

Influential Article Review - Entrepreneurial Endeavors In An Open National Innovation System (ONIS)

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This paper examines entrepreneurship and innovation. We present insights from a highly influential paper. Here are the highlights from this paper: In the context of globalization, international processes do affect the national innovation system (NIS), increasing the relationship between its agents and its components within and with external agents. The paper seeks to determine the openness and internationalization processes in the internal features of Mexico's NIS and estimate its impacts. This information could allow for a better use of scientific, technological, and innovation—internal and external—capabilities. The point of departure is the concept of innovation, which was developed for the industrial revolution where products and technological processes are emphasized, with a scope of radical to incremental innovation, as a function of the level of their impacts. Implicitly, innovation has been conceptualized internally within the company, i.e., closed innovation, especially in large companies with research and development departments. However, companies have undertaken various forms of collaboration to reduce costs particularly for R&D, which fall within the concept of open innovation. Based on the concept of open innovation, an open national innovation system (ONIS) has been proposed with internal and external components and relationships. This paper argues that the openness of innovation needs to be applied both at firm level and through a NIS as a way of handling the risks involved in innovation better. Thus, firms' open innovation must correspond to an ONIS, matching the openness and internationalization of its knowledge components and agents: firms and universities supported through government policies. The empirical analysis is exploratory, based on a direct and indirect source to assess how highly developed the Mexican ONIS is to propose some policies. For our overseas readers, we then present the insights from this paper in Spanish, French, Portuguese, and German.

Keywords: National innovation system, Open innovation, Internationalization, KIBS, TBF, Entrepreneurship, Mexico

SUMMARY

- In relative terms, Mexico has a good training capacity producing qualified personnel based on research center and university teaching and research activities and networking with its international pairs.
- To create a positive environment for registering patents and exploiting them and to anticipate the second patenting generation as commercial products besides the present protection and defense mechanisms

- Venture capital and angels for start-ups are scarce, so international sponsorship could contribute a lot if they are willing to consider partnerships with local angels and share the investment risk.
- Government policies are more oriented to developing capabilities than to drive the innovation dynamics. Besides that, the level of resources on R&D is low compared with other OCDE countries.
- Mexico's qualified «diaspora» is a strategic complement of the ONIS, considering that some of them are entrepreneurs, patenting and carrying out technology transfers, and participating in international knowledge networking.
- As mentioned in the methodology, an Indico index—which is composed of capacity indicators and results—is applied to measure the innovativeness of the firms. The Indico index for all the 41 firms shows a range from 6.78 down to 1.47 with an average of 4.77, highlighting a group of 21 firms with above average rating. In the top 10 Indico index, nine are KIBS and one is a TBF, so that innovativeness slants towards service firms.
- Considering an efficiency index—calculated by the relation between output over capacity—the first rank varies from 1.22 down to 0.19. The average tendency is 1.37 points of innovativeness by one unit of efficiency.
- The firms show a pattern of external participation involving other agents in their innovations. On one hand, half of the TBF, and one third of the KIBS do their innovations internally. On the other hand, firms' innovations developed with external participation are working in partnership suppliers; clients' participation; and collaborating two external agents either outsourcing suppliers or clients . «Innovation chains» is with three external agents joining forces with the firm and is subcontracting the whole innovation, which is without internal participation.

HIGHLY INFLUENTIAL ARTICLE

We used the following article as a basis of our evaluation:

Corona-Treviño, L. (2016). Entrepreneurship in an open national innovation system (ONIS): A proposal for Mexico. *Journal of Innovation and Entrepreneurship*, 5(1), 1–13.

This is the link to the publisher's website:

<https://innovation-entrepreneurship.springeropen.com/articles/10.1186/s13731-016-0049-5>

INTRODUCTION

At macro level, the openness and the international processes do affect the national innovation system (NIS^{Footnote1}) by increasing the relationship and collaboration of its agents and components with external agents. One aspect to be measured is determining the impact of the openness and internationalization (OpIn) processes in the (national) internal features of Mexico's NIS, through assessing them within the context of the system's components to facilitate better use of scientific, technological, innovation, and entrepreneurial capabilities, both internal and external, considering that both processes are interrelated in different ways and aspects in each component.

Generalizing to a larger context of Schumpeter's concept of innovation (Schumpeter 1934), with the concept of open innovation^{Footnote2} and of internationalization processes, an open national innovation system (ONIS) has been proposed with internal and external components and agents and relationships. The components of the ONIS are the businesses and the entrepreneurs, universities, research centers, technology transfer agents, financing-venture capital and “angels” funding, information systems, intellectual property mechanisms, and diverse government participation and regulation.

Opening up innovation and the NIS are motivated by a desire to increase sources of profits and to diminish the risks of capital investments.

