

Emergence of Industrial Ecosystems in Post-Authoritarian Contexts

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Abstract

Purpose of the article: This article analyses cluster emergence in post-authoritarian countries with immature socio-economic context by adapting the approach of industrial clusters as industrial ecosystems and analysing cluster emergence cases.

Methodology/methods: Review of scientific literature, case analysis.

Scientific aim: This article presents different scenarios of cluster emergence based on cases of industrial clusters in a Lithuanian context and provides solutions for cluster emergence in post-authoritarian countries.

Findings: The analysis of scientific literature revealed the following solutions of cluster emergence in post-authoritarian contexts: 1) Large firm(s) acting as anchors for attracting smaller companies into cluster; 2) Cluster emergence as a means to serve the needs of large customer outside the cluster; 3) Cluster emergence via local business entrepreneurs; 4) Cluster emergence via local science representatives; 5) Cluster emergence through adapting historically formed regional knowledge and networks; 6) Government as the main agent for change. The analysis of industrial clusters emergence in Lithuania revealed four different combinations of planned/unplanned non-equilibrium phenomena and the first explicit/inexplicit initiatives toward the emergence of self-organising industrial systems by analysing the cases of cluster emergence in Lithuanian context. These cases highlighted the importance of leaders-initiators that were local large or simply very experienced enterprises, groups of managers of small and medium sized enterprises, mediators-communication facilitators from non-business enterprises. These actors helped to cope with unplanned and planned non-equilibrium phenomena.

Conclusions: Since the empirical analysis concentrated only in the first stage of cluster emergence of post-authoritarian context, a further research is needed to take a deeper look at the development of industrial clusters as industrial ecosystems in post-authoritarian contexts and thus evaluate the aspects of emergence emphasised in the theoretical part of the article.

Keywords: ecosystem approach, emergence patterns, post-authoritarian, Lithuania, industrial clusters

JEL Classification: O18, R11

Introduction

Numerous studies show that various self-organisation based industrial systems, including industrial clusters, have a positive influence on individual firms, regions and countries in their adaptation to the complexity of environment in flexible and timely manner. Being a part of clusters helps firms increase competitiveness through enhanced specialisation and reduced transaction costs, collective learning and knowledge sharing and thus create the well-being for regions and countries (Eisingerich *et al.*, 2010). Nevertheless, the emergence of self-organizing industrial systems faces many challenges in post-authoritarian contexts that very often are associated to post-Soviet countries because of low trust, insufficiently developed civic and politic culture and poor cooperation traditions (Kowalski, Marcinkowski, 2014; Lauk, 2008; Smallbone, Welter, 2012). A still widespread systematic approach towards the emergence of industrial systems, which is based on the belief in sets of ingredients leading to the formation of industrial clusters, also doesn't result in desired outcomes. The unsuccessful trials to create another Silicon Valley confirm the fact that systems are more than the sum of the parts, moreover, these parts and the relationships among them are deeply embedded in a particular context, which is being continuously formed by institutional, social, economical and cultural factors, and manifest themselves in various unique forms. Naturally, the processes that occur in a social system are self-reinforcing and thus protect the system from external interruptions. The best prototype to get acquainted with the main principles of the development of social systems could be a biological ecosystem, or a forest. The example of a forest reveals that despite united patterns of development of such an ecosystem, the variety of forests depends on a particular context; while some types of forests can thrive in the South, they would easily disappear without an artificial nurturing from outside in the North. This biological example allows us to look at the very nature of industrial clusters too by emphasizing the natural and continuous emergence of self-organising origin in a particular context. Thus, *the aim* of this article is to present various solutions for cluster emergence in the post-authoritarian contexts with low level of inter-actor trust and underdeveloped modes of governance.

In *the first part* of this article, the approach of industrial cluster as industrial ecosystem is presented and analysed. In *the second part*, the main theoretical challenges and solutions regarding the

emergence of industrial clusters in post-authoritarian contexts are emphasised while in *the third part* some cluster emergence scenarios in the form of combination between planned/unplanned phenomena and the first explicit/inexplicit initiatives toward the emergence of self-organising industrial systems in Lithuanian context are revealed.

