

TECHNOLOGICAL CLUSTERS TO LIMIT BARRIERS TO SME INTERNATIONALISATION^(*)

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ABSTRACT — The aim of this paper is to devise and illustrate a model of support for innovation in Small and Medium Sized Enterprise (SME) involving bottom up territory, Universities and Research Centres of Excellence. From a strategic asset perspective, the goal is to enhance particular sections of regional specifics through innovative products and processes, rendering ‘new’ traditional production and/or creating innovative SMEs with a focus on ‘competence’ in exploiting local resources for the manufacture of intrinsically high value goods particularly appreciated on international markets. The process of digital innovation for technological and economic enhancement on the part of SMEs however, can occur only with awareness of the implications of global challenges.

KEYWORDS — Internationalisation of Economies, Small and Medium Size Enterprises (SMEs), Digital platforms.

ABSTRACT — L’intento scientifico è di implementare un modello di supporto innovativo per le Piccole e Medie Imprese (PMI) – con il coinvolgimento *bottom up* di contesti territoriali, Università e Centri di ricerca di eccellenza – per un *asset* strategico finalizzato alla valorizzazione di selezionate specificità regionali, utilizzando innovazioni di prodotto e di processo, cioè rendendo “nuove” le produzioni tradizionali e/o creando innovative PMI incentrate sulla “manualità” nell’utilizzo delle risorse indigene per la manifattura di beni ad alto valore intrinseco, particolarmente apprezzati sui mercati internazionali. Ma è evidente che l’innovazione digitale per la valorizzazione tecnologica ed economica sarà attuata dalla PMI soltanto se sussiste la consapevolezza delle sfide globali.

PAROLE CHIAVE — Internazionalizzazione dell’economia, Piccole e Medie Imprese (PMI), Piattaforma digitale

1. COMPETITIVITY AND INNOVATION FOR SME INTERNATIONALISATION. — The beginning of the XXI Century saw the rise of a new technological paradigm distinguished by relations between enterprise, finance, University and Research Centres and the Institutions guiding policies relative to socio-economic activities, the transformation of goods produced, work intensive knowledge and productive and market systems⁽¹⁾.

Industrial policies have therefore had to pivot on the evolutionary nature of technological change, fostering knowledge intensive learning processes, strengthening relations and networks and strategic cooperation between Institutions and Public Entities, Small and Medium Sized Enterprises (SMEs), Banks and relevant stakeholders. Their points of strength and integration foster innovative performance enhancing information available relative to opportunities, ensuring coordination of public and private decision-making for new investments and knowledge dissemination.

Innovation, crucial for SMEs, enhances competitiveness. Moreover, it imposes governance models that define territorial goals, dynamic local players and high added value contexts in which to invest.

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(1) This implies changes in places where competence is acquired and stored and changes in enterprise reach – i.e. outsourcing productive phases and Company functions – and in the territorial dimension of innovation and production.

Internationalisation involves identifying suitable foreign markets – adapting offers to changed demand – putting in place risk analyses on evolving trends in target markets and project design by SMEs based on the sustainable use of local specifics targeting a strategic knowledge-structured vision. For project sustainability, specialist skills and competence are fundamental to ascertain key factors for competitiveness, potential foreign trade partners and financiers not to mention legal and fiscal support for SMEs.

2. THE EUROPEAN UNION (EU) AND ITALIAN STRATEGIC VISION OF SME INNOVATION. — The EU has placed Innovation and the Knowledge Economy at the core of the Lisbon Strategy and the ‘Europe 2020 Strategy’s⁽²⁾ three pillars: intelligent growth, inclusive growth and sustainable growth in a perspective of planned or contemplated credit facilitations for SMEs⁽³⁾.