An entrepreneur could overcome some capital risks by widening the scope of their relationships. This means modifying the concept of innovation, which was developed for the industrial revolution—where innovation has been conceptualized as occurring within the company, i.e., “closed innovation.” So companies, especially those with research and development departments, have undertaken various forms of collaboration to reduce costs, particularly for R&D, which fall within the concept of “open innovation,” thus diminishing their vulnerability.

Universities and research centers can also open knowledge application relationships, linking their lines of research with potential users, participating in international consortia and research networks.

Financing is an international activity, which can be open depending on the risks involved in the innovation phases, which is particularly critical at birth (start-up) when the firm starts marketing a product, the novelty of which is often based on the intensive use of scientific and technological knowledge.

Government policies and incentives could be oriented towards developing innovation capabilities regardless of the internal or external resources. In this context, the Mexican diaspora could be a result of public policies, mainly for qualified people.

CONCLUSION

Mexico lags behind other countries with a higher or similar level of scientific and technological (S&T) development. This is due to the difference between, on the one hand, the relatively significant S&T capacities developed in the country’s higher education institutions and public research centers and, on the other hand, a rather low level of dynamism in the creation of knowledge-based start-ups.

In this context, openness in the ONIS components is proposed, in particular those related with the application and use of knowledge in production, that is, in firms and start-ups, both TBFs and KIBSs: technology development, technology transfer, intellectual property, and financing through venture capital and angels funds.

However, for this to occur, active policies will be necessary on the part of government, research centers, universities, and firms.

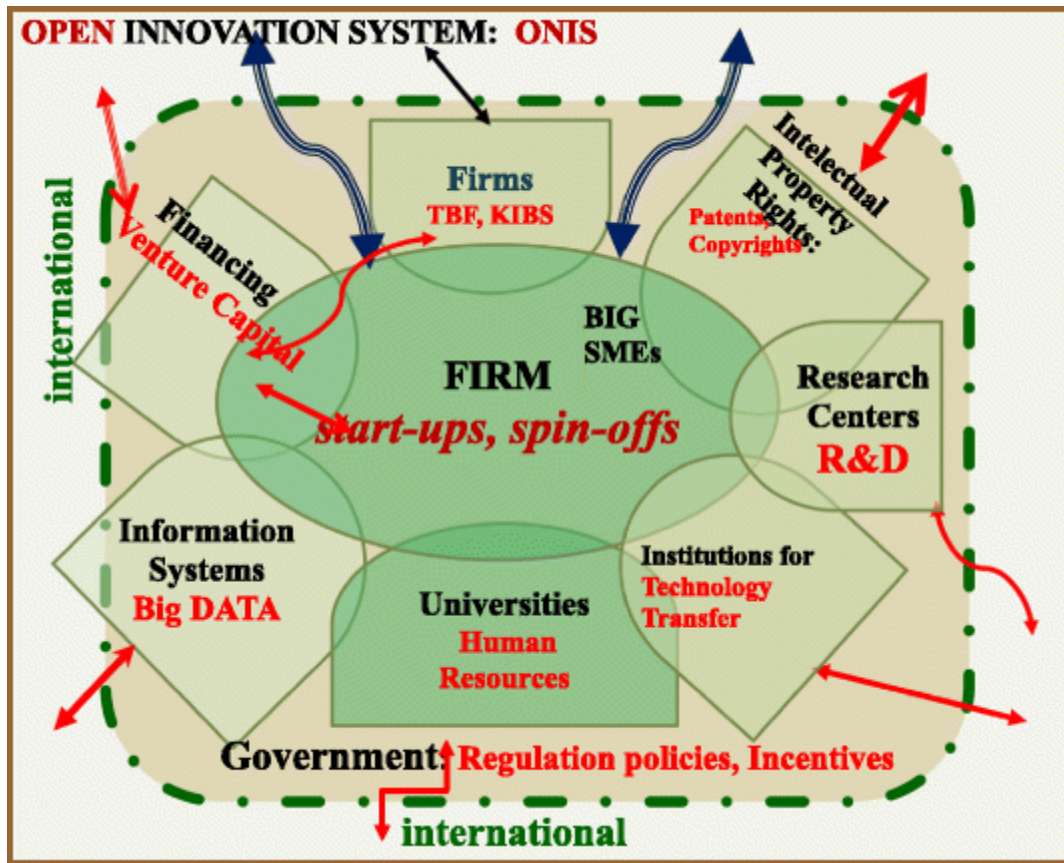
An exploratory study of 41 start-ups, based on an Indico index, suggests that KIBS are more innovative (4.8 vs 4.4, respectively) and more efficient (0.72 vs 0.57, respectively) than TBFs.

On one hand, openness with respect to innovation is observed in two thirds of the 35 KIBS and in half of the TBF; the rest handle innovation internally. Ten percent of firms have an innovation chain that is innovating with the participation of clients, suppliers, and subcontractors. On the other hand, the firms’ internationalization is positively related to its innovativeness.