1. The concept of industrial cluster as an industrial ecosystem

The concept of a cluster is as wide as it is fuzzy. The most popular definition of clusters belongs to Michael Porter (2000), who defines clusters as “geographically proximate groups of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities”. However, many related concepts, such as industrial districts, industrial agglomerations or innovative milieus are still being used in scientific research. Industrial systems typologies that are applied while analyzing cluster phenomenon, also reveal the complexity of views toward clusters (for example, see Crespo, 2011; Fromhold-Eisebith, Eisebith, 2005; Markusen, 1996), including the statement that not always industrial clusters are based on cooperation in networks. However, the adaptation of ecosystem approach requires analysing industrial clusters through the lenses of *complex adaptive systems* (CAS) comprised of various interacting actors (or agents in the complexity theory), characterised by *self-organisation* and being far from *the equilibrium*.

Self-organisation is one of the main features of complex adaptive systems and could be defined as a hardly predictable dynamical process that is conditioned by a spontaneous local interaction of lower-level agents and the absence of external central control (Anderson, 1999; Chiles *et al.*, 2004; Mason, 2007). The agents in the system are partially related to each other through the feedback loops, however, the sum of partially dependant behaviours creates a better result than in the case of a central planning (He *et al.*, 2011).

Self-organising networks fluctuate from the edge of order to *the edge of chaos* (Lewin, 1992). The scientists that represent different scientific fields acknowledge that the most significant, creative, innovative changes in the system occur when the system is close to the edge of chaos (Boal, Schultz, 2007; He *et al.*, 2011; Mason, 2007). Since the *positive feedback* pushes the system to the edge of chaos, the *negative feedback* allows the system to return to

the *attractor* or all the states that are recognisable, dynamical and not absolutely identical (Mason, 2007). In the social world, various values, norms, behaviour models can play the role of an attractor (Boal, Schultz, 2007; Mason, 2007). The concept of *basin of attraction* that was formulated by a biologist Kauffman (1993) explains the reasons of difficult changes in undesired phenomena such as lack of trust and cooperation. The basin of attraction can be understood as all the states of the system, which naturally bring the system to the attractor back (Coleman *et al.*, 2007).

The general features of complex adaptive systems explain the reasons of the variety of industrial clusters across countries and why even intensive trials to encourage the emergence and development of particular clusters in particular contexts fail. The following chapters allow us to look deeper in the factors of cluster emergence and the patterns in post-authoritarian contexts.

2. The main challenges and emergence factors of industrial ecosystems in a post-authoritarian context

Much scientific research has been done on the factors of the emergence of industrial clusters (for example, see Brenner, Mühlig, 2013; Elola *et al.*, 2012). The factors of cluster emergence, which could be grouped in *industrial, socio-economic, cultural, institutional* and finally, *psychological factors*, emphasise the importance of *regional industrial specialisation* (Brenner, Mühlig, 2013; Elola *et al.*, 2012); *industrial actors that are able to perform the role of leaders* (Brenner, Mühlig, 2013; Randelli, Lombardi, 2014); *human capital/labour force* (Brenner, Mühlig, 2013); *social capital and trust* (Arbuthnott, von Friedrichs 2013; Sapsford *et al.*, 2015; Smallbone, Welter, 2012); *regional life quality in a particular region* (Brenner, Mühlig 2013; Elola *et al.*, 2012; Sternberg 2010); *responsibility for his own behaviour, propensity to risk and to be acknowledged, self-confidence, tolerance of ambiguity and ability to innovate* (Khan *et al.*, 2014).

However, applying many of these factors in a post-authoritarian context meets many challenges. Deeply embedded beliefs, attitudes and behavioural peculiarities are still prevalent to a lesser or bigger context despite the changed circumstances. The post-Soviet European countries also still have many attributes of a post-authoritarian context. Cooperation that is a basis for the emergence of industrial ecosystems is struggling because of

lack of cooperation traditions and trust (Kowalski, Marcinkowski, 2014; Smallbone, Welter, 2012; Strzelecka, Wicks, 2015), prioritising individualism over cooperation (Lissowska, 2013) and a high power distance (Strzelecka, Wicks, 2015). Scientific research reveals an excess regional or state government intervention in the business and cooperation activities in some cases or, in the opposite – a very fragmental help that is accompanied by empty promises (Strzelecka, Wicks, 2015). Unfulfilled expectations result then in a lower level of enthusiasm to continue the previous activities (Ibid.). The breakdown of Soviet-Union caused various negative outcomes in socio-economical areas. The loss of industrial structure in regions, bankruptcies of large factories, value conflicts resulted in a helplessness, pessimism, lack of trust in the future and various forms of problem avoidance via emigration to foreign countries, alcoholism and suicide (Lakis, 2009; Leetmaa *et al.*, 2015; Strzelecka, Wicks, 2015). It is obvious that these negative processes cause a loss of qualitative labor force that is necessary for industrial ecosystem development.

