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A possible model for innovative competency-based cluster management in the interest of effective operation

Theses of Doctoral (Ph.D.) Dissertation

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1. Title and topic of the research study

The title of my doctoral research is "New competence-based cluster management as a possible method for effective operation". The focus of the research is on an innovative cluster management model that integrates a method for a new type of performance measurement. The cluster skill-building model, which forms a central theme in my work, assists the transition to effective competence-based cluster management and aims to make competence development possible. The dissertation touches on the methodology of performance management in Hungary and abroad and also on features of successful international clusters, though only at the level needed to understand how my measurement method was developed, how it differs from other models, and where it fits into a uniform framework.

1.1 Reasons behind the choice of topic, the topic's relevance

In the past few decades a great deal of attention has been focused on clusters. They have drawn this attention partially because of the changing economic environment and partially due to the presence of successfully operating clusters around the world. A cluster can be considered as a type of response mechanism that companies can use to adapt to new economic challenges. In our globalizing world, where small and medium-sized enterprises (SMEs) are taking on an expanding role in international market competition, clusters can play a determining role in improving the competitiveness of firms. Another reason for interest in clusters is the awareness that not only a company's own competences and resources provide benefits in competition; the business environment in its geographical area can, also.

Despite the attention on clusters, in Hungary the majority of collaborations called "clusters" are clusters in name only, or at least are not capable of capitalizing on the opportunities offered by clusters. The spread of clusters proves that the question is no longer whether initiating a cluster is useful. The question today is rather "How can a cluster work effectively?", which is also the central question of my research.

I strongly believe that the SME sector has a need for this form of collaboration in order to survive and to thrive by enhancing and maintaining competitiveness. For this to happen, a system of conditions must be refined to assist in and ensure the efficient operation of the cluster and the obstacles to effectiveness must be identified before they can be tackled or minimized so that effectiveness can be improved.

A new outlook is needed on the operation of clusters, and in my opinion competence-based management is a suitable approach. This is because the parties involved in the cluster need to determine the skills, abilities, personality traits, expected conduct and (of course) the resources needed to reach the goals set when first setting up the cooperation. I perceive a problem in the fact that, although the link between competences and performance is considered to be clear and established, clusters pay little to no attention to determining and assessing the competences necessary for their operation. Another problem with cooperation is that emphasis is put on the benefits of the cluster, while talk about the issues of what the parties need to do and what they may need to sacrifice is often neglected. For the collective vision, objectives and benefits to be realized, the parties need to make available certain competences, personal attributes, and resources, and a party may even need to make some sacrifices for the common good. When the goal is to achieve effective cooperation, it is not possible to ignore the fact that clusters are a special form of cooperation in which competition

and rivalry are also present; it can be difficult for the parties to handle a partner-rival situation, which leads to an interesting situation for effective operation of the cluster. I took these factors into account in my research and considered strategies for overcoming weaknesses in how clusters are currently operated.

The cohesive force of a cluster lies in the goals – of individual members and of the group – being met; in other words, of a win-win situation for all parties. A condition for developing relationships and successful operation is that the participants in the cooperation can handle the uncertainties and risks they face, which arise from informal structures being replaced by formal ones. This is an explanation for factors such as trust, information and communication taking center stage. In my research each of these factors is given high importance.

In order to facilitate the successful operation of a cluster, it is necessary to investigate what competences are needed to meet its aims, to identify the key competences, and to learn whether these are available within the cluster. In my study I attempted to eliminate the methodological weaknesses in the evaluation of performance. I needed to develop an assessment method that included the soft factors, the goals, and the competences needed to meet them. For successful operation, it is essential to be able to identify the available skills and abilities and the required competences. If a partner is not ready for the collaboration because it does not recognize the hidden potentials in it or does not possess the necessary competences, then no matter how beneficial the cooperation may be, it will not be a success, because it will be capable only of limited operation. As a result, the game cannot produce win-win results, which can even lead to a cluster ceasing to operate.

1.2 Objectives of the research

Through my research, I wish to call attention to weaknesses in the currently used methods for assessing the success of cluster management and convince readers of the need for a new perspective and new practices for such assessment. I intend to answer the question "How can clusters work effectively?" and to offer the key to achieving effective operation.

