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Key components of entrepreneurship and innovation policy frameworks

Note by the UNCTAD secretariat

Executive summary

This note presents key areas of entrepreneurship and innovation policy frameworks, for the formulation, monitoring and evaluation of the impact of national policies on the promotion of an environment that inspires and enables individuals to start and successfully grow their businesses, and in building an effective national system of innovation. The entrepreneurship policy framework addresses six areas that have a direct impact on entrepreneurial activity: the general entrepreneurship policy; awareness and network building; entrepreneurship education and skills; research and development (R&D); technology transfer; and the regulatory framework. To complement the framework, the paper identifies indicators that monitor three main entrepreneurship policy objectives: firm foundation; employment; and wealth creation.

The national innovation system concept is proposed as a policy framework for STI in developing countries. It is argued that a systemic approach to STI policymaking may be more appropriate to the needs of developing countries than earlier innovation models. To support evidence-based evaluation of innovation policies, the paper suggests a set of indicators that are relevant to developing economies to assess the different elements and linkages of a national system of innovation. The selected indicators capture inputs, outputs, and the impact of innovation, as well as the linkages among public, private and academic actors.

I. Introduction

A. Background and definitions

1. This note has been prepared as a basis for the discussion entitled “From the evaluation based on indicators to policy frameworks for entrepreneurship, small and medium-sized enterprise (SME) development and innovation – firm foundation, growth, finance and failure”. With respect to the terms of reference agreed at the fifty-fifth session of the Trade and Development Board, the topic was refined and revised by the experts at the first session of the multi-year expert meeting in January 2009, and then endorsed by the Trade and Development Board at its forty-seventh executive session in June 2009.

2. In the aftermath of the financial and economic crisis in 2008 and 2009, it has become clear that faster and more sustainable economic growth in developing countries will require, among other things, a strong effort to develop their domestic productive capacities. This should result in the creation of more productive employment and enable a significant reduction of poverty. Government policies aiming at the reinforcement of domestic productive capacities need to address the closely interrelated issues of enterprise development and technological learning and innovation. This note outlines the key components to be considered in the formulation of entrepreneurship and innovation policy frameworks in developing countries, and presents some suggestions for the effective monitoring and assessment of entrepreneurial and innovative activity. Since much of the existing work in this area has been based on data and experiences from developed countries, the note also suggests that models and indicators need to be adapted to better fit the context and needs of developing countries.

3. A policy framework is a collection of policies that sets out the overall goals, objectives and principles, as well as the means and specific measures designed to achieve them. For the purpose of this issues note, entrepreneurship policy is defined as policy aimed at the pre-start, start-up and early post-start-up phases of the entrepreneurial process, designed and delivered to address the areas of motivation, opportunity and skills, with the primary objective of encouraging more people in the population to consider entrepreneurship as an option, to move into the nascent stage of taking actions to start a business, and to proceed into the entry and early stages of the business. Pre-start is the stage that follows the evaluation of the business concept and the decision to start the business. Post-start-up covers the stages after the business opens. In general, entrepreneurship policy covers all of the above stages up to five years after the business opens.

4. This note uses the term “STI policy” to refer to policy interventions that aim at the establishment of an effective national system of innovation or to an improvement of its operation. Among the many available definitions of the national innovation system (NIS) concept, one that is particularly useful refers to it as “that set of distinct institutions which jointly and individually contributes to the development or diffusion of new technologies, and which provides a framework within which governments form and implement policies to influence the innovation process. As such, it is a system of interconnected institutions to create, store and transfer the knowledge and skills and artefacts which define new technologies”.

B. Key policy considerations

5. A first factor to consider in the design of entrepreneurship and innovation policy frameworks is the close relationship that exists between these two policy areas, and the synergies that they can generate for economic growth and development. Entrepreneurs fuel

innovation by developing new or improving existing products, services or processes. New technologies and their applications stimulate the growth of new firms, and improve the efficiency and productivity of existing ones. Entrepreneurship and innovation policies are increasingly seen as being mutually supportive. However, coordination and coherence among them could be improved. Studies show that much of the research work related to entrepreneurship and innovation is pursued by different researchers, and policies are more often than not designed and implemented by different ministries within national governments.¹

6. Another factor is the scope of policy framework. There are multiple actors in the entrepreneurial ecosystem, and it is important for policymakers to differentiate between the policies/actions that could be launched by the public sector, and the programmes/actions that would be run more effectively by other stakeholders such as the private sector, academia, non-governmental organizations and others.

7. Finally, it is important to keep in mind that entrepreneurship and innovation policies can vary widely from one country to another. Context is critical. Each country is unique in terms of its economic and social realities, and will seek to promote entrepreneurship and innovation using whatever tools are available and to meet specific goals relevant to the local context. Goals can range from generating jobs and economic growth to the empowerment of marginalized members of the community (e.g. youth, women and the handicapped).

8. A systemic approach seems the best suited to fostering innovation and entrepreneurship in developing economies. Only a comprehensive set of policies can develop the knowledge and technological capacity of economic actors and facilitate the essential interactions and flows of knowledge for innovation and entrepreneurship to take off. The following sections of this note present some of the areas that such sets of policies cover. A series of indicators to support the evaluation of such policies is also introduced.

9. Reflecting the limitations outlined above, the following pages describe firstly entrepreneurship policies, and secondly STI and innovation policies, with the intention of improving understanding of how these two traditionally separate topics can be interlinked.

