (e.g. know-how, cultural artefacts, etc.) were traded, where there were no clear rules, at that time, governing their transaction.

This gave rise to attempts by territory rulers along the Silk Road, to obtain 'public' goods for their territory's advantage. For example, the secret of papermaking that was extorted from Chinese artisans, which led to paper of the highest quality being manufactured in Samarkand. These Chinese artisans were taken prisoner in 750 by the Samarkand army after defeating the Chinese Tang Dynasty army in Bishkek City. This way of forcing goods into the public domain to escape the fair-trade rules existing for private goods typically resulted in difficult international relations.

Thus, there is considerable advantage in developing a unified transaction system, where goods are deposited and accessed in the public domain under clearly specified and agreed conditions. This transaction system should also incorporate licencing, agreed on all sides, specifying under what conditions goods, that were originally in the private domain can be accessed in the public domain. This preserves these goods' provenance, without subversion of trust and transparency (Lessig, 2008).

2.4.2 Need for provenance exploration authentication and demonstration

The general definition of Provenance, according to Wikipedia[2] is

> *The chronology of the ownership, custody or location of a historical object, starting with its* creation/first owner.. . . The primary purpose of tracing the provenance of an object or entity is normally to provide contextual and circumstantial evidence for its original production or discovery, by establishing, as far as practicable, its later history, especially the sequences of its formal ownership, custody and places of storage. The practice has a particular value in authenticating objects.

Silk Road merchants needed to establish the good provenance of the goods they were considering buying and the agents (merchants) who were offering them. This was difficult to achieve under the Silk Road trading conditions where provenance was explored and authenticated primarily through 'word-of-mouth' techniques involving face-to-face meetings and seeking 'reputation' opinions from other merchants, and visiting the creators of the goods they were considering buying in the local entrepreneurial innovation clusters in order to gain provenance information. But there was no distribution technology that could affect wider, virtual distribution available at the time.

In fact, the Silk Road merchants got halfway towards implementing this technology through use of a public shared ledger itemising transaction of specific goods and identifying who the transactors were, as part of the 'tally' process identified in Section 2.4.1. However, the fragmentary nature of the records available through these ledgers made it difficult to explore provenance chains for transacted entities (goods) or

agents (merchants) – back to the ordinal creators or producers to the goods on offer. However, the existence of a public distributed ledger available in a caravanserai, was a great help in grounding provenance assessments as it would contain a unique immutable public record of the transaction and entities involved in the caravanserais along the Silk Road, and their associated markets.

2.4.3 Ability to establish 'caravanserai' and promote transaction-based sustainable tourism supporting social innovation within the local community

The Silk Road trading system and caravanserais enabled both merchants and travellers along the Silk Road to engage in sustainable, local transaction-powered sustainable tourism. The caravanserai provided stabling and care for the visitors' animals, market places connecting visitors and local people as potential transactors – buying, selling of commercial goods and opportunity to transact public goods to the benefit of both the parties involved and their respective communities.

2.4.4 Ability to build and support entrepreneurial innovation clusters bottom-up

The silk road trading system, together with the existence of local caravanserais, enabled both merchants and travellers along the Silk Road[3] to engage in activities that promoted and sustained the development of entrepreneurial innovation clusters bottom-up. The visitors engaged in transacting with local merchants, also met and transacted with creative makers and innovative entrepreneurs in the community: learning about their activities, and purchasing their locally created products. Through instigating these processes of social innovation at the micro level, the merchants supported and sustained the growth of local entrepreneurial innovation clusters. Here, all sides benefited by gaining both local and remote links for marketing, sharing, and resourcing, transacting goods, with good provenance and 'know-how' for social innovation

3. Sustainable development enabling factors in recent history

Throughout history, entrepreneurial innovation clustering served to promote innovative, creative and sustainable social innovation not only for the Silk Road but in many other contexts as well. Xin the UK, clusters of involving collective entrepreneurial innovation by artisans skilled in a particular area evolved from the 11th century onwards. For example, an embroidery makers' cluster, established in Canterbury from 1050 onwards, made the Bayeux Tapestry,[4] a jewellery makers' cluster was initiated in 1500 in London's Hatton Garden, a shipwrights' cluster existed in Appledore from 1700 onwards.

