

# BUILDING A REGIONAL ECOSYSTEM: A COMPANY PERSPECTIVE

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## **Abstract**

Building a regional ecosystem of complementing operations and common activities, with an outset in the Triple Helix model, calls for changing of mindsets and perceptions of the interacting spheres. Conceptualizing the creation of an attractive region with a special focus on education, talent, and cluster attractiveness, a fourth sphere is added to the constellation of interactions actors – the media. Cooperating locally, competing globally, and learning across the four spheres are suggested approaches in the conceptualization of an ecosystem driven by the mindset and needs of the manufacturing firms. A paradigm shift and transformations of perceptions on academia, to be perceived as 'prosumers', as well as other actors in the four spheres, in the collaborations for sustaining the industrial jobs sector and manufacturing sector. Human capital and future generation of industrial jobs, and reputation of the manufacturing sector, lies at the core of concerns for the future of manufacturing firms, as observed in this study. This paper attempts at conceptualizing an ecosystem for regional attractiveness by gaining an understanding on the mindsets and perceptions of the firms.

## **Introduction**

A common objective of the Triple Helix model of university-industry-government relations is to realize an innovative environment that includes "tri-lateral initiatives for knowledge-based economic development" (Etzkowitz and Leydesdorff, 2000; p.112) or stated otherwise, an "Innovating Region" (Etzkowitz and

Klofsten, 2005; p.243). As the media constructs and communicates the public reality, where media and cultural artifacts have an impact on the opinion of the public and affects the perceptions of 'social images' (Carayannis and Campbell, 2009), the fourth helix is added, which is media-based. The four helices presumes that the university has another role in society, a 'third mission' of economic development, in addition to teaching and research; this is affected not only by internal development of the universities but also by an increasing demand from external influences for knowledge-based innovations (Readings, 1996; Etzkowitz et al. 2000). This paper assumes the third mission of the university, however, with a somewhat different 'driver' of the triple or quadruple helix collaboration, as the focus is on activities and operations that mainly benefit the firms. Rather than a technological or science 'push' from knowledge institutions onto firms, an interesting approach is to understand and build on the market-driven incentives as a 'pull' from a company perspective. Identifying the mindsets of the key actors in the firms, which is a fundamental 'pull' force as it underlies the actions taken by the firms; this logic would arguably be imperative as to leveraging the co-innovation processes in an ecosystem built on market-driven needs. Thus, it is the companies' perspective and their mindsets and 'pull' on the dynamics in the interactions between the three spheres of government, industry, and academia, including media as the fourth sphere.

The main assumption is that 'knowledge' is the fundamental source, and 'learning' is the most important process (Lundvall 2010). Stated as being an 'interactive learning' process by Lundvall (2010) between users and producers, this logic could arguably be transferred to the context of a network of "prosumers" (Toffler, 1980) in the realm of collaborations. It may be argued that all actors of academia, industry, and government, are producers *and* consumers of the products, which in this case, knowledge is the product. Another assumption is that the present knowledge is fundamental for creating new operations and activities, which in turn through interactions creates new knowledge. This new knowledge created is competence-building and would arguably be the fundamental source for efficiency in the system of common activities and operation across the boundaries of the actors forming collaborations for regional development in the industrial sector. The notion of interactive learning is magnified in the overlapping of complemented activities of the three spheres.

A regional cluster or an ecosystem of activities among actors from primary the three spheres should be attractive for the involved firms and to attract new firms, as well as to attract new talent and knowledge. The preconditions for future regional or national economic activity and for the 'forthcoming' businesses are *change-driven* where business model evolve, *environmentally robust* with better and long-lasting products, *global* and *knowledge-based*. The preconditions of 'change-driven' and 'global' are part of the main findings which have been discussed in the workshops by the participating manufacturing firms. Forming a *global knowledge hub* as a placed based innovation can be guided by the notion of '*attractiveness*', which according to the Emerald Model has six dimensions in order to create knowledge dynamics in the public knowledge sphere. The six dimensions of attractiveness are the following: cluster, educational, talent, R&D and innovation, ownership, and environmental. (Amir Sasson, April 2013; presentation at conference in Copenhagen)

'Attractiveness' could arguably be the extension or mission of collaborations. The inception of triple helix collaborations – with the vision of creating an 'attractive' business environment – could be identified as the key factor of regional development (Etzkowitz and Klofsten, 2005). With the fourth helix or sphere, the media would function as a communication channel to create the 'social image' of the industrial jobs and the manufacturing sector, as well as creating the attractiveness of the region. There will be given special attention to educational, talent, and cluster attractiveness, since the observation pinpointed the importance of these factors through the discussions of the participating firms, which were the main source for the data collected in this study.

The findings from the observations mainly fall in the realm of human capital and mindsets of the people. The discussion is on '*educational attractiveness*', especially cluster specific educational institutions, and '*talent attractiveness*' which focuses on skilled and highly skilled employees, and to some degree '*cluster attractiveness*', including specialization and completeness in the total value chains. The discussions in the workshops revealed another significant actor – the media – as it has a great influence on shaping the image of the industry. As stated by Sasson (2013), "the media plays a huge role in where talent goes". Hence, the media has a significant influence on the reputation of the industry, as well as an impact on what the society 'learns' about the given industry. This paper attempts at conceptualizing an ecosystem with complementing

operations and common activities for regional attractiveness. The change of mindsets and human capital in all spheres are the key ingredients to the conceptualization of a knowledge-based ecosystem for manufacturing firms in the context of regional development in a local part of Denmark.