However, the complexity of these problems shouldn't result in a statement that the emergence of industrial clusters in such a context is impossible. The stories of successful cluster emergence in spite of absence of certain factors confirm the ever existing opportunity even in disadvantaged regions (Ahedo, 2004; Arbuthnott, von Friedrichs, 2013; Chiles *et al.*, 2004; Feldman *et al.*, 2005; Randelli, Lombardi, 2014). In all those cases the emergence started with initiating events that encouraged system's members for changes; the initiatives came from different actors – such as a national government, scientists, and representatives of civic society, local entrepreneurs or large multinational companies. One should emphasise that these initiatives were directed to the *leverage points* or areas where even smallest changes can cause huge changes in an entire system (Meadows, 1997). The leverage points can be related to particular restrictions (Feldman *et al.*, 2005) or various development incentives (Arbuthnott, von Friedrichs, 2013; Sternberg, 2010). It is obvious that choosing a wrong leverage point, the outcomes would be opposite to the expected ones and would require long term actions to repair the damage. For example, reducing governmental staff in Capitol region in USA was successful because of cultural values regarding embracing uncertainty and risk taking – regional inhabitants, which lost their jobs in governmental structures, established new small enterprises, and these initiatives started IT and biotechnology cluster (Feldman *et al.*, 2005). The

same actions wouldn't work well in many post-Soviet countries, especially in the ones, which are characterised by a high level of risk aversion, criticism on failure and envy of others' success (Prats *et al.*, 2015).

Taking the case of the emergence of functional food cluster in Finland into account, one should emphasise the long term traditions of cooperation between active civic society groups and governmental institutions, and science and business representatives as well. Food industry resistance to changes was solved by an ability of science and governmental representatives to make a sense to all the events and mitigate conflicts (Ritvala, Kleymann, 2012). However, employing scientists as catalysts for change wouldn't be a very easy task in post-Soviet countries because of organisational and administrative obstacles to industry-science cooperation or low universities' involvement in research (Gál, Ptaček, 2011). On the other hand, the absence of industrial structure on which university and industry relationships could be built, also limits the expected positive outcomes of scientific research (Ibid.). However, it doesn't mean that nothing should be done in this case. Presenting significant results to the society and highlighting the need for further research may encourage the cooperation among business companies and other institutions. Thus, the clarification of common interests and defining common tasks should be also in place (Bučar, Rojcek, 2015).

A single large company or a group of some large companies acting as anchors for attracting smaller companies and thus creating a "hub and spoke" structure for a cluster (Elola *et al.*, 2012; Markusen, 1996) also wouldn't work in an immature economic context, which is peculiar to many post-Soviet countries and is characterised by poor financial state of firms, including the big ones, their concentration on low cost strategies and a harsh competition – a lack of assets make them unattractive as flagships (Gupta, Subramanian, 2008). Thus, scientific literature emphasises the importance of attracting multinational companies in the region (Arbuthnott, von Friedrichs, 2013; Elola *et al.*, 2012; O'gorman, Kautonen, 2004) that could have a positive impact on the development of industrial ecosystems as in the case of stagnating Florence leather cluster in Italy (Randelli, Lombardi, 2014). This cluster experienced a re-emergence and a novel development of its ecosystem because of a multinational company „Gucci“ that entered this cluster (Ibid). Scientists also argue that *servicing large multinational companies* outside cluster, or *large customers* in a broad sense, may work as a good beginning for the firm cooperation and future industrial ecosystems in the form

of industrial clusters (Arbuthnott, von Friedrichs, 2013). The latter authors also emphasise the creation of *international customer networks* in order to leverage the development of industrial ecosystems.