3.1 Industrial clustering by co-location

Alfred Marshall invented a theory of clusters as a 'concentration of specialised industries localities', called 'industrial districts'. According to Marshall (1890), co-locating industrial enterprises create several advantages. The steady presence of an unchanging customer base guarantees their business and steady income. The steady presence of suppliers means low costs for the firms as well. Geographic concentration also creates "

Marshall identified several advantages of forming industrial districts including the existence of hereditary skill; the growth of subsidiary trades; the use of specialised machinery; industrial leadership and introduction of novelties. These kinds of advantages created a special atmosphere that gives the various advantages to the firms gathered in an area. Marshall's 'industrial districts' approach highlighted the types of social and cultural institutions that "support close local interaction and achieve 'high levels of flexibility and more personable relations that yield better business in all manners" (Belussi & Caldari, 2009).

When physically clustered in 'industrial districts', firms could specialise in particular phases of the productive process. Each phase was not isolated from, but rather it was functional to others. The district was competitive owing to the presence of many firms but also cooperative through exchange processes.

Marshall believed that 'Vitality' (i.e. the capacity of being in step with changes, innovations and wide-spreading of knowledge) would help the small and medium enterprises (SMES) in an 'industrial district' cluster to be sustainable. Each enterprise in the cluster could experiment to adopt new ideas or process derived from others' ideas in pursuit of both its own and collective success in the cluster.

3.2 Entrepreneurial innovation clusters

Today, 'entrepreneurial innovation cluster' means groupings of independent actors, like innovative start-ups, small and medium enterprises as well as research organisations, operating in a sector and region. They are designed to stimulate innovative activities by promoting transactions, sharing of facilities and exchange of knowledge and expertise and by contributing effectively to technology transfer, networking and information dissemination among and beyond the actors in the cluster. All participants can stimulate each other to play key roles in generating ideas or solutions to nurture the ecosystem or interaction spaces with innovations.

This definition builds on the traditional notion of 'cluster' implying some degree of local economic specialisation. However, the way of facilitating this form of cluster would mainly focus on top-down efforts at the macro level of social innovation by organisations in advanced societies with good infrastructure established and supported by national policies, as described in Section 5.2.

3.3 Sustainable extended and dynamic entrepreneurial innovation clustering

In the last decade, the traditional view that clustering 'depends principally on co-location' has been questioned. The focus has shifted to considering participating firms' strategies and social innovation promoting the survival of entrepreneurial innovation clusters involving individual creative makers and small enterprises. In particular, the wider process of globalisation and the growing embedded use of information and communication technologies in economic and business practices have brought about a structural break in the theory and practice of 'co-location' agglomeration.

Damaskopoulos et al. (2008) have suggested an alternative concept to co-location as the contemporary basis for successful clustering. Their concept refers to entrepreneurial innovation clusters with the following characteristics:

> Though embedded in, (they) transcend geographical location, focus on global markets, operate as ad-hoc and/or long-term business networks, are ICT enabled, and are based on dynamic aggregations of capabilities of different, often small and medium size enterprises. (p. 11)

This conceptualisation of dynamic entrepreneurial innovation clustering has opened a new vision of exploring a way of assisting SMEs improve their global market access and their capacities for innovation and business performance, and placed emphasis on exploiting network arrangements among individuals and SMEs that have multiple effects on social innovation.

Extended clustering involves a change of perspective where entrepreneurial innovation clusters are no longer seen as regionally bound constellations nurtured by regional economic systems but rather as 'hubs' within a global network, where local clusters offer local 'real life', face-to-face interactions whereby products and services are actually created and distributed un a that enhances social innovation in the local community. But they also have global virtual reach though transactions exchanging both goods and intellectual capital[5] aided by sustainability-enabling decision support (SEDS) trading and provenance-building platforms in the way described in Section 4.1.

This requires an approach to the development and social innovation capacity at the micro level, focusing on entrepreneurial innovation clusters, in terms of skills sharing and network development and the construction of international connections to enable them to build on the challenge of being 'hubs', no longer adhering only to the advantages of physical proximity. What combinations of physical and virtual arrangements best augment the sustainability of the cluster.