II. A framework for entrepreneurship policies

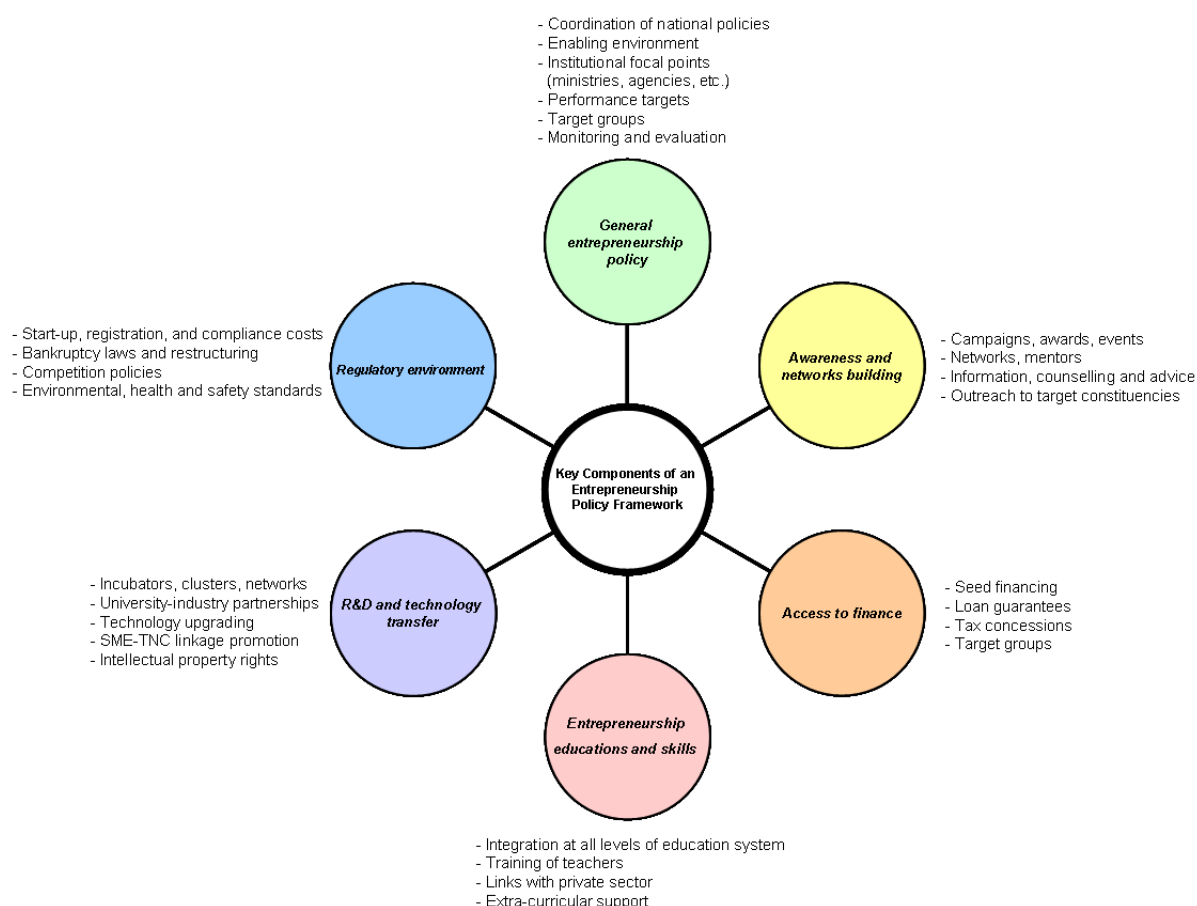
10. This section presents guidelines on the key elements of a national entrepreneurship policy framework. Entrepreneurship policy areas have been classified differently by various researchers. According to Lundström, Almerud and Stevenson,² entrepreneurship policy areas fall into seven groups: administrative burden; counselling and information; education; financing; target groups; promotion; and policy relevant research. The framework elaborated in 2007 by the Organization for Economic Cooperation and Development (OECD) for measuring entrepreneurship identified six major policy areas: regulatory environment; market conditions; access to finance; R&D and technology; entrepreneurial capabilities; and culture. These policy areas could further be divided into several sub-policy areas. For instance, education may further be broken down, inter alia, into formal and informal; general business and entrepreneurship; primary, secondary and tertiary education.

¹ Lundström A, Almerud M, Stevenson L (2008). *Entrepreneurship and Innovation Policies: Analysing Measures in European Countries*. Innovation policy research for the Economic Growth Working Group, Swedish Foundation for Small Business Research.

² Ibid.

11. The entrepreneurship policy framework for this issue note has organized policies in six areas: general entrepreneurship policy; awareness and network building; access to finance; entrepreneurship education and skill building; R&D and technology transfer; and regulatory framework.³

Figure 1. Key components of an entrepreneurship policy framework



12. In each policy area, the issues note provides an initial list of possible specific questions about policies or programmes, in order to gain a better understanding of existing entrepreneurship and innovation-oriented policy approaches. It also can help to identify the relative comprehensiveness of different policy areas in a country. However, it is important to state that this approach does not indicate good or bad performance by a country in the related area. It is not obvious that a nation doing more in one of the sub-areas is “better” than a nation doing less in such a sub-area.⁴ As discussed in the previous section, there could be many explanations for why a certain country is active or not active in a specific area of entrepreneurship policy or innovation policy. The questions presented in the framework are mainly based on the research developed by Lundström, Almerud and Stevenson, adapted by UNCTAD to reflect the concerns of developing countries.

³ Ibid.

⁴ Ibid.

A. Entrepreneurship policy framework components

1. General entrepreneurship policy

Key questions in the general entrepreneurship policy

- (a) Is there a national entrepreneurship policy?
- (b) Is the entrepreneurship policy also part of other national policies?
- (c) Is there clarity about the type of entrepreneurship that the country wants to encourage?
- (d) Do the policies differentiate between start-ups and established enterprises?
- (e) Do the policies differentiate between formal and informal enterprises?
- (f) Is there a ministry, agency or institution responsible for entrepreneurship?
- (g) Are there specific targets to increase entrepreneurial activity?
- (h) Are there surveys for assessing the entrepreneurial environment?
- (i) Does the government assess the impact of the policy measures?
- (j) Is there a deliberate policy to promote entrepreneurial activity among some groups of the population?

13. General entrepreneurship policy provides the enabling environment for entrepreneurship. It includes the existence of a national policy and of institutional arrangements for implementing policies and monitoring mechanisms.⁵ Policymakers need to be clear about the type of entrepreneurship they would like to encourage, and segment policies appropriately.⁶ Policies should have clear objectives and specific targets for facilitating entrepreneurship. Entrepreneurship cuts across areas covered by various ministries and therefore needs to be embedded into national policy, not treated as a standalone area. At the same time, entrepreneurship starts at a local level, and therefore needs to be part of local and regional development plans. Institutional focal points (ministries, agencies and dedicated institutions) can help coordinate the implementation of entrepreneurship policies and facilitate links with other key actors and stakeholders. Finally, there should be a regular monitoring mechanism to assess the entrepreneurial environment, culture and attitudes, and specific evaluations of the entrepreneurship policy measures adopted, to determine their effectiveness.