To encourage research and technological knowhow transfer, particularly in late developing Regions, the European Commission, through its I4MS (*ICT Innovation for Manufacturing SMEs Programme*) promotes Regional Digital Manufacturing Innovation Hubs, for acquiring skills, access to innovation networks and financial support with SMEs urged to devise measures for governing digital transformations. A series of local points of access to guide SMEs towards digital transformation and the Industry 4.0 (I4.0) Plan, considered the ‘Fourth Industrial Revolution’, is underway. The process involves the use of data and information, Computer Technology and Data Analysis of new material, components and digital-connected systems (Internet of Things and Machines). Italy in particular, supports innovative Companies through the Legislative Decree 24 January 2015, no. 3, converted by the Law 24 March 2015, no. 33, «*Urgent Measures for the Banking System and Investment*», known as the ‘Investment Compact’. A quota of funding allocated for innovative startups is also addressed to innovative SMEs⁽⁴⁾. Furthermore, in line with Community Directives, the Italian Industry Plan 4.0 entails support for investments, digitised productive processes, enhancement of worker productivity and education and training for new product development and processes⁽⁵⁾. The measures based on three basic guidelines: operate in a logic of technological neutrality; intervening at horizontal level and acting on enabling factors.

The I4.0 Plan includes nine enabling technologies (*Advanced Manufacturing solutions; Additive Manufacturing; Augmented Reality; Simulation; Horizontal Integration, Vertical Integration; Industrial Internet; Cloud; Cyber Security; Big Data Analytics*)⁽⁶⁾ and a crucial role for Digital Innovation Hubs (DIHs) and Competence Centers (CCs) (Fig. 1).

⁽²⁾ To reach set goals and to promote innovation, the European Community Institutions have approved various Programmes, including seven broad-ranging flagship initiatives.

⁽³⁾ Additional Programmes governed by Community Institutions and by National States in the context of the European Regional Development Fund include the European Social Fund, the European Agricultural Fund for Rural Development and Fisheries Fund and European Investment Bank (EIB) Funds for Innovation. In support of innovation for the Initiative *i2i - Italians to Italians*, the EIB has allocated 50 billion Euro for 2010-2020. It is also responsible for three additional Initiatives: SME Risk Capital, Funding allocated for the Competitiveness and Innovation Framework Programme (CIP) and Risk Sharing Finance Facilities (RSFF).

⁽⁴⁾ From approval of the Legislative Decree to date, gauging the impact of the measures accurately is not yet viable. However, notable progress within the national eco-system of innovation has enabled competition at international scale and the launch of the SME modernisation process.

⁽⁵⁾ For details <http://www.governo.it/approfondimento/il-piano-nazionale-industria-40-2017-2020/6711>

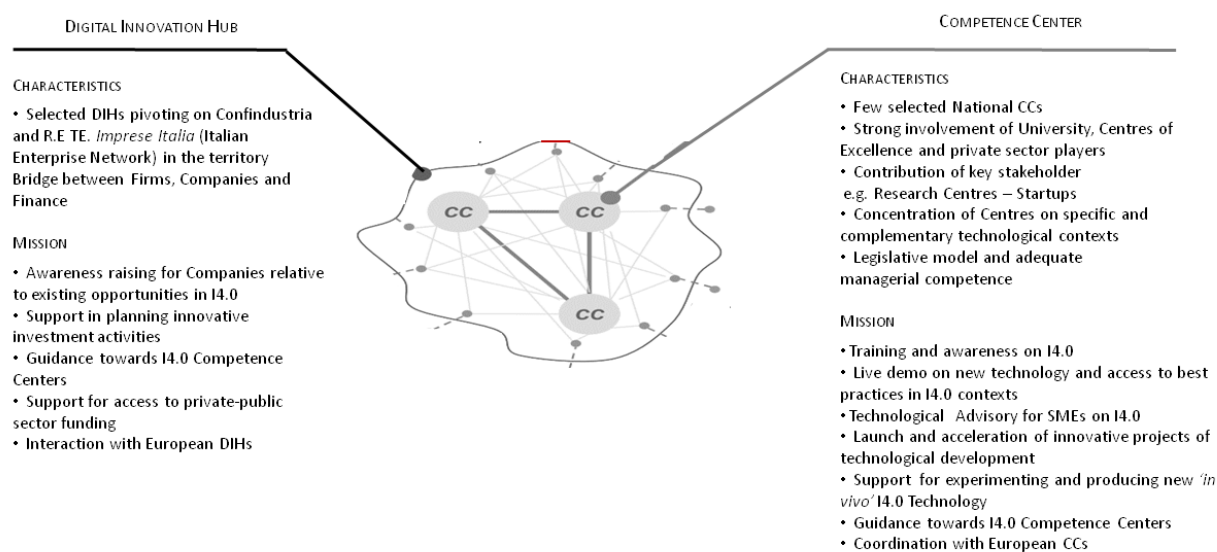
⁽⁶⁾ *Advanced Manufacturing Solutions* for more efficient and productive processes entail the integration of robots; *Additive Manufacturing* produces 3D objects, from a 3D digital model; *Simulation* models and optimises productive processes; *Augmented Reality* accentuates and enriches sensorial perception through information and/or 3D reconstructions in support of productive processes; *Horizontal Integration* expands Company activity to products, processes and knowhow linked to the technological productive chain; *Vertical Integration* enables the manufacturing or assembling Company to integrate ‘intermediate phases’ for the end product; *Industrial Internet* uses, on a wide scale, interconnected machines and devices by means of smart analytical systems; *Cloud*, a paradigm of ICT resource delivery available on demand, enables data archiving, data processing and data transmission; *Cyber Security* involves protection measures to reduce threat-provoked damage; *Big Data Analytics* collects and processes huge volumes of data to extract information and predict trends.