3.4. CADIC: building entrepreneurial innovation clusters bottom-up

In the European Union's current (2020) definition:

> An Enterprise Innovation Cluster may comprise: "Small and Medium Enterprises, as well as research and knowledge dissemination organizations, and individuals. It is designed to stimulate innovative activity by promoting and sharing facilities and exchange of knowledge and expertise; and by contributing effectively to knowledge transfer, networking, information dissemination and collaboration among its members.[6]

Starting in 2010, The CADIC project (Cross-enterprise Assessment and Development of Intellectual Capital)[7] promoted a bottom-up methodology for enterprise innovation cluster building, bottom-up with pilot implementations in seven European Countries, focusing on entrepreneurial innovation clustering.

CADIC focuses on providing an infrastructure for growing and multiplying open and extensible entrepreneurial innovation clusters bottom-up where initiatives are conceived, implemented and developed by the participants themselves. An important component in CADIC's cluster development methodology is the role of the *Catalyst SME*, a cluster member that generates the facilitating environment and innovation promotion plaform for the cluster, where

- Provenance Capital[8] can flow freely.
- Real and virtual creative spaces are created where cluster members can communicate and transact with each other in many modalities, and decide on action together.

- Tools and techniques for creative resource generation and transaction management enable cluster members' exploration, innovation and action planning to flourish.

You can watch at https://vimeo.com/61586672 an audiovisual case study of how the CADIC Italian partners Confindustria Vibo Valente and Metalsud (Catalyst SME for the cluster) supported an entrepreneurial innovation cluster bottom-up, with the participating SMEs finding and profiting from collaborative advantage.

Over the past decade, the CADIC methodology and tools (Vokurka et al., 2012) has successfully supported and facilitated the bottom-up development of innovation clusters in many European countries.).

3.5 A new kind of sustainable transaction-based tourism promoting social innovation at the micro level

In 2020, Destinet[9] announced that the preferred strategy to 'restarting tourism: let it be better afterwards than before' should be to

> Involve the local population: More than any other industry, tourism uses public space and natural resources. Therefore, new strategies are needed, developed in close cooperation with hitherto insufficiently considered local stakeholders. This type of sustainable transaction-based tourism – not only sustains local "natural" ecosystems, but also sustains and enhances local business ecosystems involving community members, (entrepreneurs, creative makers and local organisers, traders and innovators) and visitors meeting, discussing and transacting together.[10]

This provides a timely opportunity for social innovation at the micro level within local communities, linked to entrepreneurial innovation clusters, through developing the caravanserai-based model identified in Section 2.4.3. This would support locally provided tourism facilities (accommodation restaurants, etc.), benefiting both visitors and the local community. Visitors can engage with creative makers and entrepreneurial innovation clusters in the community and learning about their activities, and purchasing local products, crafting, etc.

Here all sides benefit from social innovation by gaining both local and remote (international) links for marketing, sharing, and resourcing, transacting goods and know-how with good provenance.

4. Opportunities for building a sustainability-enabling decision support (SEDS) platform

We can learn a lot from the Silk Road trading system and the subsequent history of entrepreneurial cluster and platform building, as where we identified the following four sustainable development enabling factors for bottom-up local development: enduring throughout history and across national, social and cultural contexts worldwide:

- The presence of a safe direct trading system for both private and public goods, together with safe transportation routes and payment systems for transacted goods;
- The need for communication facilities for provenance exploration, authentication and demonstration;
- The ability to establish 'Caravanserai' and promote transaction-based sustainable tourism supporting social innovation within the local community;
- The ability to build and support entrepreneurial innovation clusters like the creative makers' clusters that flourished in the cities along the Silk Road.

When implemented together, these sustainable development enabling factors promote and ensure all kinds of sustainability, physical, environmental, social, cultural creative/innovative and financial (within the 'real economy'). Moreover, these four enabling factors provide a real contemporary basis for building a successful decision support platform facilitating innovative and creative decision-making on activities that promote sustainable development: building trust and enhancing provenance at all levels in ecosystems located in a wide variety of globally linked contexts.