2. Awareness and network building

Key questions in awareness and networking

- (a) Does government carry out campaigns to promote entrepreneurship?
- (b) Does government offer entrepreneurship awards or events to recognize and profile entrepreneurs?
- (c) Is there an allocation for entrepreneurship promotion in the national budget?
- (d) Does government support networks of entrepreneurs, mentors and business leaders?
- (e) Are there easily accessible ways for entrepreneurs to seek business counselling and advice?
- (f) Are there information centres or online facilities offering comprehensive information on formalizing, creating and building a business in the country?
- (g) Are these services provided in such a way that the local community has adequate access (low-literacy groups, rural areas etc.)?

14. Entrepreneurship is a process driven by entrepreneurial individuals and teams. The key to catalysing entrepreneurship is therefore through people and networks. Too often, policy measures focus more on institutional arrangements and infrastructure, rather than on

⁵ Ibid.

⁶ Desai S (2009). *Measuring Entrepreneurship in Developing Countries*. United Nations University–World Institute for Development Economics Research. Research paper no. 2009/10. Helsinki.

people and social networks. To facilitate entrepreneurial networks, it is important to identify local entrepreneurs and to help to connect them with others in the entrepreneurial ecosystem. This could be through business associations, universities, and other networking hubs.

15. General promotion of entrepreneurship, through campaigns such as Global Entrepreneurship Week⁷ and other approaches, could improve attitudes about entrepreneurship and encourage potential entrepreneurs to formalize or to start and grow a firm. The provision of business information and services could also facilitate networking within groups of new entrepreneurs, and with established business leaders and associations. Building awareness about the benefits of entrepreneurship and celebrating successful entrepreneurs send strong and positive signals which can generate a cultural change in views about entrepreneurship. For example, the Women in Business Award is granted every two years to women-owned businesses that have benefited from the business development services of EMPRETEC – UNCTAD’s programme for the promotion of entrepreneurship that operates in 32 developing countries. The winners of the 2008 award have become outstanding role models for women entrepreneurs in developing countries.

3. Access to finance

Key questions in accessing finance

- (a) Are there measures to make funding available at early stages of firms’ formation and growth?
- (b) Is there availability of equity, guarantees and micro-loans for emerging entrepreneurs?
- (c) Are there public-private funds (venture capital and other types) for entrepreneurs?
- (d) Are there measures to encourage financial institutions to lend to start-ups and SMEs?
- (e) Are there fiscal or non-fiscal incentives for venture capital and business angel development?
- (f) Does government offer tax concessions to start-ups?
- (g) Is there an SME tier at stock markets with favourable regulations?
- (h) Has government taken steps to improve access to finance for target groups (minorities, youth, women, immigrants, disabled, unemployed/retrrenched, expatriates, researchers/technologists, those in rural areas)?

16. Seed, start-up and early-stage financing remains a major challenge for many entrepreneurs, particularly in today’s financial environment. Policy measures that seek to increase access to finance could include facilitation of access to loans, credit guarantees and equity. However, these instruments should be provided in partnership with the private sector, as there can be pitfalls with government involvement in SME financing. Common flaws in many programmes, particularly those focused on encouraging venture capital, include poor design, lack of understanding of the entrepreneurial process, and implementation problems.

17. Policies and reforms of financial institutions and markets can also facilitate SME financing. Evidence shows that SMEs are more constrained by financing and other institutional obstacles than large enterprises are, and that this is exacerbated by the weaknesses in the financial systems of many developing countries.

⁷ More than 75 countries around the world were involved in 2008, and nearly 100 in 2009. For more information about Global Entrepreneurship Week, visit <http://www.unleashingideas.org>.

4. Entrepreneurship education and skills

Key questions in education and skills development

- (a) Is there a national budget for entrepreneurship curriculum development?
- (b) Do policies aim to integrate entrepreneurship at all levels in the educational system?
- (c) Are there policies for introducing more interactive and experience-based teaching approaches in the educational system?
- (d) Does the government support programmes to provide training of entrepreneurship teachers?
- (e) Are academic institutions encouraged and supported in providing training, counselling, diagnostic and advisory services to SMEs and early-stage entrepreneurs?
- (f) Is there funding to promote extracurricular entrepreneurial activities (e.g. student activities, business plan competitions, business development programmes etc.)?
- (g) Are entrepreneurship training programmes offered outside the formal education system? Do these programmes address low-literacy groups and those in rural areas?
- (h) Has research been undertaken to monitor the provision and/or outcomes of entrepreneurship education?

18. Policies to improve entrepreneurship skills should encourage the integration of entrepreneurship training at all levels (primary, secondary and tertiary) in the education system. The utilization of methods and tools to develop the appropriate learning environment to encourage creativity, innovation and the ability to “think outside the box” to solve problems should also be encouraged.

19. Embedding entrepreneurship and innovation, cross-disciplinary approaches and interactive teaching methods all require new models, frameworks and paradigms. This requires the training of teachers, and potential changes in the way that rewards, recognition and incentives are given. It also includes the need to provide entrepreneurship training and apprentice programmes outside of formal education systems, in rural and community programmes. The ultimate objective of entrepreneurship education policies should be to create a more entrepreneurial society and culture by changing the mindsets of young people about entrepreneurship and encouraging them to consider it as a possible path for themselves in the future.

5. R&D and technology transfer

Key questions in R&D and technology transfer

- (a) Does government provide incentives and support for applied research and commercialization of science and technology?
- (b) Does government provide support infrastructure (incubators, clusters, networks) for science and technology commercialization?
- (c) Does government encourage and support linkages for university–industry partnerships?
- (d) Are there technology transfer offices and business bureaus that offer intellectual property protection and technology acquisition support?
- (e) Does government provide support to SMEs to upgrade, adopt modern technologies, or improve their efficiency and management?
- (f) Is there a policy to promote diffusion of publicly funded or acquired technologies to SMEs?
- (g) Are there programmes to engage SMEs in the value chain of larger companies and multinationals?

20. Entrepreneurship policies in this area seek not only to promote science and technology development, but also to promote their use and their transfer and diffusion into society, and should be conceived of as an integral part of broader policies to enhance the

NIS as described in section III. Policies can include: public investing in R&D and technology transfer; provision of incentives for private investment in R&D; technology acquisition; and intellectual property protection. Programmes that build linkages between researchers and industry are critical for accelerating innovation, and should be encouraged and supported.