DIHs prevalently represented by Confindustria⁽⁷⁾ are technological clusters providing innovative support to enterprises. Acting as a ‘*Bridge between firms, Companies and finance*’, they involve territories, Universities and Research Centres of Excellence.

The DIH mission is to raise awareness of the opportunities of I4.0, support innovative investment planning and offer guidance relative to CCs, facilitate access to private and public sector funding, mentoring, training and interaction with European DIHs.

CCs which include startups, SMEs and large firms⁽⁸⁾, involve Universities and Research Centres of Excellence and private sector enterprises via Public and Private Partnership. They promote and support applied research, technological transfer and Hi Tech training.

Fig. 1 – Interrelations between DIHs and CCs.



Source: See Ministero dello Sviluppo Economico⁽⁹⁾.

2.1 The limits of DIHs for territorial enhancement. — Findings from our technico-scientific analysis show that DIHs are limited by constraints, in particular regarding territory enhancement both as concerns technological innovation and socio-economic aspects. Furthermore, a lack of synergies with Credit Institutions is highlighted albeit envisaged as an integral part of the organisational model and undervaluing their proactive role as agents of local development. Moreover, of the DIHs analysed, none offers consolidation services to support SMEs in the territory and/or their penetration onto international markets.

From a technological perspective, some DIHs promote the use of integrated platforms (DIH Piemonte for the plastic industry) and Open Innovation to support the management of innovation. Others focus on reviewing the processes of the Global Value Chain (Cicero Hub) and on the readiness of companies with respect to I4.0 (Digital Compass).

Mentoring, escorting and training services are provided in cooperation with CCs. As regards value added services, those in common concern design support services, technology investments and access to public and private financing initiatives.

⁽⁷⁾ The idea for DIH originates from the *Digitising European Industry Programme*.

<https://ec.europa.eu/digital-single-market/en/policies/digitising-european-industry>

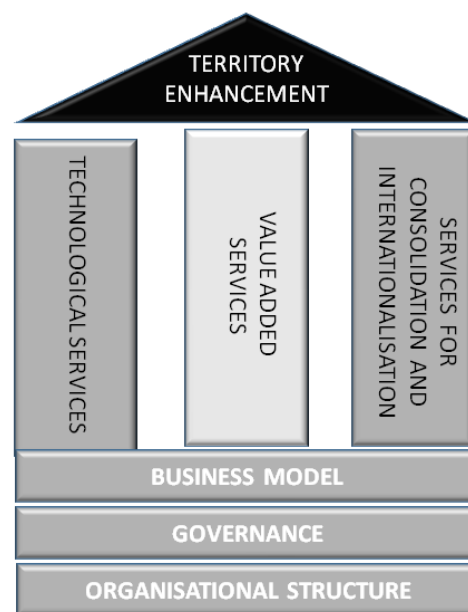
⁽⁸⁾ The Government in the startup phase commissioned the *Politecnico* of Milan, Turin and Bari, Sant'Anna School of Advanced Studies, University of Bologna, University of Naples 'Federico II', Universities of Venice, and Conference of Rectors of Italian Universities (CRUI).