The aim of the study is to investigate clusters and, using empirical research, to build a picture of them (including information from cluster managers, cluster members, and other organizations in contact with them) from the following aspects:
• current practices in cluster operation,
• benefits offered by clusters,
• key competences for long-term successful operation,
• competences requiring development in clusters accredited in Hungary,
• the primary tasks of the cluster manager,
• the level of trust in clusters accredited in Hungary,
• current methods for assessing the performance of clusters.

A further objective is to prove that competence-based cluster management is essential for successful cluster operation.

I aimed to design a cluster assessment method that was capable of revealing the characteristics of currently operating cooperation on the cluster level and on fostering an understanding of how clusters operate, how they develop, and what fosters their effective operation. The study examines operational practices in clusters accredited in Hungary with a

focus on the relation between their competences and their stated goal, which has not been investigated by earlier researchers.

1.3 Predicted outcomes of the study

One intended outcome is to provide information on what hinders and what fosters the effectiveness of clusters accredited in Hungary and what the key competences are for successful cluster operation. From this information a goal-???? process model is developed to discover whether there is a relationship between the goals reached and the competences involved in the cooperation, and what effect the handling of the rival-partner situation has on the effectiveness of the cluster. A new type of competence-based cluster management framework shall be formed to promote effective operation. A new assessment methodology, which also forms the foundation of the framework, will help identify the competence sets of the investigated clusters, determine the competences needed to reach the stated goals, and act as a diagnostic tool to reveal missing competences and map out competence areas to be developed. A further outcome is the formation of a model for cluster competence building designed to foster the transition to effective competence-based cluster management.

The models and framework created based on the information revealed in my research are suitable for the following methodological combinations:
• sacrifice/benefit analysis at entry and during operation,
• competence assessment development (within an organization, among organizations, or on an individual basis),
• performance evaluations,
• assessment of effectiveness of operation,
• supporting knowledge transfer, knowledge diffusion,
• setting up strategic leadership.

Adapting these aspects in operation will yield practical benefits, assisting in more effective operation, management, and development.

The results of the research can be of use to current and future market players, to organizations representing the interests of the profession, to consultancy firms on the market, and to decision-makers in the government or to organizations carrying our preparatory work for decision-making. The results can help us gain a better understanding of how clusters form, determine the factors behind their current state, and explore their potential for future development.

2. Methodology

I employed a number of methods in my resarch. In order to obtain complex and accurate results, both quantitative and qualitative methods were used. Figure 1 illustrates the logical structure of the research.
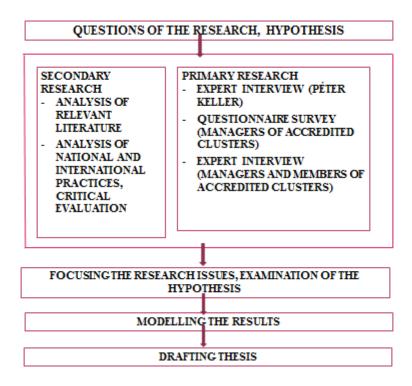

Figure 1: LOGICAL PROCESS OF THE RESEARCH
Source: developed by the author (Anett Leskó)

2.1 Research methods and sample

Since no secondary sources – databases – were available to answer my research questions, it was necessary to carry out primary research to gather data. I used two types of empirical studies to collect primary data, both of which were questionnaire-based and were cross-sectional investigations in terms of the dimension of time. I used both qualitative and quantitative methods, which allowed me to pose questions of appropriate depth. My review of the literature included international case studies of best practices, and works synthesizing current methods for assessing effectiveness. All of this information was useful in selecting the methodology and designing the questionnaires.

