Sustainable Business Model of CLUSME Metacluster

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Introduction

A business cluster is a geographic concentration of interconnected businesses, suppliers, and associated institutions in a particular field. Clusters are considered to increase competitive advantage and to find new synergy in process and strategic management [1,2,3]. Michael Porter declares that clusters have the potential to affect competition in three ways: by increasing the productivity of the institutions in the cluster, by driving innovation in the field, and by stimulating new businesses in the field. Competitive advantage determining how to make productive use of inputs, requiring continual innovation has become more important [4,5]. Porter argues that economic activities are embedded in social activities; that 'social glue binds clusters together [6].

By composition clusters can be identified:
- Geographical clusters - as stated above
- Sectoral clusters - a cluster of businesses operating together from within the same commercial sector e.g. marine, industry, social sciences
- Horizontal clusters - interconnections between businesses at a sharing of resources level e.g. knowledge management
- Vertical clusters - i.e. a supply chain cluster

It is also expected - particularly in the German model of organizational networks - that interconnected businesses must interact and have firm actions within at least two separate levels of the organizations concerned.

By type of comparative advantage several types of business clusters, based on different kinds of knowledge, are recognized:
- High-tech clusters - these clusters are high technology-oriented, well adapted to the knowledge economy, and typically have as a core renowned universities and research centres.
- Historic know-how-based clusters - these are based on more traditional economic activities that maintain their advantage in know-how the years, and for some of them, over many centuries. They are often industry-specific.
- Factor endowment clusters - they are created because a comparative advantage they might have linked to a geographical position. For example, wine production clusters because of sunny regions surrounded by mountains, where good grapes can grow.

- Low-cost manufacturing clusters - These clusters have typically emerged in developing countries within particular industries, such as automotive production, electronics, or textiles. Examples include electronics clusters in Mexico (e.g. Guadalajara) and Argentina (e.g. Córdoba).

- Knowledge services clusters - Like low-cost manufacturing clusters, these clusters have emerged typically in developing countries. They have been characterized by the availability of lower-cost skills and expertise serving a growing global demand for increasingly commoditized (i.e. standardized, less firm-specific) knowledge services, e.g. software development, engineering support, analytical services.

The internationalization of clusters is a prerequisite for making use of pre-existing complementarities and for using the synergies among present resources and know-how located in EU clusters. The international cooperation among clusters with the same sectorial affiliation can truly help to unlock their potential to act as the delivery bodies of economic growth, increased competitiveness and innovativeness of the EU.

Meta-Cluster - strategy and objectives

The main aim is to use the accumulated knowledge and experiences in the selected fields and transform these to the target markets through meta-cluster possibilities which enlarges the business opportunities of single companies and gives new competitive advantage to Central-Baltic Region.

Meta-cluster is a collaborative platform for national and international cooperation in the fields of common marketing, business and technology intelligence, new business projects, R&D, workshops etc. All project partners, who are long-term active institutions acting on the basis of cluster principles, belong to the meta cluster. In frame of this work package, main activities are: development of sustainable business model of the meta-cluster so that the meta-cluster would effectively work also after the end of the project. Main activity fields of meta-cluster are:

- common marketing,
- platform for cooperative engineering,
- network of manufacturing,
- supporting environment and structures,
- education and training,
- co operational projects,
- emerging technologies and manufacturing systems.

It is planned to develop sustainable business model of meta cluster, determining roles, tasks, mutual relations, structure etc. for effective functioning. Meta-cluster helps networking mainly by:

- gathering and sharing target market information;
- sharing contacts and helping to find right contacts in target markets;
- organizing seminars and trainings.

Regional base makes cluster work more easily, as there is already social capital built in. Public funding is used as advantage to organize clusters and usually public funding is limited to local projects targeting regional development. Also, competitive aspect is easier to work over as knowledge of competitive partners from each other is bigger. Usually that has directed competition to focusing parallel non-competitive business operations.

The overall aim is to increase market potential of SMEs belonging to meta-cluster. Meta-cluster offers support to the SMEs through its knowledge, contacts, supporting institutions and infrastructure. It is planned to arrange business negotiations between local SMEs and target market contacts.