⁽⁹⁾ See http://www.sviluppoeconomico.gov.it/images/stories/documenti/2017_01_16_Industria_40_Italianorev.pdf

Targeted support is crucial for planning investments, in using CCs, access to finance, defining the medium-long term corporate mentoring programme and for leadership and interaction with European DIHs. Clearly, digital innovation for technological and economic enhancement can be successful only if SMEs are aware of the global challenges involved.

3. AN INNOVATIVE MODEL OF SUPPORT FOR SMEs: DIHs FOR THE ENHANCEMENT OF LOCAL TERRITORY. — Applied scientific research and development has paved the way for putting in place a strategic asset to enhance selected regional specificities and product/process innovation (making traditional products ‘new’ and/or creating innovative SMEs). The focus on ‘artisan skills’ targets the use of local resources for the manufacture of intrinsically high value goods, particularly appreciated at international scale.

Fig. 2 – DIHs for local territory enhancement .



Above all, DIHs should devise an organisational structure to select which stakeholders (Credit Institutions, Research and Technology Transfer Centres, Training Bodies, Industry Unions, Public Administration) to involve in Hub creation and a governance model to delineate long-medium-short-term goals and strategic, tactical and operational guidelines. Hubs function as a useful support in defining modes of value creation and economic/corporate social responsibility models for stakeholders, in addition to SME Business Plans.

The local territory enhancement process built on three pillars has to include a model, methodology and one or several enabling technological platforms, for the pertinent areas of interest.

DIHs targeting territorial enhancement provide: technology supplies to assist production processes (advanced robotics and additive manufacturing); digital transformation of interaction processes upstream and downstream in the Global Value Chain; Material infrastructure (networks, internal business infrastructure) and intangible assets (external platforms, services enabling I4.0 applications); Cyber Security; Artificial Intelligence and Big Data; a combinations of Business and Location Analytics for Big Data territory analysis and to support stakeholder decision-making; Observatory on Key Enabling Technologies (KET).

Besides providing corporate assistance on access to regional, national and European funding, DIHs support the I4.0 Plan accessing the network of national and European CCs, promoting the acquisition, dissemination and use of the best technologies of corporate interest and identifying suitable digital transformation projects for corporate processes. Furthermore, DIHs contribute to the enhancement of

existing products, support SMEs in corporate innovation, offer skills, knowledge and ideas from researchers, students, end users or other companies in the High Tech sector or provide services for the creation of new and/or diverse companies.

In particular, DIHs stress the role of Credit Institutions for the consolidation of SMEs or penetration onto international markets with support ranging from the initial phase of expansion project definition to providing competence on transactional services, world trade dynamics and SME needs (non-banking professional services, research on counterparts and assessment, selecting banks for Trade Finance transactions or for the delivery of on-site banking services, business networks etc.). This is put in place through partnership agreements with major international Credit Institutions and primary local operators and with direct presence on international markets and subsidiaries in foreign countries. Credit Enhancement, short-term international Factoring and services for internationalisation are particularly important, via a structured network of institutional relations (such as ICE, SACE, SIMEST, the International Chamber of Commerce) and collaboration with a qualified group of professional providers.

4. THE TECHNOLOGICAL CLUSTER STRIDE (DEFINED INTEGRATED TERRITORY SYSTEM)⁽¹⁰⁾. — Several studies have highlighted the importance of proximity, which depends on cognitive and social space (Boschma, 2005, Capello, 2009; Citarella, 2012) and spatial conditions, in the link between knowledge creation and use-enabling territorial areas to activate connections, diversify use and potential knowledge spillover functions⁽¹¹⁾.

Local territorial production factors are equally important (financial capital, information, consolidated technologies). Tacit knowledge however – continuously created, exchanged and applied to the local production system – creates strategic business ideas in the real market (Camagni and Capello, 2009; 2013). Interdisciplinary scientific research is also essential in devising SME innovation models, structured on local specificities.