This sustainability-enabling decision support (SEDS) platform comprises four views with each view supporting decisions – multisided and made bottom-up – that promotes a particular sustainable development enabling factor. These views activate the following features:

(1) The features in the *safe direct trading view* facilitate the need to engage in a trustworthy trading system for both private and public goods
(2) The features in the *provenance building view* facilitate the need for provenance exploration, authentication and demonstration;
(3) The features in the *Caravanserai view* facilitate the need to establish a Caravanserai enabling local merchants and creative entrepreneurs to engage with visitors through transaction-based sustainable tourism.
(4) The features in the *cluster catalyst view* facilitate the need to build and support a local entrepreneurial innovation cluster

In the following sections, we discuss the varieties of support, which can usefully be provided via the features within each of these views.

4.1 Decision support that can usefully be provided within the safe direct trading view

The features in this view support the need to engage in a trustworthy trading system for both private and public goods; together with safe and secure transportation routes and direct payment systems for transacted goods.

4.1.1 Support features

4.1.1.1 Blockchain architecture for building safe transaction records.

A SEDS platform can profitably employ blockchain technology, implemented within Hyperledger Fabric (Manevich et al., 2018) to build time-ordered sequences of immutable verified and validated records of all the transactions involving both private and public goods that were made in the ecosystem system since its inception.

The blockchain establishes a system of creating a distributed consensus. All participants have the ability to share and inspect a distributed ledger containing all transactions ever made in the ecosystem powered by the SEDS. This creates trust and shared understanding among the participants in the powered by the SEDS as they employ this multi-sided trading and provenance building platform, building and benefitting from collaborative provenance exploration, validation and improvement. This constitutes a shared creative resource for building and maintaining safe direct trading systems offering full transparency about people's transactions in the real-world where all sides benefit, enabling social innovation.

4.1.1.2 Transaction provenance ontology and provenance tapestry. Each record in the time-ordered transaction sequence (historical provenance chain) contains concise meaningful information regarding the transaction type (barter, buy–sell, Transfer of rights and gift for private goods; Deposit and Access for public goods), represented in accord with the World Wide Web Consortium's Provenance Ontology: PROV-O and incorporates six core Provenance Attributes providing the answers, in the transaction record, to the core interrogatives, 'who' 'what/which'," when", 'where' and 'how (declarative)' (for details, see Moreau & Groth (2013) and Humphreys (2020)).

Employing the PROV-O to structure transaction records within a SEDS enables us to establish and explore the historical provenance of an entity involved in any particular transaction of interest transaction right back to its first transaction in which it was involved, marking that entity's 'creation'. This constitutes the *historical provenance chain* for that entity. In a similar way, we can establish and explore the historical provenance chain for any agent, acting in sender and/or receiver roles, from the most recent transaction in which they played a role, right back to their earliest transaction recorded within the SEDS.

Within the provenance tapestry, these historical provenance chains interact at every transaction in their establishment. Thus, provenance explorers can trace in any way they wish, provenance threads (paths through the provenance terrain) involving both persons (agents) and objects (entities) of interest to us. These threads are woven together in the *Provenance Tapestry* (intersecting at transaction nodes) to form the core structure that underpins the investigation, validation and establishment of historic provenance and authenticating the information about 'what actually happened' the focus of our search explorations.

4.2 Decision support that can usefully be provided within the provenance building view

The features in this view support the need for provenance exploration, authentication and demonstration; pParticipants explore and document and discuss their own creative and innovative activities within their community; as well as those established the sponsoring cooperative entrepreneurial innovation cluster, sharing the results as audio-visual stories.

4.2.1 Support features

4.2.1.1 Communication facilities for provenance exploration and authentication: within and beyond the provenance tapestry. One can search both (i) the tapestry of provenance threads for all transactions ever made within the SEDS system (structured provenance and (ii) the whole World Wide Web (unstructured provenance) in tracing and authenticating the provenance of entities traded as private and public goods, as well as the provenance of the agents who traded them.

Each historical provenance search involved in exploring and authenticating the provenance associated with a transaction is anchored on the transaction record in the blockchain that is of initial interest to the explorer. Starting from that transaction record, the provenance search may be extended through all the transaction records that are linked together within the provenance tapestry.