6. Regulatory environment

Key questions in addressing regulatory environment

- (a) Has government put in place mechanisms to assess the process and the ease of starting a business?
- (b) Does the government assess the time and cost of starting a business?
- (c) Does the government assess the time and cost of closing a business?
- (d) Has the government reviewed its bankruptcy laws to encourage quick restart by entrepreneurs whose businesses fail?
- (e) Is there a regular review of competition policies to ease the entry of new firms, and to monitor anticompetitive practices by large firms against small firms?
- (f) Has government set up a regulation unit to monitor the impact of new agreements, legislations and directives on start-ups and SMEs?
- (g) Does the government monitor compliance with health and safety standards in the workplace?
- (h) Does government taxation policy take into account the needs of start-ups (e.g. offer tax concessions, rebates and accelerated appreciation)?
- (i) Has the government introduced environmental protection measures and provided incentives for their application?
- (j) Has the government simplified and accelerated access to commercial courts and to alternative dispute resolution mechanisms?
- (k) Has the government introduced improvements in land titles, registers and administration?
- (l) Does government encourage skilled migrants and entrepreneurship among immigrants?

21. Policy measures in this area should seek to reduce the administrative burdens related to company formation and failure, labour, taxation, international trade and investment, public procurement, and commercial laws, and should also provide fair and transparent enforcement of competition, health, safety and environment regulations. Many countries have made significant strides in improving the general business environment (see the World Bank's *Doing Business* reports from 2000 to 2009). Recent research suggests that firms in developed countries have greater ease and incentives to incorporate informal businesses in developing countries both for the benefits of greater access to formal financing and labour contracts, as well as for tax and other purposes not related to business activities.

B. Towards viable indicators for measuring entrepreneurship in developing countries

22. While this issues note discusses both policy frameworks and indicators, it should be noted that there is not necessarily a direct link between the two, and indicators should therefore not be viewed as "evaluation" measures of policy. Policies require clear objectives, targets and measures, which can determine the effectiveness of reaching those goals. Meanwhile, indicators provide broader information, which enables policymakers to monitor the general direction of the set of policies and actions that have been taken within the country, but they do not evaluate the effectiveness of specific policies.

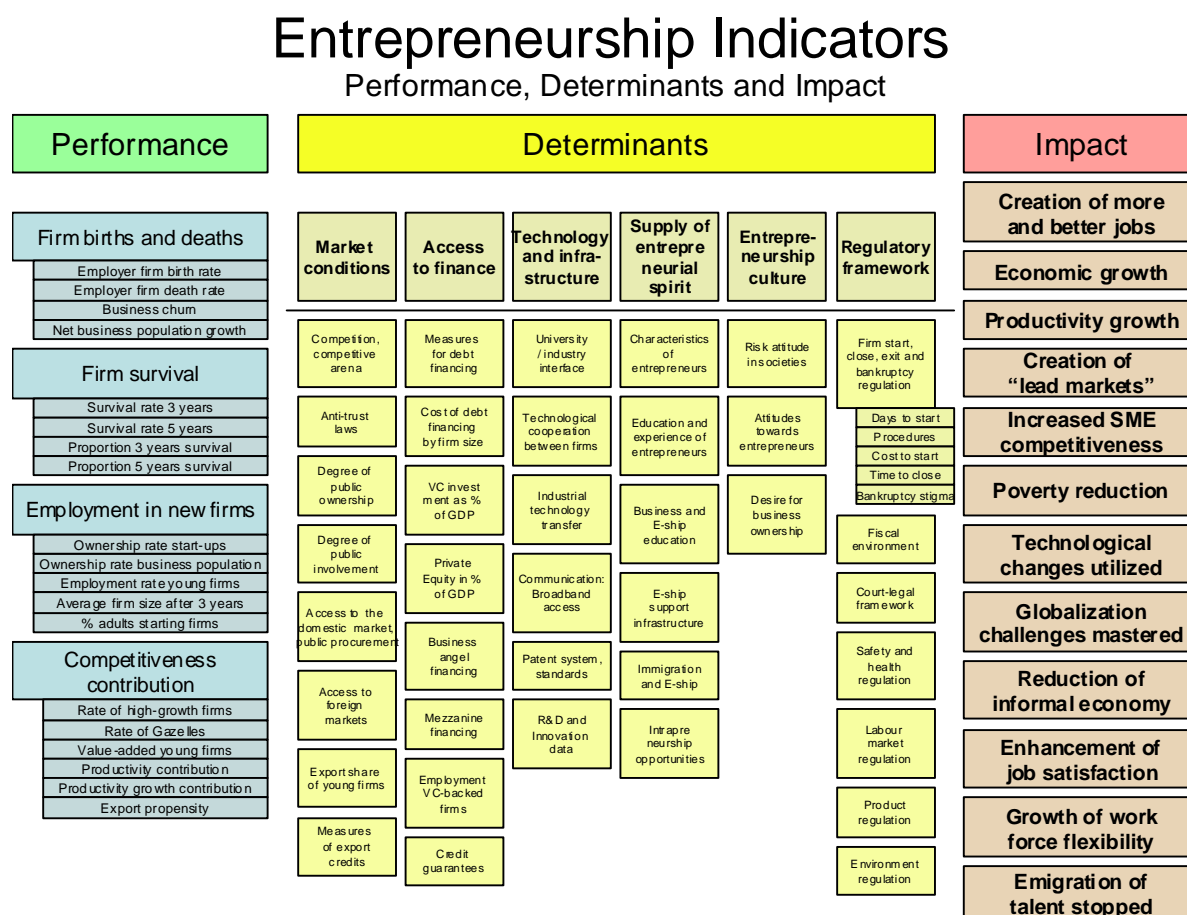
23. Various indicators for assessing entrepreneurship have been developed by different organizations, including the Global Entrepreneurship Monitor (GEM) and the World Bank Group's Entrepreneurship Survey (WBGES). There are some fundamental differences in their measurement tools. For instance, the WBGES collects information on "firm registration" and focuses on policies (i.e. entry and exit barriers) that affect firm registration procedures and administration, while the GEM focuses on early-stage entrepreneurial activity (individuals in the process of starting and managing a business, for up to 3.5 years).

24. Where developing countries are concerned, the GEM figures tend to be higher than the WBGES figures. One possible explanation is the distinction between formal registration and entrepreneurial intent and informal activity that is captured by GEM data. As a matter of fact, many developing countries face specific challenges, such as a prevalence of microenterprises, "necessity/survival" versus "opportunity" entrepreneurs, and business informality (unregistered businesses). In addition, developing countries often need technological catch-up (or to "leap frog", where the opportunities present themselves) and upgrading, as opposed to commercialization of new technologies.