Meta cluster Vision

Meta cluster's vision is to build up strong network between the project partners, industrial associations, competence centers within the region (Estonia, Finland) in order to create new possibilities for business development in new markets.

Meta cluster Mission

Meta cluster's mission is to create new possibilities in order to increase competitiveness of local companies and other involved institutions in new markets by means of international collaboration.

Advantages of Meta-Cluster

This analysis identifies SWOT elements in view of the meta-cluster co-operation in transnational context and has been elaborated based on the inputs from the partners of the project:

- Better promotion of the mechatronics field in the region;
- Achieving a critical mass to accelerate the transfer of knowledge and knowhow to the new markets;
- Internationalization of the CLUSME strategy;
- Sharing the access to research and testing facilities, and developing new and better services to clustered firms;
- Strengthening the cluster ability to innovate;
- Generating common projects with real business value
- Generating new market possibilities for each other's products
- Sharing Best Practices
- Better ability in influencing regional development policies, granting system
- Boosting the interest of potential members
- Access to EU funding

Structure and Functionality of the Meta-Cluster

In today`s global marketplace, companies face intense competition and increasingly sophisticated customer demands. Innovation lies mainly within manufacturing networks, constituted by OEMs and SMEs, which compete on the market. The manufacturing network is supported by the supplies, R&D and educational institutions, financial organizations. These networks lay locally in a certain region and globally are connected to clusters/networks in other regions. How to manage efficiently and to be competitive is a global question for each company separately as well to the certain cluster or network.

The main goal here is to use the accumulated knowledge and experiences in selected fields and transform these to the advantages in selected target markets through the meta-cluster possibilities. It enlarges the business opportunities of separate companies and gives the new competitive advantage to the Central-Baltic region.

Meta cluster is a leader of business development concept. Meta-cluster partners: Hermia Group, Machine Technology Centre Turku, Innovative Manufacturing Engineering Systems Competence Centre IMECC, Association of Mechatronics and Federation of Estonian Engineering Industry (EML) are all long-standing institutions and operating on cluster principles.

The structure of the meta-cluster is presented in the figure 1.
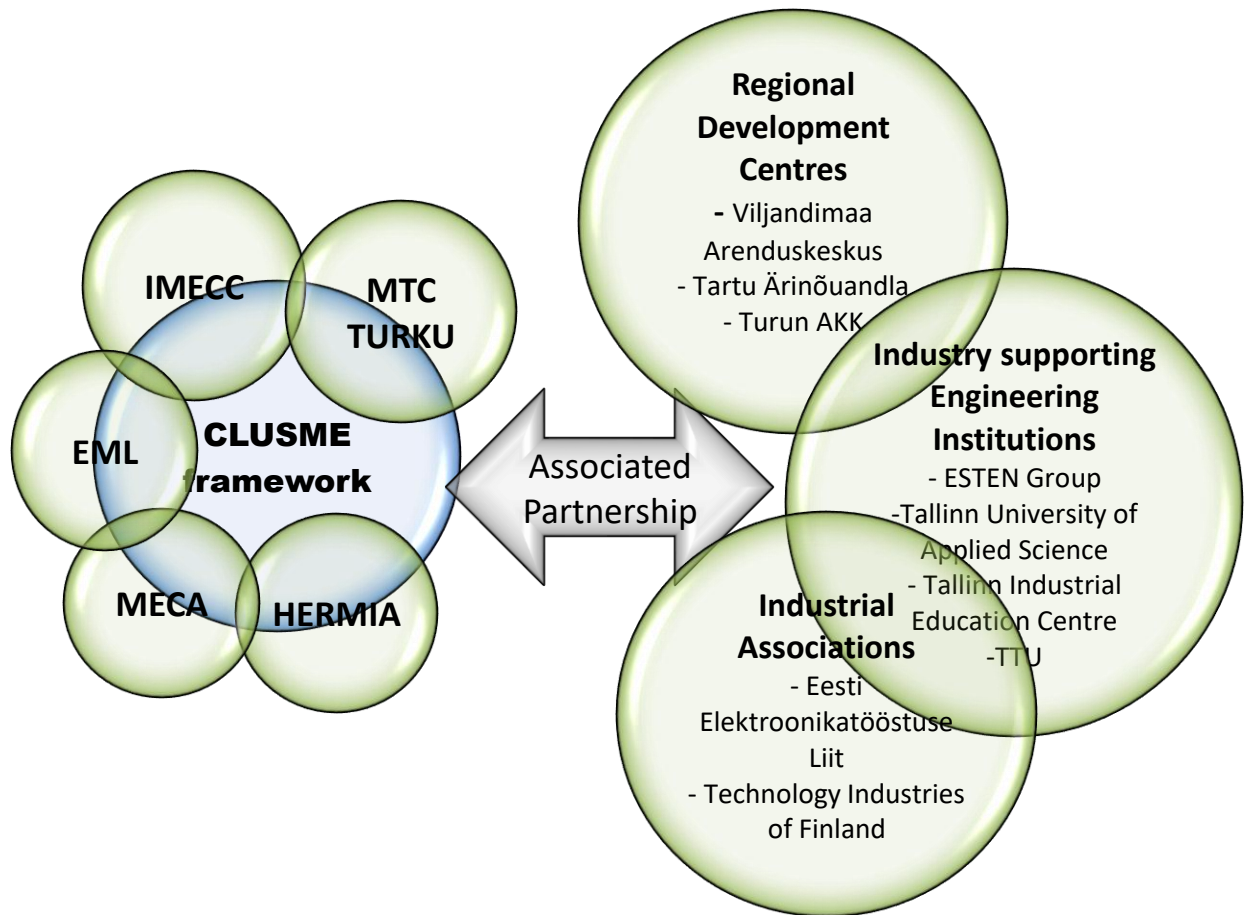
Figure 1. **The structure of meta-cluster**