Then, for further rich investigation of provenance issues relating to, and anchored on a particular transaction, the search may optionally be continued through the material in the SEDS blockchain data store that is referenced in the transaction record at this location in the provenance tapestry. This material includes:

- *A Profile* for each agent and entity referenced in the transaction record;
- *Audiovisual Stories expressed* as interpretive material in various kinds of media, including (i) Stories regarding 'how' and 'Why' for any particular transaction and (ii) Stories relating to the particular entities and agents engaged in the transaction,

In practice, the explorer's provenance search initially proceeds by traversing the provenance tapestry's interwoven entity and agent provenance threads until a transaction is reached where the explorer wishes to explore that transaction's context more deeply, through following a reference in the transaction record to interpretive material to the transaction in blockchain data store.

Then, the URLs referenced in this interpretive material enable searches anywhere in the whole wide web, starting from, and guided by the relevant material in Silubi.io's blockchain data store relating to this transaction.

4.2.1.2 Live provenance demonstration support. The Live Provenance Demonstration support feature enables participants' sustainable development enabling activities to become much more visible and attractive in both the real and the virtual world. This feature provides techniques to promote innovative creations, in each case 'with attribution', and for "letting others know about these activities establishing a virtual gallery or media channel on a public resource like internet archive or Vimeo. This serves to increase the provenance of these creations and artefacts. It also increases the participants' own live provenance, and that of the local entrepreneurial innovation cluster by establishing and publicising the good provenance of their sustainable development promoting creations and artefacts.

4.3 Decision support that can usefully be provided within the caravanserai view

The features in this view provide a multisided framework facilitating and promoting the development of transaction-based sustainable tourism in the locality. It addresses the resources and facilities that can be provided to support the establishment and

maintenance of Caravanserai, enabling engagement with visitors and promotion of transaction-based sustainable tourism operations by participants in a local entrepreneurial innovation cluster.

4.3.1 Support features

4.3.1.1 Provision and promotion of facilities supporting sustainable tourism. By means of this feature, a multisided framework addressing provision and promotion of facilities supporting sustainable tourism is populated with content provided and maintained bottom-up by local resource providers (event and course organisers and entrepreneurial innovation cluster members. It offers facilities for hospitality and exchange of know-how and expertise on sustainable development in the locality): local participants are supported to create and edit their own resource pages and establish transactions with visitors via them. In this way, they gain visibility with potential and actual visitors who can also access the resulting sustainable tourism local resource framework: satisfying to satisfy their needs for information about local provision of accommodation, food and drink, local tours and visits, transportation, medical facilities and upcoming events (markets, festivals, carnivals, etc.).

4.3.1.2 Provenance authentication for sustainable tourism resources. By means of this feature, visitors can authenticate the provenance of each sustainable tourism resource offering in all the above categories. They have virtual access to local creative makers' and resource providers' on-line galleries and media channels, with provenance authentication facilities enabled. In this way, the Caravanserai view's features provide facilities for learning about, and guided access to, activities involving members of the enterprise innovation clusters, visitors and locals (makers, entrepreneurs and merchants) with the opportunity for visitors to contact each other and arrange real-life meetings where both sides can 'show and tell' about their products and services, share know-how and transact together in the way that best meets their needs. They also gain the opportunity to participate together in many kinds of local events and initiatives promoting sustainable development.

4.4 Decision support that can usefully be provided within the cluster catalyst view

The features in this view support the need to build and catalyse entrepreneurial innovation clusters bottom-up.

4.4.1 Support features

4.4.1.1 CADIC relational online framework. This feature provides methods and tools to support collaboration between SMEs, as described in Section 3.4, including training and support for key cluster management roles such as 'Cluster Facilitator' (CF) at cluster level and 'Cluster Relation Manager' (CRM) at company level. CADIC Framework Support Services comprise methods and cluster management tools to support the effective and efficient offline communications flow between the participants in an entrepreneurial innovation cluster.

These include methods to shape collaboration events and group discussion and communication support in flexible learning environments (Humphreys & Jones, 2006). An audio-visual case study showing tools and techniques from the CADIC online relational framework in action in the context of an entrepreneurial innovation cluster in Vibo Valentia, Italy,[11] is presented at https://vimeo.com/61586672.