In the next section, the aim and scope is presented, followed by a section providing the conditions and context of the study. Methods used in this study are outlined and the intention of observing the workshops is described. Findings and interpretations of the observation and questionnaire are presented, including illustrations in figure and analyzed data in tables. Furthermore, discussions and conclusions followed by implications are addressed.

### **Aim and scope**

The aim of this paper is to gain an understanding of how the manufacturing firms in the local region *think* of co-operations in a network and how the firms *perceive* the role of universities and other knowledge institutions in a Triple Helix model from observations in workshops. The stage of the knowledge-based regional development of this paper is at the strategic level and could be classified as the *incipient stage*, which discusses the ideas for new regional development; it is in the process of moving toward an operating level of *implementation stage* by starting new activities in the near future (Etzkowitz and Klofsten, 2005; p. 249). The intention is to increase the efficiencies of the system through co-operation among regional actors in the *consolidation and adjustment stage* which is more of a long-term perspective in this case.

The intentions are to identify the participating firms' perception and *mindsets* of what needs to be done in the region – by whom and how – in order to maintain industrial jobs, but also create the appropriate conditions for regional development and 'attractiveness' within the manufacturing sector. The objective is to determine what attributes or factors are fundamental to make the region constituting eight municipalities as an attractive location, or as stated by the steering group, making the region the "The best place in Denmark to operate as a manufacturing firm"<sup>1</sup>. From the knowledge collected from the companies, the conceptualization of a strong regional production cluster – or an ecosystem of activities – supplemented with a fourth sphere of the media, is the aim the paper.

## Conditions and context

The manufacturing industry is a shrinking sector in the Danish economy. This has inspired and motivated the initiative of building a regional production cluster in the geographical heart of Denmark, where activities across manufacturing firms (especially SMEs), and government and academic actors, are the center of attention. In the past 20 years, over 200.000<sup>2</sup> have been lost to changing conditions, and from year 2000 to 2009, 100.000 industrial jobs been lost, while a great number of productions have been outsourced. The manufacturing sector, at present state, is responsible for 45 percent of Danish export, 350.000 jobs, and extended range of R&D activities (Johansen et al, 2010; pp. 10-11). Statistics illustrate that for every 100 jobs in the manufacturing industry there are 35 jobs in related industries, and the fact is that 12.5 percent of the services provided are captured by manufacturing firms<sup>3</sup>. Therefore, it is evident that maintaining industrial jobs, and securing the existence of the manufacturing industry, is essential for creating new jobs and upholding the overall Danish economy.

The objective of the collaboration between the eight Danish business councils (hereafter addressed as *municipalities*, as a business council is part of the municipality), as stated by the participating municipalities in the steering group for the project 'The industry of the future in Eastern Jutland'<sup>4</sup> (In Danish, *Fremtidens Industri i Østjylland*), is to maintain competitive jobs in the manufacturing sector and support the existence of manufacturing firms. The eight municipalities are located in the Region of Southern Denmark and Central Region of Denmark with six of the municipalities, *Vejle, Kolding, Billund, Vejen, Fredericia, Middelfart* located in Southern Denmark, and two municipalities are in the Central Region of Denmark, namely *Horsens* and *Hedensted*. Initiated and lead by the municipality of *Vejle*, the central actors of the eight municipalities<sup>5</sup> decided to collaborate and formed a steering group across local borders. The members of the steering group are all specialized in business development. The overall aim of the project 'The industry of the future in Eastern Jutland' is to find the solutions to maintain industrial jobs in the regional crossing the involved municipalities and resume it to specific actions in order to facilitate and optimize conditions for the manufacturing firms. To gain an insight to the local conditions as perceived by the firms, the network of municipalities wanted to inquiry a deeper understanding about the companies' perspective and therefore organized workshops to gather information, facts, and opinions on potential actions on the local level, in order to assist the manufacturing firms in their common quest for growth.

## Method

The primary data for this paper was collected with a qualitative approach of observations. The main part of the data is from the five workshops with manufacturing firms. Sources for basic information and further inspiration had been collected from the semi-active participation in the steering group, as well as personal communication with the consultant<sup>6</sup>, who was one of the co-facilitator of the workshops. A short questionnaire was also sent out to the participating firms. The opportunity to observe the discussions and interactions in the workshops arose, and with an open mind and a special focus on the firms' perspective on academic actors, I was a passive observer for approximately ten hours in a series of workshops. Some of the municipalities decided to combine their workshops for a total of five workshop of two hours' duration. These were conducted in January and February 2013 by two facilitators from REG LAB, which is a large network of members working in regional economic policy, including municipalities, business councils, knowledge institutions, organizations, and businesses. A total of 27 companies from the industrial sector participated, four to seven in each of the workshops. The participating manufacturing firms were selected at the discretion of the particular municipality. In the range of 7 to 15 firms were invited in each municipality, with less than half actually participating. SMEs and large corporations were represented by the top management and leaders, including CEOs and heads of production. Each workshop was held at a location in the respective municipality: two were held at company sites (*Vejle* and *Vejen/Billund*) and three in meeting rooms located in the building of the municipality (*Kolding*, *Horsens/Hedensted*, and *Fredericia/Middelfart*). All workshops were audio recorded and audio files are available for internal use of the steering group.

To give an overall view of the project conducted by the municipalities, after each workshop session, one person was selected as chairman (representing the participants in the group) for further contact regarding the next steps in the project. A follow-up meeting with the five chairmen was held in April and another meeting is scheduled for June. The goal of the workshops, as perceived by central actors of the initial project 'The industry of the future in Eastern Jutland', is to identify common themes across the eight municipalities, which are to be discussed by a greater group in the fall of 2013, anticipating a minimum of 70 participants working on finding specific actions across a broader range of actors. However, this is beyond the scope of this paper.