25. Recently, the OECD's Entrepreneurship Indicators Programme has developed a comprehensive framework to measure entrepreneurship, which includes indicators of performance, determinants and impact (fig. 2).⁸ Entrepreneurship indicators serve as important measures for assessing entrepreneurs' response to policy changes and actions, and for achieving entrepreneurship policy objectives, such as creating employment and increasing gross domestic product (GDP).

⁸ As part of the Entrepreneurship Indicators Programme, the OECD collaborated with Eurostat and national statistics offices to collect the data in a consistent and comparable manner. The first report of the Entrepreneurship Indicators Programme was issued in November 2008, and included performance indicators for 18 countries. The second report is to be issued in November 2009, containing performance indicators for 24 countries. In future years, expansion is planned both of the number of countries, including non-OECD countries, and the number of indicators included.

Figure 2. Entrepreneurship Indicators



Source: OECD (2007).

26. There are two main challenges in measuring entrepreneurship policy. Firstly, the ultimate impact of a policy shift on entrepreneurial activity is difficult to measure accurately, as several factors often interact at the same time and affect individual entrepreneurs differently. The "cause and effect" relationship between any particular set of policies and any particular impact is therefore largely contested, particularly in developing countries, where these dynamics are usually the most unclear.⁹ Secondly, in many developing countries the required data are often either not readily available or have not been collected in a systematic manner.

27. One way of addressing these challenges is to focus mainly on measuring the performance of shifts in entrepreneurship policy, for which data are easier to collect and more readily available than the underlying data for measuring impacts. In this regard, the performance indicators developed by the OECD's Entrepreneurship Indicators Programme (see fig. 2) provide the most comprehensive reference point to date. Entrepreneurship performance can be assessed, for example, in terms of the number and proportion of new

⁹ Desai S (2009). *Measuring Entrepreneurship in Developing Countries*. United Nations University–World Institute for Development Economics Research. Research paper no. 2009/10. Helsinki.

firms established and surviving; in terms of employment created; and/or in terms of increased competitiveness.

Table 1

Selected entrepreneurship performance indicators

Entrepreneurship performance at different levels		
Employment	Firms	Competitiveness
Employment created in young firms (percentage of total workforce)	Firm birth/death rate (number of firms/year)	High-growth firms (percentage of start-ups)
Business owners/start-ups (percentage of adult population)	Net firm population growth (percentage per year)	Productivity growth contribution of young firms
Average firm size after 3 and 5 years (number of employees)	“Business churn”	Value-added contribution of young firms
Employment created within specific target groups (gender, minority) in young firms (percentage of total)	Survival rate after 3 and 5 years (percentage of start-ups)	Export propensity of young firms

Source: Adapted by UNCTAD from OECD data.

Notes: *Start-up:* All stages immediately following launch of firm.

Young firm: Less than 5 years since launch of firm.

High-growth: Firms with turnover growth above 10 per cent per year for two consecutive years.

Business churn: Number of start-ups and failures as a percentage of all firms.

28. From the above, it clearly emerges that not all of the OECD performance indicators are equally applicable to developing countries. For example, many developing countries face special challenges in collecting information on firm start-up and survival rates, due to the prevalence of the informal sector. One of the key items for discussion for experts participating at the multi-year expert meeting is therefore to determine how existing indicators might be adapted and made relevant for developing countries. Additional indicators will likely need to be identified. At the same time, it is important to find ways in which developing countries can collect and keep information on key indicators using their national company registers, statistical offices, tax authorities and research groups, while ensuring that the data collected are comparable with existing international statistics.

III. A framework for the analysis and measurement of STI policies

A. Defining an STI policy framework

29. The notion that STI plays a central role in long-term economic and social development processes now enjoys nearly universal support. As a consequence, the need to step up efforts in support of innovation (and particularly technological innovation) in order to promote economic growth is increasingly visible in the policy agendas of developing countries. This calls for the definition of overall STI policy frameworks that address the processes of innovation at the national and regional level, and that are adapted to the specific conditions in which technological learning takes place in developing countries. This section will summarily describe such STI frameworks, which, given that enterprises are the main locus of innovation, must pay particular attention to the linkages with

entrepreneurship policies, especially those targeting the technological and innovative capabilities of enterprises. Considering that, compared with the area of entrepreneurship policy, quite a good deal more knowledge is available about the development and analysis of STI policy frameworks, the section emphasizes the issue of the measurement of STI policies and indicators in developing countries.

30. The following are some of the distinctive features of the environment of technological development and innovation in developing countries:

(a) The concept of what constitutes innovation activity is different in many developing-country contexts, where innovation is much more frequently incremental rather than radical; it rarely takes place at the frontiers of scientific and technological knowledge, but rather involves the adaptation, imitation and enhancement of technologies obtained from abroad; and it tends to consist more of introducing products, services or processes that are new to the firm or to the market, rather than new to the world.

(b) Many developing countries face the problem of weak technological absorptive capacities at the level of the individual firm (operational, engineering and managerial capabilities) and with regard to STI-related infrastructure and support services.

(c) In the case of the least developed countries, the sectors in which technology-based positive externalities and economies of scale can have a more marked effect have a smaller relative weight in the productive structure.

(d) The linkages between users and providers of knowledge are often weak; the physical infrastructure may be inadequate for more technology-intensive production methods; and the financial system often does not provide innovative enterprises with enough access to capital on competitive terms.

31. Given the multidimensional character of developing countries' STI weaknesses, a systems-based approach to STI policy seems more likely to respond to the needs of developing countries than the earlier innovation models, particularly linear ones. Moving from linear to systems approaches to STI policy also helps correct a frequent bias that favours R&D activities to the detriment of efforts to reinforce the innovative capabilities of firms, the linkages between the providers and the users of knowledge and technology, and the improvement of the overall STI environment.

32. The systems approach to STI policy frameworks rests on the concept of the NIS. According to this approach, the qualitative and quantitative aspects of the interactions and flows of knowledge between a set of actors that includes the business subsystem (firms, farms and cooperatives etc.), the knowledge production subsystem (universities and research centres) and intermediate organizations (technology brokers and extension services) are critical. These interactions are enabled (or not) by infrastructural elements (physical, financial, cultural and institutional) and are oriented and driven by a combination of market forces (demand for final and intermediate products) and government policies and interventions.