4.4.1.2 Expertise and innovation promotion. Creative makers and innovative entrepreneurs need their individual businesses and the innovation cluster in which they participate to become visible, attractive and accessible to potential visitors, clients, customers and external partners who value and therefore want to purchase what is on offer.

The expertise and Innovation promotion feature enables cluster participants' activities and their offerings (products, services) to become much more visible and attractive in both the real and the virtual world. It provides techniques to promote innovative creations, in each case 'with attribution', and for letting others know what one has available for transaction through establishing a virtual gallery or media channel on a public resource like internet archive or Vimeo.

This feature provides creative facilities for making media productions involving storytelling in a synthesis of rich (audio-visual) and restricted (textual) language (Humphreys & Brezillion, 2002) that show-case current expertise, know-how and innovation within the cluster that are then placed as public goods in channels that are freely accessible by the appropriate audiences attracting visitors, collaborators and clients worldwide. Participants can also make and share case studies of success in social entrepreneurship, thus supporting cluster-building bottom up and catalysing innovative activities.[12]

5. Conclusion: sustainability-enabling factors promoting social innovation at the meso and macro levels

In the previous sections of this paper, we have identified a plethora of ways that a SEDS plaform can offer comprehensive support for establishing productive transactions enabling and promoting sustainable development bottom-up, starting at the micro level, in accord with Van Wijk et al. (2019)'s three-level (micro, meso, macro) model for social innovation. We described the practical importance of this kind of bottom-up support for participants in entrepreneurial innovation clusters catalysed by organisations promoting social innovation through the set of four sustainability-enabling factors identified in Section 4.

There is plenty to attract new recruits for implementing activities that promote this set of sustainability-enabling factors bottom-up in a wide variety of contexts worldwide, aided by a SEDS plaform: bringing them alive in local practice, at the micro level in the model of social innovation cycles described by Van Wijk et al. (2019), thus enabling creative and innovative solutions to emerge and be propagated as success stories in media outputs, through bottom-up activities instigated by entrepreneurial innovation clusters.

However, the impact of these media outputs can be greatly magnified meso level, where such stories describing successes can energise social innovation processes in order to address regionally, nationally and internationally recognised major problems. Van Wijk et al. also explain how the second cycle in their model

> zooms out to the meso level, pointing to increases in interactions among diverse actors and their engagement in understanding each other's perspectives and interests and negotiating shared perspectives in 'interactive spaces'. It is at this meso level, where we see how actors' interactions and framing produce the frictions, highlight the tensions, and identify or create the cracks behind the new opportunities for social innovation. (Van Wijk et al., 2019, p. 891)

Gallego and Chaves (2020) show that these success stories produced as media outputs at the micro level by entrepreneurial innovation clusters can engender social innovation beyond the clusters' sphere of operations through a double process of innovation penetration involving adaptation and exaptation at the meso level mediated by these success stories as described in the following section.

5.1 Adaptation and exaptation at the meso level enabling sustainable development in new territories

Eentrepreneurial innovation clusters can transform territories worldwide through a process of spreading success stories about their social innovations, enabling sustainable development not only by adaptation but also by *exaptation*, defined by the Oxford Dictionary as 'the process by which features acquire functions for which they were not originally adapted or selected'.

Gallego and Chaves (2020) explain that

> Adaptation and exaptation are distinct but partly sequential processes: the adaptation of social innovations in cooperative clusters paves the way for the subsequent leap via exaptation of these innovations in the whole of the territory.. . . According to the micro-meso-macro approach, changes in a socio-economic system occur when generic meso-rules change. These rules or institutions operate at an intermediate level (meso) of abstraction and consist of a set of cognitive, behavioural, technological and social routines that promote and inform social innovations. (Gallego & Chaves, 2020, p. 3010)

Here, the four sustainable development enabling factors that we identify in this paper provide a framework that informs the formulation of these rules by meso-level decision makers working together within interactive spaces for negotiating, co-creating and imbedding social innovations (Humphreys & Jones, 2006). Thus, these sustainable development enabling factors can profitably guide the enactivism that constitutes the meso rules that push the emergence of novel problems in sustainable development in new contexts and provide facilities for implementing innovative and creative solutions in practice at the micro level in new territories.