One of the most common patterns for cluster emergence in both post-authoritarian countries and countries with non-interrupted cooperation traditions are based on *local business entrepreneurs* (Arbuthnott, von Friedrichs, 2013; Brenner, Mühligh, 2013; Kowalski, Marcinkowski, 2014). Individuals that are eager to initiate changes despite all circumstances emerge in any context. In addition, the scarcity of entrepreneurial activities can be solved via attracting transnational entrepreneurs to a particular region (Henn, 2013), including so called "new Argonauts" (Saxenian, 2006) or native employees that return home with an international education and experience (Henn, 2013). The government's aim in this case should be the creation of attractive opportunities for these entrepreneurs to come. It's also important to search for ways to create interregional and international networks (Leetmaa *et al.*, 2015).

Leetmaa *et al.* (2015) while analysing the cases of peripheral regions, emphasised *the importance of regional identity and development of cultural clusters*, such as improving the life and business creation quality in the region, including at least one high school. Strzelecka and Wicks (2015) highlighted *the importance of communities to regional development* and a necessity to enable regional inhabitants to participate in the regional development decision making. Leetmaa *et al.* (2015) emphasise the role of charismatic local leaders, including city administration, in initiating and coordinating local projects.

Finally, *a governmental role in the emergence of industrial clusters* should be analysed in regard to the post-authoritarian context. A positive impact of government on the re-emergence of lagging regions in developed European countries has been emphasised in scientific literature (Ahedo, 2004; Ritvala, Kleymann, 2012). Scientists that analyse post-authoritarian contexts argue that government may perform the role of the main agent of change also (Smallbone, Welter, 2012). Governmental and public institutions may provide financial support and / or facilitate knowledge sharing and skill development for enabling actions (Strzelecka, Wicks, 2015), including developing positive legal and organisational environment for conflict management (Lakis, 2009). However, government in post-Soviet countries sometimes acquires various forms of authoritarianism and seeks to manage self-organisation in their ways (Sapsford *et al.*, 2015; Strzelecka, Wicks, 2015). Some authors argue that government should

only invest in the infrastructure, while developing interactions should be left to other actors (Kowalski, Marcinkowski, 2014). As Strzelecka and Wicks (2015) state personal relationships with representatives of local government or a positive experience in cooperation with governmental authorities in general may have a good impact to the effective engaging into activities.

The six following patterns for cluster emergence in a post-authoritarian context that are based on the analysis performed above could be defined as follows: 1) large firm(s) acting as anchors for attracting smaller companies into cluster; 2) cluster emergence as a means to serve the needs of large customer outside the cluster; 3) cluster emergence via local business entrepreneurs; 4) cluster emergence via local science representatives; 5) cluster emergence by adapting historically formed regional knowledge and networks; 6) government as the main agent for change. The main statements regarding these patterns are shortly presented in the table (Table 1).

It's evident from this table that countries with immature socio-economic can increase cluster emergence processes through internationalisation – attracting and nurturing individuals and companies from abroad. In this article, we agree Arbuthnott, von Friedrichs (2013) stating that peripheries can be developed through advancing local networks, improving internationalisation and enhancing local infrastructures, including a facilitative local government and community mobilisation. In the next chapter the main cluster emergence **scenarios** in the context of Lithuania are presented.

3. The main emergence factors of industrial ecosystems in Lithuania

Following the information provided by a business promoting agency “Enterprise Lithuania”, the first clusters in Lithuania emerged in 2004–2005, while the biggest wave of cluster emergence can be wit-

Table 1. The patterns for cluster emergence in a post-authoritarian context.

A pattern	Barriers	Possible solutions
A large company or companies are acting as anchors for attracting smaller companies to a cluster.	National companies aren't able to play a role of flagships.	Attracting multinational companies (adequate opportunities have to be created by a country's government).
Cluster emergence as a means to serve the needs of large customers outside the cluster.	A lack of large companies. The inability of large companies to create subsidiaries.	Creating networks with international customers. Finding at least one large multinational company as a permanent customer.
Cluster emergence via local business entrepreneurs.	A lack of entrepreneurial activity and entrepreneurial cooperation due the lack of trust and a harsh competition.	Attracting the “new Argonauts” and other transnational entrepreneurs to a particular region (adequate opportunities have to be created by a country's government). Creating interregional and international networks.
Cluster emergence via local science representatives.	A scarce cooperation among business and science representatives.	An active and attractive presentation of research significance to society and business companies to trigger interest in problem solution in the form of a cluster. The clarification of common interests and defining common tasks.
Cluster emergence by adapting historically formed regional knowledge and networks.	Lost identity and industrial structure. Regional emptying because of emigration. Scarcity of civic engagement	Developing regional identity. Improving life quality especially in peripheral regions. Enabling regional communities. The importance of local leaders.
Government as the main agent for change.	Lack of trust in institutions. Authoritarian manner of governmental and scientific institutions in self-organising processes.	Governmental concentration only on the investment of infrastructure. Positive legal and organizational environment for conflict management.