In more detail, the observed workshops in January and February 2013 were structured as group interviews facilitated by two representatives from REG LAB. The protocols for the workshops were identical, as follows: First, the head of the particular municipality shortly introduced the initiative and the purpose of gathering the manufacturing companies in a workshop, followed by a short round-the-table introduction of each participating firm. Second, the results of a report<sup>7</sup> on the Danish industry were presented by REG LAB in a 20-25 minutes overview session with statistics, cases, and conceptual framework. The main part of the agenda was the one-by-one answering round-the-table, where each participant was asked to give his or her input, followed by an open discussion among firms supplemented by further questions by the facilitators. The report listed some common trends of fast-growing manufacturing firms in the industrial sector (measured in number of employees) and those were conceptualized in a framework in the shape of a star with five ends:

- i) Holistic business models, ii) Leaner production, iii) Strong ties with customers (mostly B2B), iv) Specialization, and v) Organizations with focus on development, not only production and sales.*

The participants were asked to respond to whether or how well the framework – the star with its five labeled ends – showed a realistic view of their particular firm and the modern manufacturing firm. The overall response was positive to the conclusions of the report and to the framework. This opened up for further discussion on challenges and opportunities in the region where the firms were located.

For the purpose of this paper, the most interesting part of the discussions was the input by the participating firms that addressed ‘what’ should be done on a local and regional level in order to maintain industrial jobs and optimize the conditions, and by ‘whom’, including 1) public entities and actors, 2) education programs and knowledge institutions, and/or 3) the companies in the local region. The open discussion addressed issues rooted in the companies, as well as challenges and opportunities of current and future trends were debated. Thus, the outcome of the five workshops differed to a certain extent, with some common points of interest identified. My intentions were to observe how the companies *perceive* and *think* of the actors in academia and in the educational systems. Notes were taken on the content of the discussions and audio files of the workshops were analyzed and stored. All notes were analyzed and placed on a white board for correlations of the themes discussed, with special attention to the actors of academia. The limitation in the data collected from the workshops, for the objective of this paper, is the presence of actors solely from the

industry (active participants) and municipalities (semi-passive participants), whereas actors from knowledge institutions or other educational programs were not invited to the workshops.

However, the overall aim of the series of workshops, by the municipalities, was to obtain information focused on challenges and opportunities from the companies' perspective, and to identify what thematic commonalities were in the eight municipalities for further discussions. Through the conversations and the input given by the companies, the output of the workshop illuminated the special attention to education and media, which are presented in the findings. As a passive observer in a project driven by others, my influence was limited. Therefore, a short questionnaire with 5 questions and open comment boxes was sent out via e-mail to the 27 participants. 24 of the e-mails were delivered and resulted in a total of 12 responses – or a 50 percent response rate. The sample size is too small to be significant data of percentages; however, with the estimation of approximately half of the participating firms mentioning their views, directly or indirectly, on academia, the responses indicate their perception of academia, as the questions were targeting their mindsets toward an active or potential collaboration with academia. The data from the 12 respondents was analyzed and interpreted into *Table 1* and *Table 2*, and further elaborated on in the next section.

### **Findings and interpretations**

The observations indicated interesting findings of how manufacturing firms *think* and *perceive* of actors in the academic sphere; in other words, the *attitude* of participating individuals representing the manufacturing firms. These findings have implications for the conceptualization of the regional cluster or ecosystem of activities; it indicates the mindset of the firms and their perception of another academic actors' role in a collaboration to maintain industrial jobs in the region. The main issues and attributes addressed by the participating firms were categorized into the following:

- 1) Transformation and willingness to change of the industrial firms;
- 2) Competence level, attitudes, and flexibility of workforce;
- 3) Global visions for locally anchored activities and initiatives with other actors; and,
- 4) The image of the manufacturing sector and internal/external communication channels.

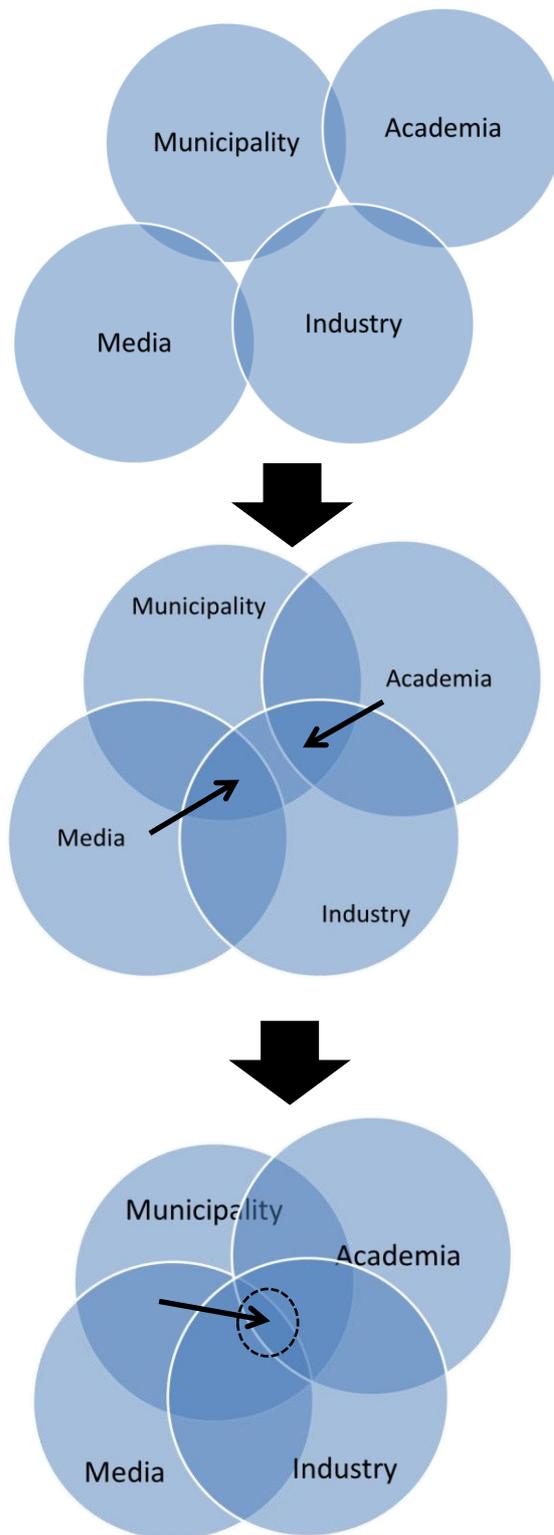
These issues may be divided into four fields of responsibility:

- 1) Industry; 2) Knowledge institutions; 3) Public entities; and, 4) the media

This is where the fourth sphere is highlighted: the media. There were various focuses at the five workshops, but one factor discussed across the five groups of firms was the *reputation of the industrial sector*. The argumentations could be compressed into one line: “the media is talking the industry out of the country, and thus the industrial jobs disappear”, as discussed by several of the participants. One may argue that the power of the media is out of the hands of the firms, and therefore, the blame for a shrinking industry is placed on the media. The fact is that many of the articles by the media communicate negative stories about the industrial sector, and thus the society shapes a negative impression and image of the industry. However, it is rather difficult to state the cause and effect of the influences by the media and the trends of the sector. In terms of attractiveness, there may be some truth to the impact of the media on the reputation of the industry.

The attractiveness of a region, especially the *talent attractiveness* of the particular region as a ‘global knowledge hub,’ is highly influenced by the media (Sasson, 2013). The media is a powerful tool of channeling information to the society. Negative publicity could fortify the downturn in the industry and negatively affect the creation of human capital in the manufacturing sector. The participating firms agreed on the vision of positive publicity would advocate the true image of the industrial sector, make it more attractive to future generations, and thereby create a virtuous cycle for the industry. As the media not only shapes the reputation of a sector, it would arguably also portray the image of the regional activity in the given industry or sector, and assist in attracting talent to the region. With this reasoning, the media is a central actor with its own influential operations; therefore, the media should be perceived as a sphere in itself, which needs to be united with the constellation of the triple helix of academia, industry, and government.

Substantiating the Quadruple Helix (Carayannis and Campbell, 2009) and combined with the presumption of synergistic mechanisms between the four spheres, as depicted in *Fig. 1* with the inspiration from the Hypercycle model (see top image) by Leydesdorff (2012), where all spheres are not overlapping into a central zone – as in the Triple Helix model – but overlapping partially or negative overlap, where “with a decentralized process of translations... among communications of different nature... or... of functionally differentiated codes of communication” (Leydesdorff, 2012; p 30).



**Fig.1** Author's own conceptualization – with inspiration from the Triple Helix model and the Hypercycle model. Top model has no central overlap of all four spheres; over time, the four spheres may share their spaces into a centralized area of interaction for innovation.

The actors in the sphere of academia were addressed by the participating firms as educating the new employees of the firm; thus, the main role of the knowledge institutions, as perceived by the firms, is to teach the students in order for their next generation of employees to have the appropriate professional or technical skills. Other attributes discussed were the flexibility of the new generation of employees and their attitude toward work, which concerned the firms. These are more personal skills or attributes; however, the firms consider it to be the task of the education programs to also teach the students the 'right' attitude and mindset, including being flexible and taking responsibility for their tasks at work. Overall, the firms are asking for a lot of the academic actors in relation to competence building of the individual in the educational system before being introduced in the industrial environment. Some of the participants went so far as to state that the teachers and their equipment at the technical schools<sup>8</sup> were "old fashioned" and suggesting the teachers to go on internship in the industry to acquire knowledge that is needed presently.

Arguably, as with the media, the participating firms were blaming or holding the educational system responsible for the skills and talent of the new generation of employees. Although academia was addressed as being essential for maintaining industrial job in the region – as an institution with the task of teaching – the actors in the academia sphere were not directly perceived as partners. In fact, the main collaborations of interest were, not surprisingly, the suppliers and B2B customers in the upstream or downstream activities of the value chain. Examples of the knowledge institutions' 'third mission' of economic development or active involvement with the industry was not addressed, only shortly mentioned when clustering was the topic of discussion in three of the five workshops. The notion of academic as partners was not mentioned or discussed or addressed as an essential attribute to the survival of industrial jobs; this could be due to time constraints and group dynamics. Therefore, curious to discover whether or not the participants perceived the academic actors as potential partners, 12 out of 24 responses to the online questionnaire (*Table 1*) indicated in a summarized format the following (on a scale of 1 to 5, and 1=*very unwilling*, 2=*unwilling*, 3=*neutral*, 4=*willing*, 5=*very willing*):