In this context the meta-cluster is a collaborative platform for national and international cooperation in the fields of business and technology intelligence; new business projects; new R&D; enlargement workshops. The meta-cluster is organizing business activity consortiums in the target markets and estimating their efficiency and providing functional support.

The model of the meta-cluster is presented in the Fig. 2.

Model of CLUSME meta cluster
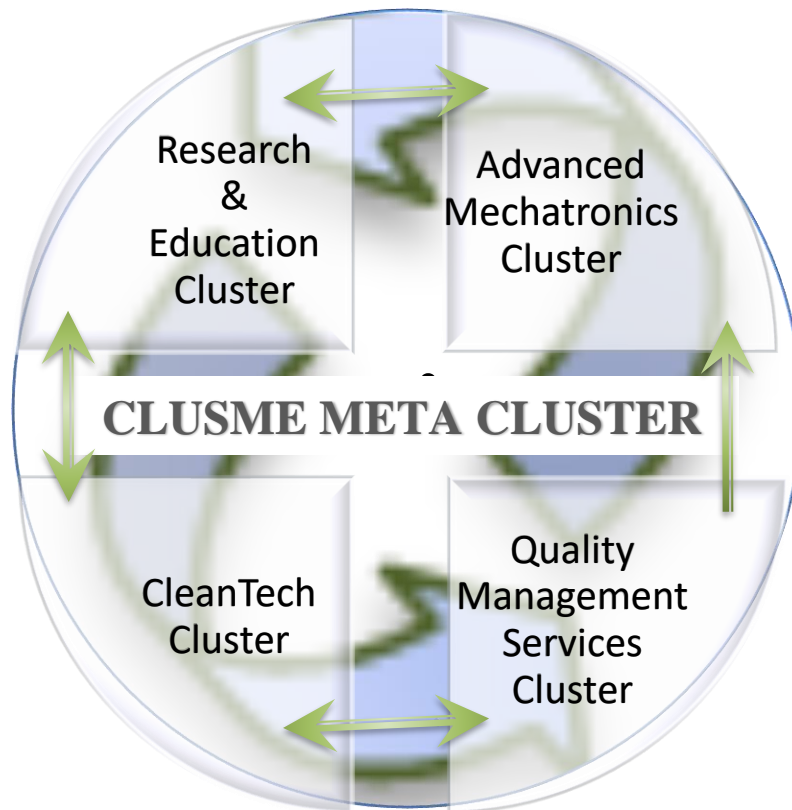
Figure 2. **Model of CLUSME meta-cluster**

Meta-cluster initiatives include:

Information & Communication

- Regular events
- Communication with key-persons of target markets
- Information and marketing materials
- Development of a regional identity
- Trade fairs, conferences, seminars

Co-operation

- Initiations and discussions about co-operation projects
- Establishment of contacts between potential project partners (extension of the network)
- Co-operation between R&D, educational institutions and special service providers
- Development of special co-operation programmes

Internationalization

- Access to international events, conferences, topics, customers and trends
- Set-up of network activities between comparable/complementary international clusters
- Attract foreign attention and visits to established meta-cluster
- Support of international co-operation

Meta-cluster activities

The above-mentioned meta-cluster strategy is shown in the Figure 3.