Table 1: Main features of primary research

Compilation of research database	• Managers of accredited clusters • Members of accredited clusters • Akkreditációt koordináló szervezet
Mode of search	**Questionnaire:** • Contact: email • Online survey: Evasys survey **Expert interview:** • Contact: email / phone • Interviews: personal contact
Duration of the questionnaire survey	Summer 2015 - January 2017
Number of questionnaires sent	20 and 33 requests
Number of valid questionnaires returned	15 pieces, of which 14 pieces can be evaluated
Analysis of the questionnaire survey	• Correlation test • By principal component analysis (tested by KMO and Bartlett test)
Recording of expert interviews	• Summer 2015 - with a representative of the Accreditation Coordinating Organization • Spring 2017: with cluster managers, member companies
Number of expert interviews	• 2 pcs cluster manager • 8 pcs member companies • 1 pcs representative of the organization coordinating the accreditation

Source: developed by the author (Anett Leskó)

2.2 Research model

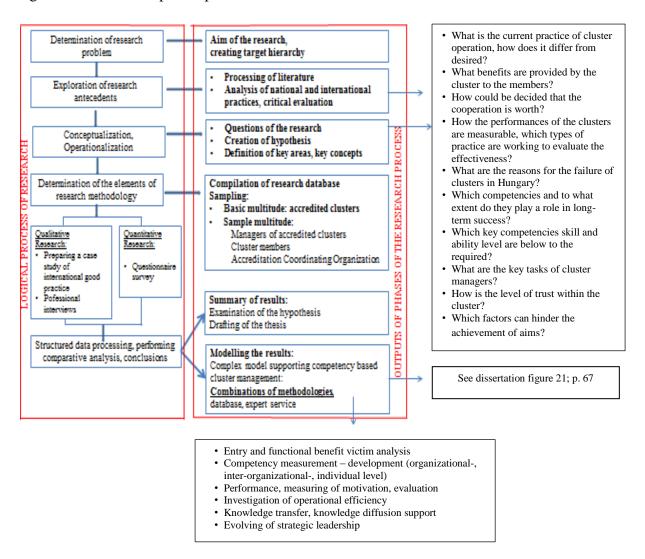Figure 2 shows the steps and phases of the research with the outcomes.

FIGURE 2: RESEARCH MODEL
Source: developed by the author (Anett Leskó)

3. Hypotheses, investigation, theses

At the start of my research I drew up my hypotheses. I used different methods to test the hypotheses (each method provides information for several hypotheses). Figure 3 shows the connections between the hypotheses and the methods used to investigate them.

Hypothesis	Literature	Expert interview	Questionnaire	Expert interview (cluster managers)	Interview (cluster members)
H_0	✓	✓	✓	✓	✓
H_1		✓	✓	✓	✓
H_2			✓	✓	✓
$H_{3,1}$	✓			✓	✓
$H_{3,2}$	✓		✓	✓	✓
H_4	✓		✓	✓	✓
$H_{5,1}$	✓	✓		✓	✓
$H_{5,2}$		✓	✓	✓	✓

FIGURE 3: RELATIONSHIP-MATRIX OF RESEARCH METHODS AND HYPOTHESES
Source: developed by the author (Anett Leskó)

H_0: Regardless of the branch of industry, competence-based cluster management (including the individual and organizational skills, competences, and resources needed for its operation) that is built on knowledge management fosters effective cluster operation.

The basis of Hypothesis H_0 has already been proven in the literature: the collected resources available to enterprises and networked collaborations increase performance and competitiveness (Prahalad-Hamel, 1990; Marengo, 1992; Grant, 1996, Lengyel, 2000; Porter, 1990, 2000/a, 2000/b, 2001). Although the importance of resources and know-how are already recognized in relation to clusters, up to now there has been no evidence of a relation between cluster performance and the individual and organizational competences available to a cluster. In fact, the competences possessed by clusters have not even been investigated, since the current operation or management of clusters is not competence based. This hypothesis was tested through primary research. Questionnaire items dealing with the goals set by clusters and the competences of individual members and of the organization revealed data that I was able to use for investigating correlations and primary component analysis. Additional results of my primary research – interviews with experts and related questions – confirm this hypothesis (see dissertation on pages 70-77).