To sum up, the OpIn of innovation needs to be applied both at firm level and through an open NIS as a way of increasing firms’ innovativeness and creating a positive environment through which to manage the risks involved in innovation.

APPENDIX

FIGURE 1
OPEN INNOVATION SYSTEM: ONIS



**TABLE 1
INNOVATIVENESS FIRMS' INDICO INDEX**

Number	Firm	KIBS/TBF	Indico index	Output	Capacity	Efficiency	Industry
51	Impresos técnicos marno S.A. de C.V.	KIBS	6.78	6.55	7.01	0.94	Printing
1	Praxis	KIBS	6.73	6.39	7.08	0.90	Software
35	Grupo SSC	KIBS	6.48	5.33	7.64	0.70	Software
49	Integral Project IT S. de R.L. de C.V.	KIBS	6.32	5.71	6.94	0.82	Software
31	Agro&biotecnia	KIBS	6.32	6.11	6.53	0.93	Biotechnology
10	BUSINESS INTELLIGENT	KIBS	6.32	4.88	7.75	0.63	Software
33	Government Solutions	KIBS	6.30	5.86	6.74	0.87	Software
45	Google Inc.	KIBS	6.19	3.82	8.56	0.45	Software
9	PIXCOMP	KIBS	5.82	5.32	6.32	0.84	Software (móv
47	Productos Mahaua	TBF	5.68	4.74	6.63	0.71	Design
32	Qualsoft	KIBS	5.67	4.13	7.20	0.57	Software
36	Grupo QUAE Laboratorio de Diagnóstico Molecular	KIBS	5.52	4.54	6.50	0.70	Health molecu diagnosis
14	Uno uno cero uno	KIBS	5.40	4.99	5.81	0.86	Software
15	Factor Evolución	KIBS	5.29	4.54	6.04	0.75	Software
44	Mesquite Tech S.A. de C.V.	KIBS	5.23	4.35	6.12	0.71	Software
34	BrainUp Systems	KIBS	5.19	4.44	5.95	0.75	Software
4	Innovaweb	KIBS	5.17	4.59	5.75	0.80	Software
39	Ideo Gráficos & Publicidad S.A. de C.V.	KIBS	5.14	2.65	7.62	0.35	Publicity
6	WEXLER	TBF	5.11	4.76	5.46	0.87	Autoparts

46	Sociedad de Ingeniería Especializada de Occidente SA de CV	KIBS	5.01	3.62	6.40	0.57	Engineering
48	Grupo Financiero Banorte	KIBS	4.73	3.44	6.02	0.57	Finance
42	Grupo Nacer Global	KIBS	4.52	4.91	4.12	1.19	Education
38	Alimentos Nutracéuticos Bioprocados SAPI de CV	TBF	4.42	1.43	7.41	0.19	Food
40	Wender & Wender	KIBS	4.41	2.47	6.34	0.39	Design graphic
18	Comparte Vida	TBF	4.37	2.56	6.18	0.41	Health
12	REDRABBIT	KIBS	4.34	3.38	5.29	0.64	Software
2	PROSA	KIBS	4.34	4.76	3.91	1.22	Informatics finance
8	WRP	KIBS	4.19	3.73	4.64	0.80	Software
11	RQ PORTILLO	KIBS	4.13	3.81	4.45	0.86	Software
52	Argeomática SA de CV	KIBS	3.92	1.87	5.96	0.31	Software
5	CustomSoft	KIBS	3.86	3.94	3.78	1.04	Software
50	INDUSTRIA ZÜDHER S.A. DE C.V.	TBF	3.83	3.01	4.65	0.65	Transport
41	CLEMENTE CAMARA Y ASOCIADOS PUBLICIDAD S.A. DE C.V.	KIBS	3.66	2.14	5.18	0.41	Publicity
17	ONE CARD	KIBS	3.24	1.23	5.25	0.23	Software
53	PIENSA GRAM SERVICE S.A. DE C.V.	KIBS	3.24	2.19	4.30	0.51	Finance
43	UBER MEXICO AC RL	KIBS	3.21	3.34	3.07	1.09	Transport
19	Biocris	TBF	3.19	2.38	4.00	0.60	Health

7	CIA	KIBS	3.12	2.92	3.32	0.88	Design dressin
16	CENTRO DE DESARROLLO	KIBS	2.28	1.59	2.96	0.54	Consulting
13	Amplemind Technology Agency	KIBS	1.47	0.89	2.05	0.44	Software

^aInternational index is the sum of international firm's sales, patents, relations, and certificates. Source: based on data collected directly from author's interviews with firms