Analyzing phase

Fixing the results and finding the new possibilities for cooperation and business development in the new markets

Preparation phase

Collecting the new ideas and analysing the interests for further business development in the new markets

Execution phase

If and when possible give the practical aid and help the companies to find the possibilities for business development or to realise the ides in the new markets
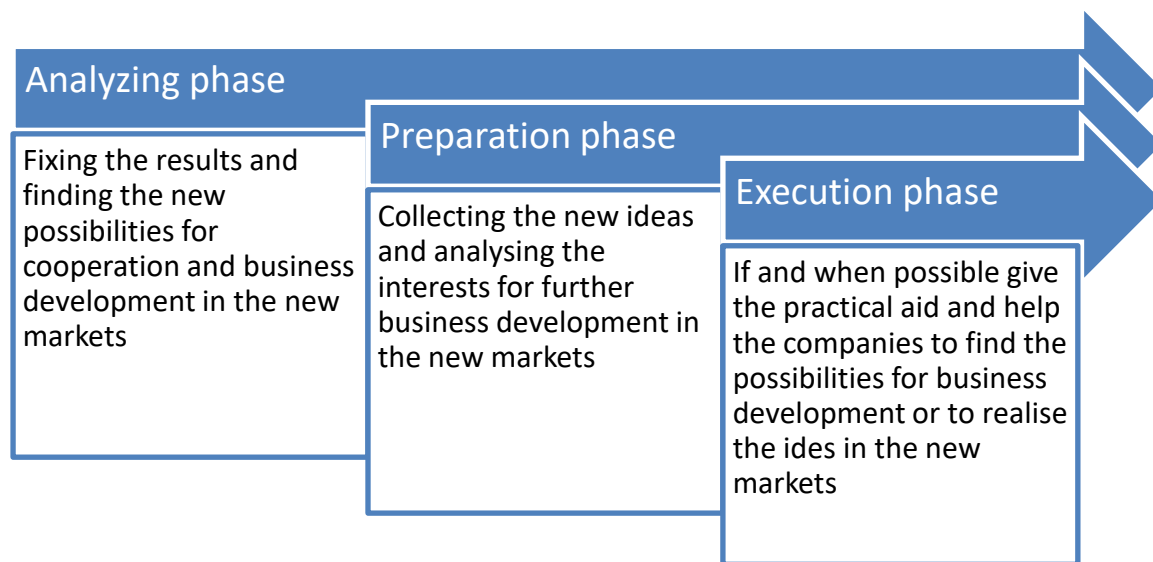
Figure 3. **Activities roadmap**