Based on the data given in the dissertation, I accept Hypothesis H_0, since there is a stochastic relation between competences and goals. The results provide confirmation that there is a very real relationship between achieving cluster goals (which means its successful performance) and the competences possessed by the cluster, since the skills and abilities related to objectives that have been achieved can be said to be at a good level. Based on the evidence, **Thesis T_0** of my dissertation is the following: **Regardless of the branch of industry, competence-based cluster management (including the individual and organizational skills, competences, and resources needed for its operation) that is built on knowledge management fosters effective cluster operation.**

H_1: The factors leading to the lack of success of clusters can be attributed primarily to deficiencies in leadership and/or management; other contributing factors may be a low degree of trust and the short-term aim of maximizing profits.

To test Hypothesis H_1 I relied on my primary research (interviews and questionnaires). Relevant questionnaire items dealt with the goals set by clusters and the competences of individual members and of the organization. To investigate the relationship I carried out a correlation analysis to find which competences were related to the unrealized goals and to what degree these competences were available. An open question focusing on this point was included in both the online questionnaire (*"Many cluster initiatives have failed. In your opinion, what could the reasons be for a cluster in Hungary breaking up? Please justify your answer."*) and in the interviews with experts (*"Many cluster initiatives have failed. In your opinion, what could the reasons be for a cluster in Hungary breaking up?"*). In addition, I investigated results of the cluster management activities listed in the questionnaire; respondents were asked to give a score of 1–6 to various leadership activities based on their importance for effectiveness and how characteristic they were of the given cluster.

My research confirmed that cluster management activities make a major contribution to the effectiveness of a cluster. My supposition that the lack of success of a cluster is not due only to deficiencies in its leadership/management is also supported by my findings. An insufficient level of certain competences – accuracy, teamwork, systematic approach, trust (open exchange of information, open sharing of specialist knowledge), generosity, tolerance, willingness to take risks, communication skills, ability to work under pressure – contribute to the results of the cluster being below expectations (see dissertation on pages 77-82).

From my results, I reformulate Hypotheses H_1 as **Thesis T_1: The factors leading to the lack of success of clusters can be attributed mainly to deficiencies in leadership/management and to the short-term aim of maximizing profits; in addition, to an insufficient level of skills, abilities and competences, such as accuracy, teamwork, systematic approach, trust (open exchange of information, open sharing of specialist knowledge), generosity, tolerance, willingness to take risks, communication skills, and ability to work under pressure.**

H_2: Trust plays a major role in the organizational culture and in handling the situation of working with partners who are simultaneously rivals; the lack of trust leads to lower effectiveness.

Hypothesis H_2 is based on the fact that the existence of trust is a necessity for cooperation, as shown in the literature. (Fukuyama, 1997; Wahl-Nowak, 1999; Lengyel, 2000; Torday, 2002; Tarnai, 2003; Kovács, 2003; Castells, 2005; Angyal, 2005; Szabó, 2010) However, clusters are a special form of cooperation where the parties are not only partners in appearing on the market but are also rivals, and their internal relationship is characterized by competition. In such a situation it is difficult to find a balance between trust and mistrust. Hypothesis H_2 was tested with primary research findings, especially the interviews and also the questionnaire items dealing with issues of trust (see dissertation on pages 83-86).

The results of the empirical studies confirm the hypothesis, thus I accept Hypothesis H_2 as **Thesis T_2: Trust plays a major role in the organizational culture and in handling the situation of working with partners who are simultaneously rivals; the lack of trust leads to lower effectiveness.**

H$_{3.1}$: The cohesive force of a cluster is that the goals of both individual members and of the organization be achieved. For the members it is important that the profit from the cooperation be larger than the victim of benefit (if this does not happen, members will leave the cluster, which can lead to its dissolution).

H$_{3.2}$: When considering the balance of profit-cost, members only partially take into account the competences that can be taken advantage of in the collaboration and that can contribute to meeting or failing to meet the goals. This originates partly from the mistrust and selfishness that accompanies the situation of dealing with other members as both partners and rivals in the cluster.

Hypotheses H$_{3.1}$ and H$_{3.2}$ were tested through items dealing with trust and generosity in the questionnaire and interview and were informed by findings in the literature in order to reveal cause-and-effect relationships (see dissertation on pages 86-92).