TABLE 2
COLLABORATION IN THE INNOVATION %

Number	FIRM	INTERNAL %	SUPPLIERS	OUTSOURCING	USERS- CLIENTS	KIBS/TBF	INNOVATION DRIVEN BY		INDUSTRY
							NUMBER of AGENTS	AGENTS	
5	CustomSoft	100	0	0	0	KIBS	1	Internal (KIBS/ TBF)	Software
6	WEXLER	100	0	0	0	TBF			autoparts
7	CIA	100	0	0	0	KIBS			clothing design
10	BUSINESS INTELLIGENCE	100	0	0	0	KIBS			Software
11	RQ PORTILLO	100	0	0	0	KIBS			Software
12	REDRABBIT	100	0	0	0	KIBS			software
16	CENTRO DE DESARRO	100	0	0	0	KIBS			consulting
31	Agro&biotecnía	100	0	0	0	TBF			Biotech
32	Qualsoft	100	0	0	0	KIBS			software
33	Government Solutions	100	0	0	0	KIBS			software
36	Grupo QUAE Laborat	100	0	0	0	KIBS			Health
38	Alimentos Nutraceut	100	0	0	0	TBF			Food
42	Grupo Nacer Global	100	0	0	0	KIBS			education
48	Grupo Financiero Ba	100	0	0	0	KIBS			finance
51	Impresos técnicos A	0	0	0	100	KIBS	Clients	printing	
17	ONE CARD	80	20	0	0	KIBS	2	Internal &Suppliers	software
40	Wender & Wender	10	90	0	0	KIBS			Graphic Design
41	CLEMENTE CAMARA Y	70	30	0	0	KIBS			Publicity
45	Google Inc.	66.7	33.3	0	0	KIBS			software
50	INDUSTRIA ZÜDHER!	50	50	0	0	TBF			autoparts
52	Argeomática SA de C	20	80	0	0	KIBS			software
1	Praxis	67.5	0	0	32.5	KIBS			software
8	WRP	60	0	0	40	KIBS			software
9	PIXCOMP	60	0	0	40	KIBS	Internal &clients	software (móvil)	
13	Amplemind Technol	50	0	0	50	KIBS		software	
15	Factor Evolución	72	0	0	28	KIBS		software	
35	Grupo SSC	50	0	0	50	KIBS		software	
37	Kampa Tlatlatla A.C.	95	0	0	5	KIBS		social innovation	
39	Ideo Gráficos & Publ	33.3	0	0	66.7	KIBS		Publicity	
44	Mesquite Tech S.A. d	33.3	0	0	66.7	KIBS		software	
14	Uno uno cero uno	81.3	0	2.5	16.25	KIBS	3	Internal & outsourcing & clients	software
43	UBER MEXICO AC RL	66.7	0.0	16.7	16.7	KIBS			Transport
2	PROSA	58.25	2.5	0	39.25	KIBS	3	Internal & suppliers + clients	finance Informatic
4	InnovaWeb	59	21	0	20	KIBS			informatica
34	BraInUp Systems	80	10	0	10	KIBS			software
53	PIENSA GRAM SERVIC	50	25	0	25	KIBS			finance
49	Integral Project IT S.	83.3	0.0	16.7	0	KIBS	4	external innovatio	software
18	Comparte Vida	0	50	25	25	KIBS			health
19	Biocrits	0	5	5	90	TBF			health
46	SIEO, Sociedad de li	36.7	43.3	3.3	16.7	KIBS	4	Internal & innovatio	Engineering
47	Productos Mahaua	90.0	3.3	3.3	3.3	TBF			Design

Source: Based on data collected directly from author's interviews with firms

TABLE 3
INDICO INDEX KIBS

Issues	Max score	O, Output	Max score	C, Input capacity
Innovations	3, 5			
Intellectual propriety	1			
Market	3			
Certification	1			
Service knowledge intensity	1, 5			
Innovation components: hardware, information, and knowledge			2	
Employees training			1	
Employee certification			1	
Employees studies			1	
R&D organization			2	
R&D, % of sales			2	
Relationship with knowledge sources			1	
Sum	10		10	
Indico index: average (O + C)/2				

Source: Corona-Treviño 2015

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TRANSLATED VERSION: SPANISH

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A continuación se muestra una traducción aproximada de las ideas presentadas anteriormente. Esto se hizo para dar una comprensión general de las ideas presentadas en el documento. Por favor, disculpe cualquier error gramatical y no responsabilite a los autores originales de estos errores.

INTRODUCCIÓN

A nivel macro, la apertura y los procesos internacionales afectan al sistema nacional de innovación (nisfootnote1) al aumentar la relación y la colaboración de sus agentes y componentes con agentes externos. Un aspecto a medir es determinar el impacto de los procesos de apertura e internacionalización (opin) en las características internas (nacionales) del NIS de México, a través de la evaluación en el contexto de los componentes del sistema para facilitar un mejor uso de las capacidades científicas, tecnológicas, innovadoras y empresariales, tanto internas como externas, considerando que ambos procesos están interrelacionados de diferentes maneras y aspectos en cada componente.