An endogenous Government and Credit Institutions supported innovation model within scientific/technological networks is one of creative application, implying cross fertilisation of ideas and knowledge, designed for innovative technical territorial problem solving (Foray, 2009).

Theoretical and technico-scientific considerations foster our intent to design a technological platform for developing and testing an SME innovative support tool by integrating DIH architecture with a governance model to define strategic, tactical and operational guidelines and a business model for stakeholder value creation and management. By applying the specific technical and scientific skills of territorial contexts, Universities and Research Centres of Excellence, knowledge of the Credit Institutes, acquired also in international areas and with the advanced technologies for SME development available, innovative growth scenarios and decision-making processes can be simulated.

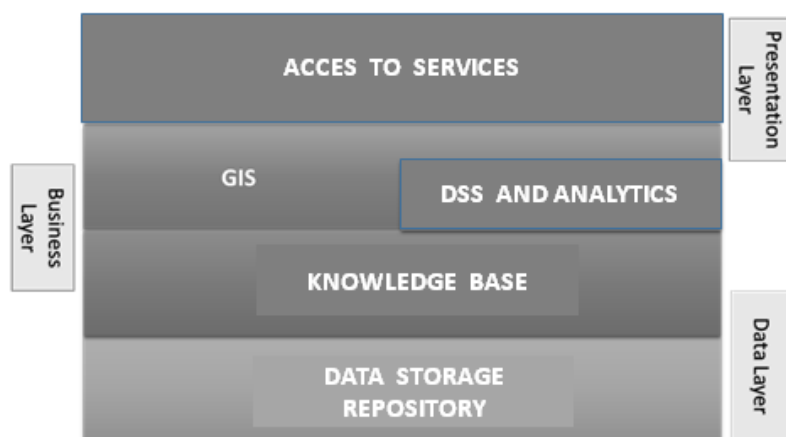
STRIDE a catalyst for stakeholders, is an open and modular platform, structured with Geographical Information System (GIS), Analytics and one or several decision support system(s) (Decision Support System - DSS), augmenting decision-making efficacy compared to traditional problem-solving research models (Fig. 3).

STRIDE will provide services for enhancing local specifics facilitating the use of technologies linked to productive processes; digital transformation of interactive dynamics in the Global Value Chain; digital solution infrastructure and Cyber Security measures; scenarios and performance delineated by Artificial Intelligence and Big Data and finally; Big Data Analytics to combine corporate/geographical analysis and decision-making process support.

¹⁰ Interdisciplinary scholars and technical experts of the USART (University of Salerno Advanced Research Team) have long been engaged in a Feasibility Study, under the supervision of the Research Lead, Prof. Francesco Citarella (Scientific Coordinator of the OBSERVATORY FOR SUSTAINABLE DEVELOPMENT AND TERRITORY PLANNING - OPSAT), Department of Information and Electrical Engineering and Applied Mathematics (DIEM), Faculty of Engineering, University of Salerno and in conceiving and designing the architectural system of the Technological Cluster STRIDE.

¹¹ Spillovers of knowledge, already studied at length (Jaffe et al., 1993; Acs et al., 1994), support the generating of new knowledge processes and as part of R&D, are strategic in activating the process of innovation. Local SMEs have frequently benefited from knowledge spillovers from multinational companies.

Fig. 3 – The Architecture of STRIDE



STRIDE's innovative virtue is its modularity and replicability. The model can be updated, perfected and adapted in line with strategies, tactics and indications sanctioned by relevant governance and business model subjects/structures, stakeholder interests, Institutions (Laws and Regulations) and local territory. The analysis level based on blended technological solutions, will potentially create GeoBusiness intelligence applications to support Credit Institutions with Asset and Liability Management functions, Credit and Liquidity/Operational risk information, Trend predictions and Econometrics and the socio-economic dynamics of specific territory contexts.

In conclusion, STRIDE constitutes an integrated system, characterised by an applicative architecture typical of information systems utilising complex schema. Non-functional objectives hold particular relevance and are subject to constant incrementing and updating over the medium-long term, given that information sources change continually.

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