Source: Prepared by authors.

nenced in 2011, triggered by cluster financing from structural European funds. It confirms the statement of Kowalski and Marcinkowski (2014) that public financing regarding clusterisation processes may result in cluster initiatives that aren't related to the specialisation of a particular region. There are enough cases, when the vitality of emerged clusters directly correlates to the funding; when the funding is over, cluster also experiences decline. The reason of a decline may also lie behind the artificial cluster emergence just to utilise funds. Nowadays, the experts of cluster development distinguish 26 active clusters in Lithuania. These clusters are acting in tourism sector, furniture, engineering, ICT, concerned manufacturing, construction, electronics, health promotion, medicine, plastics, chemistry, textile, clothing and leather, food, creative industries, inclu-

ding film and advertising, physical and information security sectors. The biggest amount of enterprises concentrates in Vilnius and Kaunas, the two biggest Lithuanian cities.

Eight clusters from the list mentioned above were analysed in more detail by analysing internet sources about them and conducting interviews with their coordinators. The clusters that contain at least 10–15 members (Jucevičius, 2008) were selected in order to concentrate on growing clusters. Thus, the clusters that are active for at least two years were selected. From 15 selected clusters eight cluster coordinators were reachable for interviewing in this period of time. These clusters belong to the sectors of creative industry – film and advertising (1), game industry (creative industries and ICT) (1), electronics (2), ICT (1), health promotion (2), and engineering (1).

Table 2. The scenarios for cluster emergence in Lithuania.

A combination of first triggers and first initiatives	An explanation	Examples
Unplanned non equilibrium phenomena and events that cause inexplicit initiatives towards emergence of self-organising industrial systems.	Various unplanned events, such as natural phenomena (<i>i.e.</i> floods, storms), socio-economic phenomena (<i>i.e.</i> epidemics, wars or financial crisis) or accidental meetings that lead to various trials to overcome these challenges without a clear intention to create a self-organising industrial cluster.	During the process of the break-up of Lithuanian Film Studio emerged some leaders that encouraged various audiovisual enterprises, which had nothing in common, to take an opportunity to stay in the building of the Studio. Close proximity to each other has resulted in future common projects and emergence of a cluster.
Unplanned non equilibrium phenomena and events that cause explicit initiatives towards the emergence of self-organising industrial systems.	Various unplanned events, such as natural phenomena (<i>i.e.</i> floods, storms), socio-economic phenomena (<i>i.e.</i> epidemics, wars or financial crisis) or accidental meetings that lead to a clear intention to create a self-organising industrial cluster.	The emergence of new big potential customers and markets those are unreachable under efforts of a single enterprise. A scarcity of resources resulted in an emergence of a leader – enterprise manager who united six enterprises for the emergence of an industrial cluster.
Planned non equilibrium phenomena and events that cause explicit initiatives towards emergence of self-organising industrial systems.	Various intentionally created events, actions, processes (<i>i.e.</i> governmental restrictions or funding, planned actions of large companies, etc.) that lead to a clear intention to create a self-organising industrial cluster.	The emergence of cluster funding opportunities from European Union Structural Funds encouraged to legalise their long-term cooperation and to enter in a new stage of development. A group of managers of enterprises or a large company invites other enterprises to join in an emerging cluster.
Planned non equilibrium phenomena and events that cause inexplicit initiatives towards emergence of self-organising industrial systems.	Various intentionally created events, actions, processes (<i>i.e.</i> governmental restrictions or funding, planned actions of large companies, etc.) that lead to various trials to cope with a current situation without a clear intention to create a self-organising industrial cluster.	This combination explains the cases where the enterprises invite other like-minded actors to expand business opportunities without any intentions to create an industrial cluster and successful outcomes of these trials resulted in industrial cluster much later.