Generalizando a un contexto más amplio del concepto de innovación de Schumpeter (Schumpeter 1934), con el concepto de innovación abiertafootnote2 y de procesos de internacionalización, se ha propuesto un sistema de innovación nacional abierto (ONIS) con componentes y agentes y relaciones internos y externos. Los componentes de la ONIS son las empresas y los empresarios, universidades, centros de investigación, agentes de transferencia de tecnología, financiación-capital de riesgo y financiación "angels", sistemas de información, mecanismos de propiedad intelectual y diversa participación y regulación del gobierno.

La apertura de la innovación y el NIS están motivados por el deseo de aumentar las fuentes de beneficios y disminuir los riesgos de las inversiones de capital.

Un empresario podría superar algunos riesgos de capital ampliando el alcance de sus relaciones. Esto significa modificar el concepto de innovación, que se desarrolló para la revolución industrial, donde se ha conceptualizado la innovación como que se produce dentro de la empresa, es decir, "innovación cerrada". Así pues, las empresas, especialmente las que cuentan con departamentos de investigación y desarrollo, han emprendido diversas formas de colaboración para reducir los costes, en particular para la I+D, que entran dentro del concepto de "innovación abierta", disminuyendo así su vulnerabilidad.

Las universidades y centros de investigación también pueden abrir relaciones de aplicación de conocimiento, vinculando sus líneas de investigación con usuarios potenciales, participando en consorcios internacionales y redes de investigación.

La financiación es una actividad internacional, que puede estar abierta en función de los riesgos que entrañan las fases de innovación, que es particularmente crítica al nacer (start-up) cuando la empresa comienza a comercializar un producto, cuyo tipo se basa a menudo en el uso intensivo de los conocimientos científicos y tecnológicos.

Las políticas e incentivos gubernamentales podrían orientarse hacia el desarrollo de capacidades de innovación, independientemente de los recursos internos o externos. En este contexto, la diáspora mexicana podría ser el resultado de políticas públicas, principalmente para personas calificadas.

CONCLUSIÓN

México está por detrás de otros países con un nivel más alto o similar de desarrollo científico y tecnológico (S&T). Esto se debe a la diferencia entre, por un lado, las capacidades de S&T relativamente

significativas desarrolladas en las instituciones de educación superior del país y los centros públicos de investigación y, por otro lado, un nivel bastante bajo de dinamismo en la creación de start-ups basadas en el conocimiento.

En este contexto, se propone la apertura de los componentes de la ONIS, en particular los relacionados con la aplicación y el uso de los conocimientos en la producción, es decir, en empresas y empresas emergentes, tanto TBF como KIBS: desarrollo tecnológico, transferencia de tecnología, propiedad intelectual y financiación a través de capital de riesgo y fondos de ángeles.

Sin embargo, para que esto ocurra, serán necesarias políticas activas por parte del gobierno, los centros de investigación, las universidades y las empresas.

Un estudio exploratorio de 41 start-ups, basado en un índice Indico, sugiere que los KIBS son más innovadores (4.8 vs 4.4, respectivamente) y más eficientes (0.72 vs 0.57, respectivamente) que los TBF.

Por un lado, la apertura con respecto a la innovación se observa en dos tercios de los 35 KIBS y en la mitad del TBF; el resto maneja la innovación internamente. El diez por ciento de las empresas tienen una cadena de innovación que está innovando con la participación de clientes, proveedores y subcontratistas. Por otro lado, la internacionalización de las empresas está positivamente relacionada con su innovación.

En resumen, el opin de la innovación debe aplicarse tanto a nivel de empresa como a través de un NIS abierto como una forma de aumentar la innovación de las empresas y crear un entorno positivo a través del cual gestionar los riesgos que implica la innovación.

TRANSLATED VERSION: FRENCH

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VERSION TRADUITE: FRANÇAIS

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INTRODUCTION

Sur le plan macroéconomique, l'ouverture et les processus internationaux affectent le système national d'innovation (note de bas de page1) en augmentant la relation et la collaboration de ses agents et composants avec des agents externes. Un aspect à mesurer est de déterminer l'impact des processus d'ouverture et d'internationalisation (opin) dans les caractéristiques internes (nationales) du SNI du Mexique, en les évaluant dans le contexte des composantes du système afin de faciliter une meilleure utilisation des capacités scientifiques, technologiques, d'innovation et entrepreneuriales, tant internes qu'externes, étant donné que les deux processus sont interdépendants de différentes manières et aspects de chaque composante.