33. Once the NIS rather than the linear model is adopted as the framework of STI policy, policies need to consider a much broader set of issues:

(a) The most prominent issue is how to increase the supply of knowledge into the system, generally through measures to reinforce the education and research subsystem and build up human capital. Supply-side policies should be complemented by the provision of adequate incentives to the demand side of technology markets, the generation of strong links between the creators and disseminators of knowledge on the one hand and the users of knowledge on the other hand, and the overall framework conditions for STI activity.

(b) Human capital development policies need to support the emergence of a sufficiently wide and deep pool of operational, engineering, managerial and research skills. This requires well-sequenced investments in basic education, vocational training, on-the-job training programmes and more advanced managerial, engineering and scientific education. Many developing countries face serious shortages in design and engineering capabilities, which have tended to worsen in recent years. Another important set of policies in a systems-based STI policy framework concerns the promotion of stronger linkages between the various players in the national innovation system. This takes in a very wide scope of interventions, including supporting research networks, providing incentives for inter-firm collaborations, supporting linkages between the public research institutions and enterprises, and facilitating the creation of linkages between national firms and subsidiaries of foreign companies. It may require the establishment of publicly funded technology intermediation and/or consultancy services. Policies to encourage public-private partnerships, the development of technology clusters and the promotion of technology parks are other examples of policies in this broad area.

(c) Finally, an NIS policy framework should also consider measures to improve the overall environment for STI activity. This includes a very wide variety of issues that range from those that are closely related to STI (such as STI infrastructure, including standardization, metrology, information networks, technological extension services), regulatory aspects (intellectual property regimes, competition policies), trade and investment policies, financial constraints (development of venture capital, facilitation of access by SMEs to credit), taxation, and physical infrastructure (power, ICT infrastructure).

34. This cursory enumeration of the broad areas that a systems-based STI policy framework must encompass provides an indication of the complexity of the challenge of devising instruments to measure STI activities that are relevant to policy formulation. This will be explored in the following paragraphs.

B. Selecting indicators for innovation policymaking

35. Measuring the NSI is fundamental for the success of STI-based growth strategies, starting with the policy formulation itself. Policymaking involves choices about the allocation of resources, which must be informed by an objective, precise evaluation of factors such as the strengths and weaknesses in the national innovation system, the key innovation strategies that enterprises undertake, or the impact that specific policies have had on innovation outputs. Through the measurement of STI, policymakers can also benchmark national systems of innovation.

36. Measurement, monitoring and evaluation are equally important at the other end of the policy process. STI policies are necessarily long-term. Therefore, their success requires continued political commitment, which in turn depends on the visibility to policymakers of the benefits of innovation and on the actors bringing forth these benefits. Without a reliable set of indicators and a sustained effort to gather this information, it is not possible to record successes or to acknowledge the transformation that innovation induces in the economy, nor is it possible to compare performance across sectors, policies or regions, or with international competitors. These are all factors that may lead to policy fatigue, lack of continuity, and ultimately, to policy failure.

37. Our understanding of STI affects how we measure it. Under the assumptions of a linear approach to innovation, increased STI inputs are seen as directly leading to increased STI outputs. Consequently, STI statistics centre on measuring R&D inputs and outputs. The development of the notion of a national system of innovation, and of a broader understanding of innovation, has brought into question the use of aggregate science and technology indicators (such as patent statistics or expenditure on R&D) as exclusive STI

indicators, and has encouraged the use of firm-level innovation data to better understand how innovation takes place.

38. In order to provide useful information, STI measurement must reflect the nature and role of STI in the specific conditions in which technological learning and innovation takes place in developing countries. Understanding the differing nature of these innovation activities, the absorptive capacity of enterprises, the strength and scope of linkages in the innovation system, the dynamics across sectors, firms and regions, and the incentives and disincentives that innovative SMEs face will be much more important than the mere quantification of STI inputs and outputs. Significant statistical work has been developed over the last decades on STI surveys and indicators, mostly in developed countries, providing a tried basis on which to build efforts to develop STI measurement in developing countries.

39. The OECD's Oslo Manual is the reference manual for the collection of innovation information. The Bogotá Manual was the first regional effort to collect STI data in developing countries and to make innovation surveys more relevant to their situation. For instance, having noted the lesser importance of R&D in Latin American firms, and recognizing the importance of a wider notion of innovation, it encouraged analysis of other types of innovation activities, such as marketing and organizational innovation. The latest edition of the Oslo Manual, which was issued in 2005, uses a wider definition of innovation, and has added an analysis of the characteristics of STI in developing countries. It provides specific guidelines for the collection of innovation information to match the key research questions about issues such as ICTs and innovation, linkages between different STI agents, or the scope of industrial design and engineering activities.

40. Another regional effort is the African Science, Technology and Innovation Indicators Initiative, which promotes the collection of STI data at the national level with the support of the Office of Science and Technology of the New Partnership for Africa's Development (NEPAD). The 19 African countries participating in this initiative have selected national focal points, agreed on the methodology, and started the collection of data through R&D and/or innovation surveys. The collection of data is based on the Oslo Manual and the South African Innovation Survey. Two meetings have addressed harmonization of the surveys and the validation of the data, and it is expected that by early 2010, the first set of STI data will be available.

41. In Asia, the Science and Technology Network of the Association of Southeast Asian Nations (ASEAN) supported the collection of comparable science and technology (S&T) data in the mid-nineties; more recently, a new drive to develop a core set of ASEAN S&T indicators has been put in motion. The efforts of ASEAN have largely concentrated on S&T indicators, but several Asian developing countries have experience in conducting innovation surveys.

C. A possible reference set of STI indicators for developing countries

42. Despite these regional initiatives and other national experiences, the absence of STI data remains a serious difficulty for policymaking in developing countries. Two major challenges remain to ensure the wide availability of relevant STI data:

(a) Increasing the number of countries that collect STI data, and widening the scope of the data being collected. For example, in Latin America, the set of countries for which comparable data in innovation can be extracted is limited to Argentina, Brazil, Colombia and Uruguay, and to a lesser extent, Mexico and Peru.

(b) Facilitating STI data analysis by promoting data comparability and access. Often, STI data held by national statistical offices are not open to external users. In order to

conduct meaningful analysis, researchers need access to comparable sets of data or to raw data. Taking into account confidentiality concerns, national statistical offices can be encouraged to share STI data in two complementary ways: by reporting aggregate statistics on a limited set of indicators to a centralized database; and by providing access to raw data to researchers and/or institutions covered by confidentiality agreements.