- A. 8 out of 12 (66.67%) were '*very willing*' and 3 out of 12 (25%) were '*willing*' (or 11 out of 12 overall were '*willing*'/'*very willing*') to
  - *Collaborate with a sub-contractor or supplier*
- B. 4 out of 12 were '*very willing*' (33.3%) and 5 out of 12 responded '*willing*' (41.67%) to

- *Have an academic researcher included in a new collaboration with other firms or suppliers in the value chain*
- C. 5 out of 12 (41.67%) were 'neutral' and 4 out of 12 (33.3%) were 'very willing' to
  - *Have an academic researcher involved in an existing partnership with other firms/suppliers*
- D. 8 out of 12 (66.67%) were 'very willing' or 10 out of 12 were 'willing'/'very willing' to sit at a table and
  - *Discuss with central actors from academia in order to influence the competences and skills of students*

A question addressed the firms' involvement with academic researchers for instance in projects for developing new products, optimizing processes, or after-production activities of sales and marketing (five possible responses, with the option of several responses, were available to the respondents):

- E. 4 out of 12 (33.3%)
  - *"Yes, we currently collaborate with an academic researcher"*
- F. 3 out of 12 (25%)
  - *"Yes, we have previously collaborated with an academic researcher"*
- G. 7 out of 12 (58.3%)
  - *"No, we do not collaborate, or have not collaborated, with an academic researcher"*
- H. 1 out of 12 (8.33%)
  - *"Collaborating with an academic researcher is not relevant for our firm"*
- I. None responded
  - *"No, we are not interested in collaborating with an academic researcher"*

To draw preliminary conclusions on the small sample of 12 firms opting to respond to the short questionnaire (responses in *Table 1*), it is evident in the first part (i.e. A-D) that the great majority is willing to collaborate with a sub-contractor, as well as including an academic researcher in a new collaboration with other firms or suppliers. This finding supports the observation from the workshops that the mindset of collaborating with a supplier is reasonable and of interest to the participating firms. If this logic – collaborating with a supplier – could be transferred to academic researcher such that they are being perceived as suppliers of a product, i.e. knowledge, not only a teaching institution, this could suggest that the 'third mission' of academia and higher education institutions (HEIs) to be included in the value chain of the firms. Expanding this logic to the

interaction between the four spheres of industry, academia, government, and media, the cooperation among the actors as perceiving each other as 'prosumers' – producer and consumer of each other's knowledge production and shared operations.

Furthermore, the respondents were slightly more split – some 'neutral' and some 'very willing' – in including an academic researcher in an existing partnership with another firm or supplier. This could be an indication of firm in a well-functioning partnership do not require researcher responded 'neutral', whereas firms with existing partnership demanding external knowledge from an academic responded 'very willing'. Moreover, 10 out of 12 firms would be willing to sit at a table and discuss with central actors from academia in order to influence the competences and skills of students – or the firms' future employees. This latter notion of wanting to discuss future skill-sets of students aligns well with the observation of the participating firms in the workshop discussed the education system as institutions with the main task of teaching.

In *Table 2*, according to sequence of responses by each individual, five profiles have been created to capture the pattern of responses and mindsets of firms toward academia and suppliers. 4 out of 12 fit '*Profile A*' where the individuals responded 'very willing' to all four questions (i.e. A-D, above) and are currently collaborating with an academic researcher. '*Profile B*' which has previously collaborated with a researcher, had responded 'neutral' to having a researcher in an existing partnership and willing to incorporate a researcher in a new collaboration.

Contrary, the majority of the respondents (7 out of 12) does not collaborate, or has not collaborated with an academic researcher. Their responses to the four questions (A-D) varied and were categorized into various profiles. '*Profile C*' (3 out of 12) is very willing to discuss with academia, very willing to collaborate with supplier, willing to include a researcher in a new collaboration, but rather neutral for existing partnerships. '*Profile D*' is not willing to discuss with central actors of academia, but is 'willing' or 'neutral' to collaborating with suppliers and including researchers in new or existing partnerships. '*Profile E*' is overall rather neutral regarding collaborations and willing to discuss in order to influence the competence of future employees.

**Table 1 – The respondents' answers to the questionnaire**

Respondent #	Collaborate with a sub-contractor or supplier.	Have an academic researcher included in a <i>new collaboration</i> with other firms or suppliers in the value chain.	Have an academic researcher involved in an <i>existing partnership</i> with other firms/suppliers.	Discuss with central actors from academia in order to influence the competences and skills of students.	Collaboration with academic researcher (several responses available)	Time consumed on responding (minutes)	Corresponding to profile (see Table 2)
1	5 = Very willing	4 = Willing	4 = Willing	5 = Very willing <sup>1</sup>	"No, we do not collaborate, or have not collaborated, with an academic researcher"	01:33	C
2	5 = Very willing <sup>2</sup>	5 = Very willing	5 = Very willing	5 = Very willing	"Yes, we <i>currently</i> collaborate with an academic researcher" & "Yes, we have <i>previously</i> collaborated with an academic researcher" <sup>3</sup>	05:17	A
3	3 = Neutral	2 = Unwilling	2 = Unwilling	4 = Willing	"No, we do not collaborate, or have not collaborated, with an academic researcher"	00:59	E
4	5 = Very willing	4 = Willing	3 = Neutral	5 = Very willing	"No, we do not collaborate, or have not collaborated, with an academic researcher"	00:57	C
5	5 = Very willing	4 = Willing <sup>4</sup>	3 = Neutral	5 = Very willing <sup>5</sup>	"No, we do not collaborate, or have not collaborated, with an academic researcher"	07:44	C
6	5 = Very willing	5 = Very willing	5 = Very willing	5 = Very willing <sup>6</sup>	"Yes, we <i>currently</i> collaborate with an academic researcher" & "Yes, we have <i>previously</i> collaborated with an academic researcher" <sup>7</sup>	05:08	A