Source: Prepared by authors.

Although interviews included various aspects of cluster development, this paper only concentrates only on the first stage of cluster emergence in a post-Soviet context, the main preconditions, triggers and factors that were in place during the emergence of a new cluster.

Despite different industries the clusters represent, four different scenarios of emergence could be revealed as the combinations of the first triggers and the first initiatives regarding cluster emergence: 1) Unplanned non equilibrium phenomena and events that cause inexplicit initiatives towards emergence of self-organising industrial systems; 2) nplanned non equilibrium phenomena and events that cause explicit initiatives towards the emergence of self-organising industrial systems; 3) Planned non equilibrium phenomena and events that cause explicit initiatives towards emergence of self-organising industrial systems; and 4) Planned non equilibrium phenomena and events that cause inexplicit initiatives towards emergence of self-organising industrial systems (Table 2):

The cases analysed reveals that negative non-equilibrium, which was related to the destruction of stable existence or experiencing an even deepening gap between capabilities and expectations, especially in the light of a new big customer or emerging market, resulted in the explicit or inexplicit initiatives toward the emergence of industrial ecosystems. One should emphasise leaders as an essential factor for such outcomes to happen. They encouraged individuals to unite in order to overcome the struggles and achieve good results (see also Leetmaa *et al.*, 2015; Ritvala, Kleymann, 2012). This role of a leader was played by a single individual – an enterprise manager, who united other enterprises, which had previous successful cooperation with each other; group of enterprise managers; large enterprises or simply enterprises that possessed much knowledge and expertise, including scientific research, and this expertise was very attractive to small enterprises to join the emerging cluster. Also, an ability to find sources of help, such as mediators to facilitate the emergence and further development of an industrial cluster, enhanced the cluster success. Public institutions, especially “Enterprise Lithuania”, provided a significant support for enterprises in a clusterisation process. There is also at least one case, where an expert in leadership and building teams was invited to lead the process of cluster emergence. All actors in a clusterisation process were of Lithuanian origin (in contrast to the international emphasis in Table 2).

It’s important to note that the main precondition for cluster emergence was previous successful

business cooperation among some enterprises (their managers). The emergence of funding opportunities as a non-equilibrium phenomenon planned by European Union and Lithuanian governmental structures had a significant impact for legalising previous cooperation, which in some cases already continues for decades. Although funding of clusters resulted in emergence of many artificial clusters, the same funding had a positive impact on new clusters with the ground of cooperation, such as improving research infrastructure or developing new products that require a very large investment.

In addition, it is important to emphasise that the challenges such as cooperation struggles, lack of trust, fierce competition, lack of quality labour force, challenges in communication between business and government, are emerging in the next stages of cluster development and these stages are an object for the future research.

4. Conclusions

Clusters that are usually understood as the concentration of interconnected firms and related institutions in a particular location gain various forms depending on intentions of clustering firms to cooperate and reasons to emerge. From the viewpoint of complexity theory, clusters can be analyzed as complex adaptive systems, possessing the abilities of self-organisation and bottom-up emergence via the cooperation of their members, thus they can be seen as industrial ecosystems.

Since the post-authoritarian countries are characterised by a lack of productive cooperation, this article provides some patterns for cluster emergence as solutions to overcome the existing barriers, based on theoretic analysis. These patterns highlight the importance of local business, science, public and society representatives as co-workers for cluster emergence but first of all, the significance of internationalisation by attracting multinational companies and transnational entrepreneurs, and entering global networks with international customers and international clusters.

A deeper look in the emergence of eight clusters in Lithuania revealed four different combinations of planned/unplanned non-equilibrium phenomena and the first explicit/inexplicit initiatives toward the emergence of self-organising industrial systems. It also revealed the importance of mediators from public institutions or individuals that aren’t in business that have skills to encourage cooperation

and mitigate interest conflicts. The analysis also highlighted the importance of the first initiators – individuals, group of enterprises, large enterprises or enterprises with rich knowledge and experience in general. Although funding from EU Structural Funds was one of the main triggers for the emergence of official industrial clusters, the use of this funding by vital clusters, which are based on a

long-term cooperation of their core members, resulted in expanded research and business opportunities.

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