43. The development of a reference set of key STI indicators can help respond to these two challenges. In the first place, countries that up until now have not collected STI data can use the reference set of STI indicators to organize their first efforts in STI measurement. Secondly, national statistical offices can be encouraged to report aggregate statistics based on the reference set of indicators, thereby facilitating international comparisons of STI data. Given the diverse information needs of policymakers and the limited statistical resources available in developing countries, careful consideration needs to be paid to which indicators are to be included in the set. The indicators selected must be based on a strong conceptual framework that is based in the concept of the NIS; they must provide a relevant and balanced overview of its components and the flows and interactions within it; and they must be easy and cost-effective to collect.

44. Table 2 suggests a set of STI indicators that can help policymakers take informed decisions. It is intended to serve as the starting point for a discussion about a possible set of reference STI indicators for developing countries. The set is broadly based on the European Innovation Scoreboard (EIS). The EIS provides good coverage of the different aspects of an NIS (including STI inputs, outputs and impacts), and is based on extensive experience in the definition, data collection and analysis of STI indicators. To enhance its relevance to developing countries, preference has been given to indicators that are more often collected or could more easily be collected in developing countries. Some are defined in a slightly different manner than in the EIS, in order to use indicators that are available in public international data sources. Indicators selected by existing regional STI measuring initiatives in developing countries (i.e. African Science, Technology and Innovation Indicators Initiative, and Red Iberoamericana de Ciencia y Tecnología (RICYT)) have been preferred. Preference has also been given to those indicators that focus on aspects of the NIS that are particularly relevant to developing countries.

45. The set of STI indicators suggested here could serve as a basis for the collection and sharing of internationally comparable statistics. The set should not be restrictive or mandatory. Countries that find themselves at earlier stages of STI development and/or with more limited STI statistical sources may focus on obtaining data for a smaller number of indicators most suited to capturing the key characteristics of STI in their national context.

46. Best practice recommends that STI data should be collected through two separate surveys. The first would be an S&T survey that captures mainly R&D data at a macro level. The second would be a more challenging innovation survey. Smaller economies may decide to conduct one survey that covers both areas. Some of the STI data can be captured from existing sources of information (i.e. bibliometric and patent statistics). The processing and analysis of such data can be carried out by expert regional or international organizations. For instance, the secretariat of NEPAD has agreed to take responsibility for the collection of bibliometric and patent data for African countries.

47. The most critical challenge is to ensure that STI indicators are relevant for policymaking. In this regard, complex indicators can be better suited than simple indicators. While most simple indicators measure STI inputs and outputs, complex indicators can provide an enhanced picture of how innovation takes place, provide a measure of the diffusion of innovation, and facilitate international comparisons. Moreover, the involvement of policymakers in the selection and definition of STI indicators can help make better use of indicators to guide the development of concrete policy proposals.

Table 2
Science, technology and innovation indicators for developing countries

		Indicator	Definition and notes	Interpretation	Potential data source
Enablers	Human resources	1. Researchers in R&D per million population	Professionals engaged in the conception or creation of new knowledge, products, processes, methods or systems, and in the management of the projects concerned (including PhD students engaged in R&D)	Supply of R&D skills	UNESCO Institute for Statistics
		2. Labour force with tertiary education (percentage of total labour force)		Supply of advanced skills	International Labour Organization
		3. Scientific articles per million population	Number of scientific and engineering articles published in physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.	R&D throughput	National Science Foundation, Science and Engineering Indicators
	Finance and support	4. Public R&D expenditure	All R&D expenditure in the government sector (GOVERD) and university sector (HERD) / Gross domestic product	R&D expenditure by government and higher education institutions	UNESCO Institute for Statistics
		5. Venture capital (percentage of GDP)	Private equity raised for investment in companies (management buyouts, buy-ins, and venture purchase of quoted shares are excluded) / Gross domestic product. It includes early-stage (seed and start-up) and expansion and replacement capital.	Dynamism of new business creation	To be discussed
		6. Proportion of businesses with broadband access	Proportion of businesses using the Internet – with fixed broadband or mobile broadband – download speed ≥ 256 Kbit/s, in one or both directions	Broadband increasingly important for innovative activities	UNCTAD
Firm Activities	Investments	7. Business R&D expenditure	R&D expenditures in the business sector (BERD) / Gross domestic product	Formal creation of new knowledge within firms	UNESCO Institute for Statistics
		8. ICT expenditure (percentage of GDP)	ICT expenditure by the public and private sector (including individuals and households)	Infrastructure and diffusion	Digital Planet 2008
		9. Non-R&D innovation expenditure (percentage of turnover)	Innovation expenditure for enterprises excluding R&D expenditures / Total turnover for all enterprises (both innovators and non-innovators)	Non-R&D expenditure particularly relevant for developing countries.	National innovation surveys

		Indicator	Definition and notes	Interpretation	Potential data source
Entrepreneurship and linkages		10. SMEs innovating in-house (percentage of SMEs)	Sum of SMEs that have introduced new products or processes (either alone or in collaboration with others) / Total number of SMEs (both innovators and non-innovators)	Limited to SMEs, because almost all large firms innovate	National innovation surveys
		11. Innovative SMEs cooperating with others (percentage of SMEs)	Sum of SMEs with innovation cooperation activities (i.e. that have had any cooperation agreement on innovation activities with other enterprises or institutions in the three years of the survey period) / Total number of SMEs (innovators and non-innovators)	Linkages between firms and between firms and public research institutions	National innovation surveys
		12. Share of enterprises receiving public funding for innovation	Sum of enterprises that have received public funding for innovation / Total number of innovating enterprises	Public–private linkages in terms of input. Outcome of public policies.	National innovation surveys
Throughputs and internationalization		13. Patent applications by residents per million population	Number of patents filed in the national or regional patent office by the country’s residents, by address of the applicant	Proxy of intermediary output (research), not necessarily innovation	WIPO Patent Report
		14. Trademark applications by residents per million population	Number of direct trademark applications by country residents	Innovation, in particular in the services sector	WIPO Patent Report
		15. Industrial design applications by residents per million population	Number of direct industrial design applications by country residents	Innovation	WIPO Patent Report
		16. Technology balance of payments flows (receipts plus payments) (percentage of GDP)	Royalty and licence fee receipts plus Royalty and license fees payments (BoP, current USD) / GDP current USD	Disembodied technology diffusion	World Development Indicators