<sup>1</sup> Currently active in an education committee

<sup>2</sup> We already do collaborate to a great extent

<sup>3</sup> Process

<sup>4</sup> Many of our sub-suppliers are located abroad

<sup>5</sup> We have often contact to vocational schools

<sup>6</sup> We have a partnership agreement with 'IBC Kurser' – and work closely with all other local educational systems

<sup>7</sup> Innovation processes, action research, leadership of owners

7	5 = Very willing	4 = Willing <sup>8</sup>	3 = Neutral	5 = Very willing	Yes, we have <i>previously</i> collaborated with an academic researcher <sup>9</sup>	04:30	B
8	4 = Willing	3 = Neutral	3 = Neutral	2 = Unwilling	"No, we do not collaborate, or have not collaborated, with an academic researcher"	01:54	D
9	5 = Very willing	5 = Very willing	5 = Very willing	5 = Very willing	"Yes, we <i>currently</i> collaborate with an academic researcher" <sup>10</sup>	05:44	A
10	4 = Willing	3 = Neutral	3 = Neutral	4 = Willing	"No, we do not collaborate, or have not collaborated, with an academic researcher" & "Collaborating with an academic researcher is not relevant for our firm"	02:10	E
11	5 = Very willing	5 = Very willing <sup>11</sup>	5 = Very willing <sup>12</sup>	5 = Very willing	"Yes, we <i>currently</i> collaborate with an academic researcher" <sup>13</sup>	02:46	A
12	4 = Willing	4 = Willing	4 = Willing	2 = Unwilling	"No, we do not collaborate, or have not collaborated, with an academic researcher"	01:06	D

Scale from 1 to 5: 1=very unwilling, 2=unwilling, 3=neutral, 4=willing, 5=very willing. Optional open answering available to the respondents and responses are stated in footnotes.

<sup>8</sup> If we have a need, we are very interested, we have worked with Institute of Technology on several occasions

<sup>9</sup> Development of refrigeration systems using CO2 as a refrigerant

<sup>10</sup> A project on energy

<sup>11</sup> Depends on cost-benefit analysis

<sup>12</sup> Depends on cost-benefit analysis

<sup>13</sup> Graduation projects (master level), product development with supplier

**Table 2 – Profile of respondents**

Profile	Respondent #	Sequence of responses (scale values)	Ratio of respondents	Percentage of respondents	Collaboration with academic researcher	Summary
A	2*, 6*, 9, 11	5 / 5 / 5 / 5 (all)	4 out of 12	33.3 %	"Yes, we <i>currently</i> collaborate with an academic researcher"	Overall 'very willing'
B	7	5 / 4 / 3 / 5	1 out of 12	8.33 %	"Yes, we have <i>previously</i> collaborated with an academic researcher"	Overall 'willing' but 'neutral' on existing partnership, and 'very willing' to discuss
C	1, 4, 5	5 / 4 / 4 / 5 5 / 4 / 3 / 5 5 / 4 / 3 / 5	3 out of 12	25 %	"No, we do not collaborate, or have not collaborated, with an academic researcher"	'Very willing' with supplier, 'willing' and 'very willing' to discuss with central actors from academia
D	8, 12	4 / 3 / 3 / 2 4 / 4 / 4 / 2	2 out of 12	16.67 %	"No, we do not collaborate, or have not collaborated, with an academic researcher"	'Willing' or 'neutral', but 'unwilling' to discuss with central actors from academia
E	3, 10**	3 / 2 / 2 / 4 4 / 3 / 3 / 4	2 out of 12	16.67 %	"No, we do not collaborate, or have not collaborated, with an academic researcher"	Overall 'neutral' and 'willing' to discuss with central actors from academia

Scale from 1 to 5: 1=very unwilling, 2=unwilling, 3=neutral, 4=willing, 5=very willing.

\* Respondents #2 and #6 have also responded "Yes, we have *previously* collaborated with an academic researcher"

\*\* Respondent #10 has also responded "Collaborating with an academic researcher is not relevant for our firm"

It may be implied from the portfolio of profiles in *Table 2* that the mindset of the firms collaborating or have collaborated with academia are more willing to keep collaborating. This is an interesting and valuable finding; the human-based barriers, such as the factors bound in the differences of the two spheres which constitutes the 'perceived gap' between the firms and academia, appear to have been mitigated (Filip, 2013). What is unknown is the interaction level and experience level of industry-academia collaborations. Human interaction through face-to-face and interactive learning experiences has indicated to have a greater impact on mitigating human-based barriers, and to a certain extent also overcoming system-based barriers, as relationships built are stronger than the incentives of formal systems (Filip, 2013). This unknown factor is a limitation of the study and further analysis is needed in order to be able to indicate the willingness to collaborate with academia according to previous experience of business-academia interactions. Moreover,

the profiles which have not collaborated with academic researchers are differing according to the mindsets toward academia; few are rather willing to incorporate a researcher in a new collaboration and more neutral on existing partnerships, and yet willing to discuss about skills and competences of future human capital. The various differences are outlined in *Table 2* for more details and further interpretations of attitudes toward academia.