My results lead me to accept both hypotheses and to merge them into **Thesis T$_3$: A condition for the long-term survival of the cluster is that the individual and organizational goals are achieved and the cooperation brings benefits to its members; in other words, the profit obtained through cooperation is larger than the costs incurred. In the case of clusters accredited in Hungary, the mistrust and selfishness arising from dealing with partners who are also rivals leads to a situation in which not all potential competences are involved in the cooperation, which causes the cluster as a whole to lack the sufficient set of competences, meaning that the goals are only partially achieved.**

H$_4$: Joining a cluster is a voluntary action. For this reason, there is no stated expectation regarding competences, and thus there is no assessment of them upon entry, which means that partners have differing, heterogeneous competence levels and performance levels, as there is a connection between the competences possessed and meeting goals. This can be a problem for cluster performance, since an insufficient level of the skills and abilities that make up key competences will impede realization of the goals. Since accredited clusters in Hungary do not utilize competence assessment in their performance assessments, neither upon entry nor during the cluster's operation, there is currently no method for identifying competences needing development; such a method would aid in achieving any unmet goals.

I tested Hypothesis H$_4$ using primary research data from the questionnaire and the interviews, and used the literature in order to survey methods for assessing cluster effectiveness (see dissertation on pages 92-102).

The results of the empirical investigation confirm Hypothesis H$_4$, thus it becomes **Thesis T$_4$: Joining a cluster is a voluntary action. For this reason, there is no stated expectation regarding competences, and thus there is no assessment of them upon entry, which means that partners have differing, heterogeneous competence levels and performance levels, as there is a connection between the competences possessed and meeting goals. This can be a problem for cluster performance, since an insufficient level of the skills and abilities that make up key competences will impede realization of the goals. Since accredited clusters in Hungary do not utilize competence assessment in their performance assessments, neither upon entry nor during the cluster's operation, there is currently no method for identifying competences needing development; such a method would aid in achieving any unmet goals.**

H$_{5.1}$: Reciprocal altruistic behaviour fosters long-term effective operation. In the clusters accredited in Hungary, there are heterogeneous levels of trust. Members of a cluster that have already effectively worked together as partners have a high level of trust in each other, but there are cluster members that mistrust the others, especially new members. This impedes the development of reciprocal altruistic behaviour and the effectiveness of clusters.
H$_{5.2}$: The key competences of cluster members for long-term effective operation are trust, openness, the ability to cooperate and the willingness to take risks.

I used data from the questionnaire and interviews to test the hypotheses, and returned to the literature to seek confirmation for Hypothesis H$_{5.1}$. (Kovács, 2004; Gary Beckernek, 1974 quoted by Faragó, 2003; Herbert A. Simonnak, 1982 quoted by Faragó, 2003

The results of the interviews of experts and the questionnaire survey confirmed my suppositions that trust, generosity, willingness to take risks, integrity and honour are indispensible for long-term effective cluster operation. Furthermore, altruistic behaviour can enable clusters to operate effectively (see dissertation on pages 102-105).

Based on these findings I state **Thesis T$_5$: Reciprocal altruistic behaviour fosters long-term effective cluster-level operation, which includes trust, openness, willingness to take risks, integrity and honour as key competences for effective operation. For clusters accredited in Hungary, heterogeneity in the level of trust in fellow cluster members impedes the development of reciprocal altruistic behaviour and the effectiveness of clusters.**

4. Conclusions: Results of research, extension of the research and future research direction

The objective of my doctoral research was to use my findings to draw conclusions and make recommendations for more effective operation and direction of clusters. My aim was to discover the factors and competences that are associated with the successful operation of clusters. I investigated several aspects of accredited clusters currently in operation in Hungary, looking at their practices and at the competences of the clusters and of their members. My investigation included the factors motivating the formation of a cluster, the goals attained during operation, factors that obstruct or assist the success of clusters, competences that influence success, the relation between the objectives and the competences involved in cooperation, attitudes towards trust, practices related to successful operation and performance measurement, and the "leadership activities" of cluster managers. My primary research was carried out among clusters registered in Hungary as "Accredited Innovation Clusters", and cluster managers, individual member firms, and organizations involved in accreditation and coordination were involved in my study. In order to assure a sufficiently broad picture, I expanded my investigation to clusters in other countries as well, examining practices used in cluster development and assessment of performance and in order to identify best practices.