Généralisant dans un contexte plus large le concept d'innovation de Schumpeter (Schumpeter 1934), avec le concept d'innovation ouverte de page2 et de processus d'internationalisation, un système national d'innovation ouvert (ONIS) a été proposé avec des composantes internes et externes et des agents et des relations. Les composantes de l'onis sont les entreprises et les entrepreneurs, les universités, les centres de recherche, les agents de transfert de technologie, le financement-capital-risque et le financement « anges », les systèmes d'information, les mécanismes de propriété intellectuelle et la participation et la réglementation diverses du gouvernement.

L'ouverture de l'innovation et du SNI sont motivées par le désir d'augmenter les sources de profits et de réduire les risques liés aux investissements en capital.

Un entrepreneur pourrait surmonter certains risques en capital en élargissant la portée de ses relations. Il s'agit de modifier le concept d'innovation, qui a été développé pour la révolution industrielle, où l'innovation a été conceptualisée comme se produisant au sein de l'entreprise, c'est-à-dire « l'innovation fermée ». Ainsi, les entreprises, en particulier celles qui ont des départements de recherche et développement, ont entrepris diverses formes de collaboration pour réduire les coûts, en particulier pour la R&D, qui relèvent du concept d'«innovation ouverte », réduisant ainsi leur vulnérabilité.

Les universités et les centres de recherche peuvent également ouvrir des relations d'application des connaissances, reliant leurs lignes de recherche avec les utilisateurs potentiels, participant à des consortiums internationaux et à des réseaux de recherche.

Le financement est une activité internationale, qui peut être ouverte en fonction des risques liés aux phases d'innovation, ce qui est particulièrement critique à la naissance (démarrage) lorsque l'entreprise commence à commercialiser un produit, dont la nouveauté est souvent basée sur l'utilisation intensive des connaissances scientifiques et technologiques.

Les politiques et les incitations gouvernementales pourraient être orientées vers le développement de capacités d'innovation, quelles que soient les ressources internes ou externes. Dans ce contexte, la diaspora mexicaine pourrait être le résultat de politiques publiques, principalement pour les personnes qualifiées.

CONCLUSION

Le Mexique est à la traîne par rapport à d'autres pays ayant un niveau de développement scientifique et technologique (S&T) plus élevé ou similaire. Cela est dû à la différence entre, d'une part, les capacités relativement importantes de S&T développées dans les établissements d'enseignement supérieur et les centres de recherche publics du pays et, d'autre part, un niveau assez faible de dynamisme dans la création de start-ups fondées sur le savoir.

Dans ce contexte, l'ouverture dans les composantes de l'innovation est proposée, en particulier celles liées à l'application et à l'utilisation des connaissances dans la production, c'est-à-dire dans les entreprises et les start-up, tant dans les FCT que dans les KIBS : développement technologique, transfert de technologie, propriété intellectuelle et financement par le biais de fonds de capital-risque et de fonds providentiels.

Toutefois, pour que cela se produise, des politiques actives seront nécessaires de la part du gouvernement, des centres de recherche, des universités et des entreprises.

Une étude exploratoire portant sur 41 start-up, basée sur un indice Indico, suggère que les KIBS sont plus innovants (4,8 contre 4,4, respectivement) et plus efficaces (0,72 contre 0,57 respectivement) que les TBF.

D'une part, l'ouverture en matière d'innovation est observée dans les deux tiers des 35 KIBS et dans la moitié de la TBF; les autres gèrent l'innovation à l'interne. Dix pour cent des entreprises ont une chaîne d'innovation qui innove avec la participation de clients, de fournisseurs et de sous-traitants. D'autre part, l'internationalisation des entreprises est positivement liée à son innovation.

En résumé, l'opinion de l'innovation doit être appliquée à la fois au niveau de l'entreprise et par le biais d'un SNI ouvert comme moyen d'accroître l'innovation des entreprises et de créer un environnement positif à travers lequel gérer les risques liés à l'innovation.

TRANSLATED VERSION: GERMAN

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

ÜBERSETZTE VERSION: DEUTSCH

Hier ist eine ungefähre Übersetzung der oben vorgestellten Ideen. Dies wurde getan, um ein allgemeines Verständnis der in dem Dokument vorgestellten Ideen zu vermitteln. Bitte entschuldigen Sie alle grammatikalischen Fehler und machen Sie die ursprünglichen Autoren nicht für diese Fehler verantwortlich.

EINLEITUNG

Auf Makroebene wirken sich die Offenheit und die internationalen Prozesse auf das nationale Innovationssystem (nisfootnote1) aus, indem sie die Beziehung und Zusammenarbeit ihrer Agenten und Komponenten mit externen Agenten verbessern. Ein zu messender Aspekt ist die Bestimmung der Auswirkungen der Offen- und Internationalisierungsprozesse (opin) in den (nationalen) internen Merkmalen der mexikanischen NUS, indem sie im Kontext der Systemkomponenten bewertet werden, um eine bessere Nutzung der wissenschaftlichen, technologischen, Innovations- und unternehmerischen Fähigkeiten sowohl interner als auch externer Fähigkeiten zu erleichtern, da beide Prozesse in jeder Komponente auf unterschiedliche Weise und Aspekte miteinander verknüpft sind.