Changing the mindset of the firms to perceive academia as a 'partner', and to a certain extent as a 'prosumer', in the interaction among the four spheres – either with an overlap of all four spheres in a central point or through synergistic effects where a selection of sphere overlap (*Fig. 1*). Over time, the four spheres may share their spaces in a central point. As the profiles suggest, once the firm is collaborating with academia, the interaction between the two spheres is wanted, as the respondents have implied. This change of mindset lies in the realm of the industry, as previously presented as one sphere where 'transformation and willingness to change' have been addressed by the participating firms themselves. The second sphere – academia – with its responsibility of creating the 'competence level, attitudes, and shaping the flexibility of workforce', as addressed by the firms, is the task of teaching both professional and personal skills. Industry together with academia, while being supported by the government, could create the future employees by aligning the needs of the firms with the resources at academia in order to produce the new generation of candidates.

The third sphere of municipality, as suggested by the firms, has to have 'global visions for locally anchored activities and initiatives with other actors' across the eight municipalities; in short, cooperate locally and compete internationally. Suggestions as to assisting in optimizing the value chains by coordinating and aligning the larger corporations and SMEs in the industrial sector by supporting with shared activities including shared logistics, would substantiate the cluster attractiveness of the region. The fourth sphere – the media – should be brought into the interaction point of municipality and industry by communicating success stories in order to shape a more positive 'image of the manufacturing sector' and to assist in creating the regional talent attractiveness. Thus, the interactions among all or few of the spheres should shape the ecosystem of shared operations and activities while creating the regional attractiveness in order to maintain industrial jobs and secure the future of the sector by cooperating on common goals and mindsets.

## Discussions and conclusions

A paradigm shift in the mindsets and perceptions of the manufacturing firms need to be adjusted and adapted to perceive academia and HEIs, as well as the other actors, as potential 'prosumers' in the interaction between the four spheres – industry, municipality, academia, and media. Actors and stakeholders in each of the four spheres should be involved in problem-solving activities in collaborations in order to solve the challenges of a shrinking production industry in Denmark. One aspect of approaching this issue is to coordinate common activities locally and optimize the value chain with a global outlook, and as discussed by the participating firms, examples thereof are shared business model and coordinated logistics. On a greater scale and with a holistic view on the value chain, complex and short series production are to be kept in the region and to outsource standard production; in other words, anchor specialized activities locally to build strong competences and capabilities in the overall value chain of production while competing internationally. In order for initiatives to prevail, buy-in from all actors in the four identified spheres is crucial and calls for shared goals and visions – for the region and industrial sector.

The participating firms acknowledged the change-driven, knowledge-based, and global preconditions for the future of the industrial sector. Creating the attractiveness of the regional is important in order for current and future manufacturing firms to tap into the resources of the regional prosperity, with a special attention to cluster attractiveness (i.e. total value chain), educational attractiveness (i.e. specialized programs for industrial jobs), and talent attractiveness (i.e. attracting knowledge to the region). Incorporating the academic sphere in the creation of educational and cluster attractiveness would support the missions of teaching and economic development. The media has a great influence on especially talent attractiveness, as the media has the power of shaping the image of a particular industry (Sasson, 2013). Furthermore, the locational epicenter of the ecosystem for manufacturing firms could be the '*Danish Production Universe*' (Original name in Danish: *Dansk Produktion Univers*<sup>9</sup>), which is located in one of the eight municipalities, namely the municipality of *Hedensted*. '*Danish Production Universe*' is conceptualized with the attempt to align the options of the five future trends, as presented in *Manufacturing 2025* (Johansen et al., 2010). These include *industrial power centers* by focusing on new manufacturing technologies and new requirements by the users, *innovation factory* where manufacturing is perceived as a 'knowledge container' and evaluated on cost as well as knowledge contributions, and *flexible value chain integrator* for coordinating the network of small

suppliers with special competences. Arguably, the absorptive capacity (Cohen and Levinthal, 1990) of the manufacturing companies is built through organizational learning and collaborations with knowledge institutions, preferably in a region where the ecosystem is optimized. The ability to innovate will reflect the relations and interplay between individuals, organizations and institutions in a regional innovation system (Lundvall, 2002). Transforming the mindset and learning to perceive the other actors as 'prosumer' would arguably improve the interaction between at least few spheres and catalyze future collaborations in an ecosystem shared by the four spheres.

Establishing a strong ecosystem where the actors of the four spheres – industry, government, academia, and media – interact and co-innovate not only for the greater good of the manufacturing industry, but also for the regional economic activity since services in related industries is impacted by the productivity level of manufacturing firms. The assessment is that a great commitment from the participating firms is a requirement as the willingness to change the processes and mindsets is essential for learning and building capacity in a changing and challenging global environment; sharing and co-creating knowledge on a local or regional level is advised. Actors in knowledge institutions and education systems, as well as actors in the local public arena, are important influencing factors through active involvement in creating and in the building-phase of a regional production ecosystem and its attractiveness. Communicating the 'right' message and portraying the manufacturing sector through a positive lens, as channeled by the media, would arguably influence the society's perception of the manufacturing firms and the future of industrial jobs. Nonetheless, the interplay of the four spheres united in a common ecosystem with mechanism built on mindsets of the actors, especially anchored in the needs and mindsets of the firms should be the main driving force for building and sustaining an attractive and regional ecosystem, and the source of place based innovations.