I used several methods in my research in order to delineate the topic and investigate it from different angles. Both quantitative and qualitative methods were employed. In the early stages of my research I carried out a thorough review of the literature and also interviewed an expert in order to define the main focus of my research. During my secondary research I worked in depth with numerous works in the literature, from relevant areas in company theory to research in the psychological background of cooperation among organizations. I studied international cluster practices through accessing public documents and processing available statistics. As a result of this line of inquiry, I published a descriptive method paper that summarizes current practices in measuring the success of cluster initiatives. I judged the investigated assessment methods to be insufficient, because they do not pay enough attention (and sometimes no attention at all) to soft factors. Since the operation of clusters deals with relationships among partners and series of human decision-making series, such factors cannot be ignored. I consider the investigation of soft factors to be justified, and thus I incorporated it into my later methodology. I compiles a table of 12 factors of several international clusters in order to identify their best practices. Before designing my questionnaire survey I interviewed a representative of the body coordinating cluster accreditation who follows applicants through the accreditation process and thus was able to supply relevant information on clusters that are accredited or attempting to become so. In the next phase of my research I focused on the managers of clusters accredited in Hungary, using an online questionnaire (in the EVASYS system) that contained both closed and open questions. To analyze results I used the statistical data from EVASYS, carrying out the Pearson correlation test and principal component analysis. In the final stage of the study, I built on the information gained from various sources and from the questionnaire by carrying out 60-minute interviews with experts: two cluster managers and eight cluster members. I felt it was necessary to involve not only leaders but also members, as their opinions are also important and of use in forming a system to support operational effectiveness, as my model is multilevel, including the cluster level (organizational), member level (individual), and the level of inter-organizational competences.

The questions that I posed at the beginning of my research have been answered, the validity of my hypotheses has been tested and the contributions I have made are given in my dissertation. During the investigation I discovered new areas of research and based on my results, I have reached conclusions and made recommendations for more efficient operation and management of clusters.

I created a new measurement method that concentrates on assessing soft factors, offering opportunities to identify the system of conditions that is needed to realize cluster objectives, based on modifications that I made to the Mintzberg model. Based on my results, I formed a model for building cluster competences that is aimed to assist in the transition to effective competence-based cluster management. For clusters, the cohesive force is the benefit to all actors. For the members, it is important that the profit from the cooperation be larger than what it has cost them. Their collaboration is a success if the objectives have been attained; for this to happen, certain individual and organizational competences are required, and members must make these available and take advantage of them in their cooperation. With my method for measuring performance, I was able to determine the competence sets of the investigated clusters, compare these with the competences needed to achieve their goals, identify any missing competences, and make recommendations for the development of competences in the cluster. This can be of direct use when the developed framework is applied in practice for the more effective operation of Hungary's accredited clusters. It is necessary to tailor the identification of competences needing development in order to reach goals that have not yet been achieved. Adjusting the competence-building model to a particular cluster can aid in the realization of organizational and individual development. Another possibility for application is that the framework and model can be adapted to any cluster. The framework can be applied to assessing accreditation/applications for accreditation or can aid applicants in winning the title of accredited cluster, i.e. it can be used as a system to support decision making.

I believe that the SME sector needs this form of cooperation, but that a change in attitude is needed in terms of cluster operation. In my opinion, cluster management should be competence based. When the collaboration is being formed, each of the members needs to reveal to the others the necessary skills, qualifications, the personal qualities and conduct expected, and of course the necessary resources. The assessment of these should be carried out before accepting members, and if any of the conditions are not met, or fall below the level needed, then it would be justified to require the development of competences as a condition of membership. I consider it important to carry out regular assessments of effectiveness when collaboration is underway, and to target competence development as needed, which can be assisted by adoption of the cluster competence-building model.

This research could be extended to clusters in other countries. It would be worth investigating the relationship between objectives and competences for them, also. It would be interesting to employ models of culture to gain a glimpse into the question of whether the low level of competence in some soft factors found for the case of Hungary is related to cultural characteristics.

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