5.2 Facilitation and guidance at the macro level

Van Wijk et al. (2019) describe how the third cycle in their social innovation model

> Zooms further out to the macro level. It recognizes that institutional contexts, often structured around organizational fields, guiding, or even disciplining the dynamics of the micro and meso cycles. This macro view is important because it allows acknowledgment of how institutional contexts differ in their enabling and constraining influence on actors' actions. Institutional contexts enhance, or stall the agentic energy emerging from the micro and meso cycles. (Van Wijk et al., 2019, p. 890)

Here the meso-level rules on exaptation promoting social innovation, guided by the set of four sustainable development enabling factors identified in this paper, can profitably be facilitated top-down by national and regional authorities operating at the macro-level, as in the following historical example.

In the 10th century, Turkish Seljuk rulers consolidated and policed the overland Silk Road routes throughout the territories that they ruled, thereby protecting the itinerant merchants, regardless of their nationality from theft and attack. The merchants enhanced this protection bottom-up, by travelling in caravans: close knit groups of up to 1000 merchants, together with their animals and goods. Up to the 12th century, the Seljuk sultans did everything they could to invite merchants to take the silk road across Anatolia, offering travelling merchants three days free lodging in caravanserais that provided care for the merchants' camels, horses & mules and an opportunity for the merchants to eat well, rest and prepare themselves in safety for their onward journey.

This maintained a process of exaptation where social development enabling factors were continually revitalised, through the social innovation activities of entrepreneurial clusters in localities with caravanserai along the Silk Road routes for the next three centuries (i.e. until the routed were blocked by the Ottoman Turkish administration).

This historical example of action at the macro level that promotes sustainable development enabling factors under conditions of exaptation, is even more relevant in regard to enabling actions promulgated by national and regional administrations at the present time.

In sum, in this paper, we have discussed and established an alternative bottom-up micro and meso-level methodology that addresses the need of community development under enabling factors that promote social innovation and sustainability in the real and digital environment.

Notes

1. Image credit: Eugène Flandin, Wikimedia commons (https://commons.wikimedia.org/wiki/Main_Page (accessed 28/03/2022).
2. https://en.wikipedia.org/wiki/Provenance (accessed 10/04/2022).
3. Perhaps the most famous Silk Road traveller, following the transaction-powered sustainable tourism model, was Marco Polo, who explored eastwards from Venice with his two brothers along the Silk Road to China, returning by sea to Venice after 20 years of travel. Marco Polo dictated the story of his adventures to Rustichello. This, eventually, became the book for which Marco Polo is famous. The book became a bestseller and had a huge impact on medieval and modern explorers, missionaries, merchants and travellers in general.
4. The Bayeux tapestry comprised the first rich representation of provenance grounded in a complex sequence of events and transactions. For details, see Bouet and Neveux (2019) and Humphreys and Luk (2022).
5. That is, exchanging both goods and intellectual capital (see Yu et al., 2013).
6. For more details, see https://www.clustercollaboration.eu/cluster-definitions
7. CADIC was part of the European Union's Framework 7 programme (2010–2013) and was subsequently self-sustainable. For more details, see www.cadic-europe.org (accessed 10/04/2020).
8. Provenance Capital is a combination of Intellectual Capital, Social Capital and Cultural Capital.
9. *Destinet* is a portal for Sustainable & Responsible Tourism, registered in 2015 as a United Nations Partnership for Sustain able development, re-launched in 2017 as *Tourism2030: UN partnership for Sustainable Development Goals*.
10. https://destinet.eu/News/2020/4/restart-tourism-let-it-be-better-afterwards-than-before (Accessed 9/04/2022).

11. This case study demonstrates how the CADIC Italian partners Confindustria Vibo Valente and Metalsud (Catalyst SME for the cluster) catalysed an entrepreneurial innovation cluster bottom-up, with support provided in accord with the CADIC framework.
12. The central role of the catalyst in this context was described in Section 3.4. Humphreys and Brezillion (2002) describe how support techniques for making and sharing, integrated in the SaRA methodology, were successfully developed and implemented bottom-up by the participants themselves, in a variety of practical contexts.

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