As previously mentioned, this study has the limitation of a selective sample in observing the thinking process and mindsets of the participating firms, as well as small sample of respondents to the questionnaire; therefore the findings are not conclusive, but rather suggestive and providing direction for further research. Proposed future research include identifying which factors that are the driving force of firms collaborating with academia as partners, and how the mindset of the interacting actors in the four spheres could be altered and adapted in order to perceiving academia and other actors as 'prosumers' in an ecosystem of several

spheres. Focus on the notion of attractiveness of the region and creating a global knowledge hub is also advised. A suggestion for research design is to conduct both a quantitative analysis of the 'drivers' of the firms across a range of sectors and industries, complemented by qualitative methods including but not restricting to in-depth interviews with various actors in the four spheres, as presented in this study.

### **Implications for management**

In a changing world with global economic challenges, new approaches to doing business are requirements to overcoming threats, as for instance a decline in the number of industrial jobs. Transformation of mindsets is a prerequisite to start the innovation through collaborations across and at the intersections of the spheres. Expanding the knowledge field by collaborating with other actors in the industry and knowledge institutions in order to absorb and create knowledge, and to have centrally coordinated activities by the local public actors, would arguably bundle and leverage the competences of the firms involved in the ecosystem for cooperation and co-innovation. A paradigm shift of mindsets and transformation of attitudes toward cooperating across the four spheres and across local borders would be necessary to benefits to gain knowledge and build competences locally, while competing globally as a stronger unit of excellence through a regional cluster. Thus, cooperate locally across the four spheres – and compete globally.

### **About the author**

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## References

- Carayannis, E.G. & Campbell, D.F.J. 2009, "'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem", *International Journal of Technology Management*, vol. 46, no. 3, pp. 201-234.
- Cohen, W.M. & Levinthal, D.A. 1990, "Absorptive Capacity: A New Perspective on Learning and Innovation", *Administrative Science Quarterly*, vol. 35, no. 1, pp. 128-152.
- Etzkowitz, H. & Klofsten, M. 2005, "The innovating region: toward a theory of knowledge-based regional development", *R&D Management*, vol. 35, no. 3, pp. 243-255.
- Etzkowitz, H. & Leydesdorff, L. 2000, "The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations", *Research Policy*, vol. 29, no. 2, pp. 109-123.
- Etzkowitz, H., Webster, A., Gebhardt, C. & Terra, B.R.C. 2000, "The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm", *Research Policy*, vol. 29, no. 2, pp. 313-330.
- Filip, D. 2013, "Interactive learning in SME-university collaborations: A conceptual framework for facilitation interaction" in *Conference Proceedings*, University-Industry Interaction Conference, Amsterdam, May 2013
- Johansen, J. & Madsen, O. & Jensen, H.V. & Vestergaard, A. 2010, *Manufacturing 2025: Five future scenarios for Danish manufacturing companies*, Aalborg University, Center for Industrial Production and Department of Mechanical and Manufacturing Engineering, AK print.
- Leydesdorff, L. 2012, "The Triple Helix, Quadruple Helix, ..., and an N-Tuple of Helices: Explanatory Models for Analyzing the Knowledge-Based Economy?", *Journal of the Knowledge Economy*, vol. 3, Issue 1, pp. 25-35.
- Lundvall, B. 2010, *National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning*, Anthem Press, London, New York, pp. 1-19.
- Readings, B. 1996, *The university in ruins*, Harvard University Press, Cambridge.
- Sasson, A. 2013, "Knowledge-based economic development" presented at *REG LAB conference*, Copenhagen, on April 30<sup>th</sup> 2013.
- Toffler, A., 1980, *The third wave*. Bantam Books

*Note: Non-academic references are included in endnotes.*

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<sup>1</sup> In Danish: *Danmarks bedste sted at drive fremstillingsvirksomhed*.

<sup>2</sup> Copenhagen Economics and Quartz+Co, on behalf of 'Danmarks Vækstråd' (June 2011). "Danmark som produktionsland – muligheder og udfordringer for danske fremstillingserhverv". Retrieved from:  
[http://www.danmarksvaekstraad.dk/file/164439/Danmark\\_som\\_produktionsland.pdf](http://www.danmarksvaekstraad.dk/file/164439/Danmark_som_produktionsland.pdf)

<sup>3</sup> Sources from Statistics Denmark and Confederation of Danish Industry, 2012. *Nyskabende Danmark*.(2012). "Production in Denmark". Facts and sources from Statistics Denmark and Confederation of Danish Industry. Retrieved from:  
<http://www.danskproduktion.dk/danmark.html>

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<sup>4</sup> Eastern Jutland, or *Østjylland*, is a geographic region in the peninsula of Jutland, across several municipalities, including other municipalities that are not part of the project. Thus, the term Eastern Jutland in this context is used loosely. In fact, there is another project which works with the similar targets of maintaining industrial jobs; that project constitute collaboration across other municipalities, including the city of Aarhus.

<sup>5</sup> The entities responsible for business development in regions of Denmark, in Danish *Erhvervsråd*, or business councils as mentioned in a section, are a part of and act on behalf of the municipalities. The process of the project is mainly driven by the municipality of Vejle, who manages and administrates the overall process of this initiative, organizes meetings with the steering group, communicates with the facilitators of the workshops and of the upcoming conference in the fall of 2013.

<sup>6</sup> The consultant's recommendations to the municipalities included the focus on education and the reputation of the industry, as well as coordinating and improving public administration and procedures with the industrial sector.

<sup>7</sup> '*Fremtidens Industri i Danmark*' (translated to 'The industry of the future in Denmark') by REG LAB. Retrievable in Danish:  
<http://www.reglab.dk/english>

<sup>8</sup> In Danish: *Erhvervsskoler* and *Erhvervsakademier*.

<sup>9</sup> *Dansk Produktions Universe* accessible at <http://www.danskproduktionsunivers.dk/>