		Indicator	Definition and notes	Interpretation	Potential data source
Outputs	Innovators	17. SMEs introducing product or process innovations (percentage of SMEs)	Number of SMEs that introduced a new product (good or service) and/or a new process to one of their markets / Total number of SMEs	Technological innovation	National innovation survey
		18. SMEs introducing marketing or organizational innovations (percentage of SMEs)	Number of SMEs that introduced a new marketing innovation and/or organizational innovation to one of their markets	Non-technological innovation	National innovation survey
		19. Resource efficiency innovators	Average score of (a) percentage of innovating firms whose product or process innovation has had an important effect on reducing labour costs per unit of output, and (b) percentage of innovating firms whose product or process innovation has had a great effect on reducing materials and energy per unit of output.	(a) cost savings from product and process innovation (b) proxy for eco-innovation	National innovation survey
	Economic effects	20. Employment in knowledge-intensive services (percentage of total workforce)	Number of employed persons in the knowledge-intensive services, including NACE 61-62, 64-67, 70-74 / Total workforce (including all manufacturing and services sectors)	Knowledge-intensive services provide services directly to consumers and inputs to the innovative activities of other firms	International Labour Organization
		21. Employment in medium-high and high-tech manufacturing (percentage of total workforce)	Number of employed persons in the medium-high and high-tech manufacturing sectors (NACE 24, 29-35) / Total workforce (including all manufacturing and services sectors)	Captures the extent to which the manufacturing economy is based on continual innovation	International Labour Organization
		22. Medium and high-tech manufacturing exports (percentage of total exports)	High-tech exports include the following SITC Rev.3 products: 266, 267, 512, 513, 525, 533, 54, 553, 554, 562, 57, 58, 591, 593, 597, 598, 629, 653, 671, 672, 679, 71, 72, 731, 733, 737, 74, 751, 752, 759, 76, 77, 78, 79, 812, 87, 88 and 891	(a) Technological competitiveness (b) Ability to commercialize innovation results in international markets (c) Product specialization	UN Comtrade
		23. Knowledge-intensive services exports (percentage of total services exports)	Exports of knowledge-intensive services (Extended Balance of Payment Services (EBOPS) credits): 207, 208, 211, 212, 218, 228, 229, 245, 253, 254, 260, 263, 272, 274, 278, 279, 280 and 284) / Total services exports (credits in EBOPS 200)	Competitiveness of the knowledge-intensive services sector	EBOPS
		24. New-to-market sales (percentage of turnover)	Total turnover of new or significantly improved products for all enterprises / Total turnover for all enterprises (innovators and non-innovators)	Turnover of new or significantly improved products, which are also new to the market	National innovation survey
		25. New-to-firm sales (percentage of turnover)	Total turnover of new or significantly improved products to the firm but not to the market for all enterprises.	Proxy for the use elsewhere of existing products and the diffusion of new technologies	National innovation survey

Source: UNCTAD.

IV. Conclusions and issues for discussions

A. Policy frameworks for developing countries

48. The frameworks presented in this note provide an overview of key policies that have been found to be important in promoting entrepreneurship and innovation in developed and developing countries. This note has also discussed some benchmarking tools that policymakers in developing countries can use to identify entrepreneurship and innovation policies relevant to their country and situation. Improving the understanding of entrepreneurship and innovation in developing countries is an important prerequisite to appropriate public policy planning (Desai, 2009).

B. Entrepreneurship and innovation indicators for developing countries

49. While there will be inevitable differences in policy approaches across countries, collecting data on key entrepreneurship and innovation indicators is useful. Although broad indicators do not provide a direct assessment of the effectiveness of policies, they do provide information that enables policymakers to monitor the general direction of the set of policies and actions that have been taken within the country, and identification of areas for further action.

50. For consistent and sustainable data collection, and to leverage existing resources, governments could require statistical offices to include entrepreneurship and innovation indicators as part of their annual census exercise alongside other economic and social surveys. Similarly, banks, company registers, funding agencies and researchers, among others, could be encouraged to collect information to assess entrepreneurial performance. Linking relevant national institutions with existing international initiatives or organizations could enable faster and more effective adaptation and use of good practices in data collection and analysis.

51. In the field of STI, experience shows that surveys and indicators should be adapted to local conditions. Developing countries may therefore wish to start by collecting basic STI indicators while they build capacities to engage in more extensive STI data collection and analysis. The development of a reference set of indicators can be the first step in that direction. Regional initiatives such as those mentioned above and others that should be encouraged in other regions can provide useful support to this process.

C. Inventory of good practices

52. An inventory of good practices in these areas could address the questions outlined in the frameworks and/or include a special form which could be prepared by the experts. This could be used as a basis for developing guidance on good practices to assist policymakers in designing, implementing and monitoring coherent policies to enhance the role of entrepreneurship and innovation in their national development strategies.

53. Suggested guidelines for identifying such good practices could include the following criteria:

(a) Whether the initiative is innovative, has clear objectives and benchmarks, seeks to reach and stimulate entrepreneurship or seed entrepreneurial attitudes, behaviours and skills in a large proportion of potential entrepreneurs;

- (b) Whether it has successfully established programmes and dedicated institutions to support entrepreneurs and innovation;
- (c) Whether it coordinates entrepreneurship and innovation policies with other policies providing support for improvements to the business environment;
- (d) Whether it regularly monitors the performance of its actions or the actions of others against agreed milestones and targets;
- (e) Whether it can demonstrate success in at least three indicators related to development.

D. Issues for discussion

54. The experts' discussion is expected to point to policy actions or measures necessary for building and boosting developing countries' entrepreneurial and innovation capacity. Taking into consideration their special and unique needs, the following are some questions suggested for review by the experts:

- (a) What are the key entrepreneurship and innovation policies to enable developing countries to facilitate firm formation, access to finance and growth?
 - (b) What are the characteristics of good practice in entrepreneurship and innovation policies? What should be the process and format for collecting good practices?
 - (c) Which indicators are applicable and the most crucial in assessing entrepreneurial performance in developing countries?
 - (d) What reforms in the policy or business environment have proven effective in breaking new ground and creating a more conducive environment for entrepreneurship?
 - (e) What are the key determinants of successful entrepreneurial capability and performance?
 - (f) Can a set of STI indicators for developing countries be identified on the basis of those suggested in this note, and how can a methodology for data collection be established?
 - (g) What mechanisms at the regional level could support national statistical offices in the collection and analysis of STI data and indicators?
 - (h) How can the relevance of STI indicators and surveys to development policy be enhanced?
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