Verallgemeinert auf einen größeren Kontext von Schumpeters Innovationskonzept (Schumpeter 1934), mit dem Konzept der offenen innovationfootnote2 und von Internationalisierungsprozessen wurde ein offenes nationales Innovationssystem (ONIS) mit internen und externen Komponenten und Agenten und Beziehungen vorgeschlagen. Die Bestandteile des ONIS sind die Unternehmen und die Unternehmer, Universitäten, Forschungszentren, Technologietransferagenten, Finanzierungs-Venture-Kapital und "Engel"-Finanzierung, Informationssysteme, Mechanismen des geistigen Eigentums und vielfältige staatliche Beteiligung und Regulierung.

Die Öffnung von Innovation und NUS ist von dem Wunsch motiviert, die Gewinnquellen zu erhöhen und die Risiken von Kapitalanlagen zu verringern.

Ein Unternehmer könnte einige Kapitalrisiken überwinden, indem er den Umfang seiner Beziehungen erweitert. Das bedeutet, das Konzept der Innovation zu ändern, das für die industrielle Revolution entwickelt wurde – wo Innovation als im Unternehmen auftretend konzipiert wurde, d.h. "geschlossene Innovation". Daher haben Unternehmen, insbesondere Unternehmen mit Forschungs- und Entwicklungsabteilungen, verschiedene Formen der Zusammenarbeit unternommen, um die Kosten zu senken, insbesondere für Forschung und Entwicklung, die unter das Konzept der "offenen Innovation" fallen und damit ihre Anfälligkeit verringern.

Universitäten und Forschungszentren können auch Wissensanwendungsbeziehungen eröffnen, ihre Forschungslinien mit potenziellen Nutzern verknüpfen und an internationalen Konsortien und Forschungsnetzwerken teilnehmen.

Die Finanzierung ist eine internationale Tätigkeit, die je nach den Risiken der Innovationsphasen offen sein kann, was bei der Gründung (Start-up) besonders kritisch ist, wenn das Unternehmen mit der Vermarktung eines Produkts beginnt, dessen Neuheit oft auf dem intensiven Einsatz wissenschaftlicher und technologischer Kenntnisse beruht.

Staatliche Politiken und Anreize könnten auf die Entwicklung von Innovationsfähigkeiten unabhängig von den internen oder externen Ressourcen ausgerichtet sein. In diesem Zusammenhang könnte die mexikanische Diaspora ein Ergebnis der öffentlichen Politik sein, vor allem für qualifizierte Menschen.

SCHLUSSFOLGERUNG

Mexiko hinkt anderen Ländern mit einem höheren oder ähnlichen Niveau der wissenschaftlichen und technologischen Entwicklung (S&T) hinterher. Dies ist auf den Unterschied zwischen den relativ bedeutenden S&T-Kapazitäten, die in den Hochschulen und öffentlichen Forschungszentren des Landes entwickelt wurden, einerseits und einer eher geringen Dynamik bei der Schaffung wissenschaftlicher Start-ups andererseits zurückzuführen.

In diesem Zusammenhang wird Offenheit in den ONIS-Komponenten vorgeschlagen, insbesondere im Zusammenhang mit der Anwendung und Nutzung von Wissen in der Produktion, d. H. In Unternehmen und Start-ups, sowohl tbfs als auch kibss: Technologieentwicklung, Technologietransfer, geistiges Eigentum und Finanzierung durch Risikokapital und Engelsfonds.

Damit dies geschieht, werden jedoch aktive Maßnahmen seitens der Regierung, der Forschungszentren, der Universitäten und der Unternehmen erforderlich sein.

Eine explorative Studie mit 41 Start-ups, die auf einem Indico-Index basiert, legt nahe, dass KIBS innovativer (4,8 vs. 4,4) und effizienter (0,72 bzw. 0,57) sind als tbfs.

Einerseits wird in zwei Dritteln der 35 KIBS und in der Hälfte des TBF Offenheit in Bezug auf Innovation beobachtet; der Rest kümmert sich intern um Innovation. Zehn Prozent der Unternehmen verfügen über eine Innovationskette, die unter Beteiligung von Kunden, Lieferanten und Zulieferern innovativ ist. Andererseits steht die Internationalisierung der Unternehmen in positivem Zusammenhang mit ihrer Innovationskraft.

Zusammenfassend lässt sich zusammenfassen, dass die Innovationstechnologie sowohl auf Unternehmensebene als auch durch eine offene NUS angewendet werden muss, um die Innovationskraft der Unternehmen zu steigern und ein positives Umfeld zu schaffen, durch das die mit Innovationen verbundenen Risiken gehandelt werden können.

TRANSLATED VERSION: PORTUGUESE

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

VERSÃO TRADUZIDA: PORTUGUÊS

Aqui está uma tradução aproximada das ideias acima apresentadas. Isto foi feito para dar uma compreensão geral das ideias apresentadas no documento. Por favor, desculpe todos os erros gramaticais e não responsabilize os autores originais responsáveis por estes erros.

INTRODUÇÃO

Em nível macro, a abertura e os processos internacionais afetam o sistema nacional de inovação (nisfootnote1) aumentando o relacionamento e colaboração de seus agentes e componentes com agentes externos. Um aspecto a ser medido é determinar o impacto dos processos de abertura e internacionalização (opin) nas características internas (nacionais) do NIS do México, através da avaliação deles no contexto dos componentes do sistema para facilitar o melhor uso das capacidades científicas, tecnológicas, de inovação e empreendedoras, tanto internas quanto externas, considerando que ambos os processos estão interrelacionados de diferentes formas e aspectos em cada componente.

Generalizando-se para um contexto maior do conceito de inovação da Schumpeter (Schumpeter 1934), com o conceito de inovação abertafootnote2 e de processos de internacionalização, um sistema nacional aberto de inovação (ONIS) foi proposto com componentes internos e externos e agentes e relacionamentos. Os componentes do ONIS são os negócios e os empreendedores, universidades, centros de pesquisa, agentes de transferência de tecnologia, financiamento de capital de risco e "anjos", sistemas de informação, mecanismos de propriedade intelectual e participação e regulação governamentais diversas.

A abertura da inovação e o NIS são motivados pelo desejo de aumentar as fontes de lucros e diminuir os riscos de investimentos de capital.

Um empreendedor poderia superar alguns riscos de capital ampliando o escopo de seus relacionamentos. Isso significa modificar o conceito de inovação, desenvolvido para a revolução industrial — onde a inovação foi conceituada como ocorrendo dentro da empresa, ou seja, "inovação fechada". Assim, as empresas, especialmente aquelas com departamentos de pesquisa e desenvolvimento, empreenderam

várias formas de colaboração para reduzir custos, particularmente para p&D, que se enquadram no conceito de "inovação aberta", diminuindo assim sua vulnerabilidade.

Universidades e centros de pesquisa também podem abrir relações de aplicativos de conhecimento, vinculando suas linhas de pesquisa com potenciais usuários, participando de consórcios internacionais e redes de pesquisa.

O financiamento é uma atividade internacional, que pode ser aberta dependendo dos riscos envolvidos nas fases de inovação, que é particularmente crítica ao nascer (start-up) quando a empresa começa a comercializar um produto, a novidade muitas vezes é baseada no uso intensivo do conhecimento científico e tecnológico.

Políticas e incentivos governamentais poderiam ser orientados para o desenvolvimento de capacidades de inovação, independentemente dos recursos internos ou externos. Nesse contexto, a diáspora mexicana poderia ser resultado de políticas públicas, principalmente para pessoas qualificadas.

CONCLUSÃO

O México fica atrás de outros países com um nível mais alto ou similar de desenvolvimento científico e tecnológico (S&T). Isso se deve à diferença entre, por um lado, as capacidades relativamente significativas de S&T desenvolvidas nas instituições de ensino superior do país e centros de pesquisa pública e, por outro lado, um nível bastante baixo de dinamismo na criação de start-ups baseadas no conhecimento.

Nesse contexto, propõe-se a abertura nos componentes do ONIS, em especial aqueles relacionados à aplicação e uso do conhecimento na produção, ou seja, em empresas e start-ups, tanto tbfs quanto kibss: desenvolvimento de tecnologia, transferência de tecnologia, propriedade intelectual e financiamento por meio de capital de risco e fundos anjos.

No entanto, para que isso ocorra, políticas ativas serão necessárias por parte do governo, centros de pesquisa, universidades e empresas.

Um estudo exploratório de 41 start-ups, baseado em um índice Indico, sugere que os KIBS são mais inovadores (4,8 vs 4,4, respectivamente) e mais eficientes (0,72 vs 0,57, respectivamente) do que os tbfs.

Por um lado, a abertura em relação à inovação é observada em dois terços dos 35 KIBS e na metade da TBF; o resto lida com a inovação internamente. Dez por cento das empresas têm uma cadeia de inovação que está inovando com a participação de clientes, fornecedores e subcontratados. Por outro lado, a internacionalização das empresas está positivamente relacionada à sua inovação.

Resumindo, o opin da inovação precisa ser aplicado tanto em nível firme quanto através de um NIS aberto como forma de aumentar a inovação das empresas e criar um ambiente positivo para gerenciar os riscos envolvidos na inovação.