Clusters inside the Meta-Cluster

Research and Education Cluster

The main target of Research and Education Cluster is to develop and implement new trends in education and opening ways to innovation with the help of cross-border cooperation of new markets. The structure of Research & Education Cluster is shown in the figure below (Figure 4).
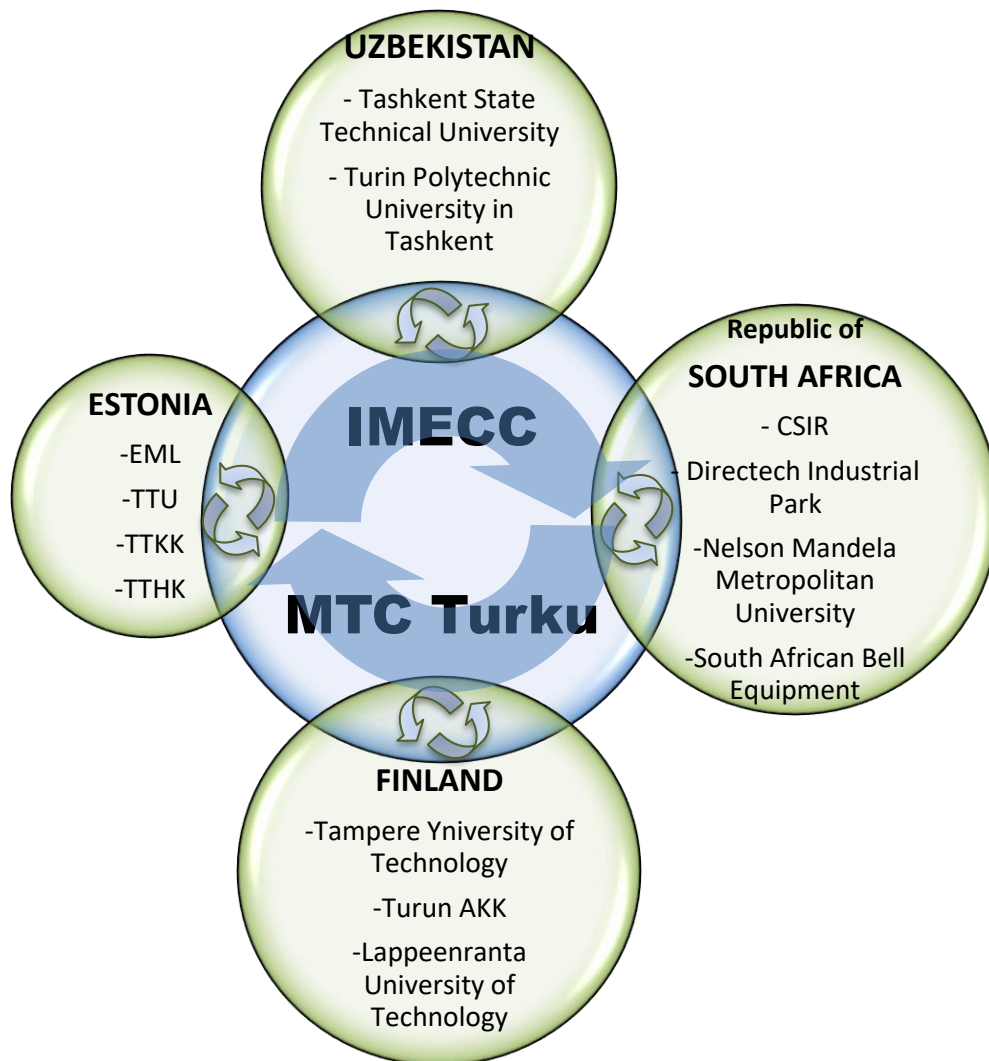

Figure 4. **The structure of Research & Education Cluster**

Target activities of the Research & Education Cluster are:

- Education Development
- E-Learning
- E-School
- Adult Education

- Common research activities

Advanced Machatronics Cluster

Mechatronics is a multidisciplinary field of engineering that includes a combination of mechanical engineering, electrical engineering, telecommunications engineering, control engineering and computer engineering. As technology advances the subfields of engineering multiply and adapt. Mechatronics` aim is a design process that unifies these subfields. Originally, mechatronics just included the combination of mechanics and electronics, hence the word is a combination of **mecha**nics and elec**tronics**; however, as technical systems have become more and more complex the word has been broadened to include more technical areas.

Project partners: IMECC OÜ, Machine Technology Centre Turku, HERMIA - New Factory are all the companies who have given the high priority to the field of research and development in mechatronics.

During the CLUSME project partners have developed the contacts and strategies in two basic fields:

- Cooperation between partners in research and development
- Find the possibilities for cooperation between the companies

There have been two cases developed under this field with opportunities and potential to enlarge during the further cooperation.

1. **CASE 1. Cooperation in tooling (entering the market)**

Entering to the market through one local service provider. Executive Research Associates (ERA) is one of Africa`s leading socio-economic, political and security risk research and consultancy firm. ERA assists multinational organisations venturing into Africa by providing them the information needed to make strategic business decisions.

ERA possibilities are introduced to the Finnish and Estonian companies. Two Estonian companies have already used the services of ERA.

Table 1. Service portfolio of ERA

Services	Used (y) / not used (N)
Country reports – overviews about the possibilities to enter to the market	Y
Due Diligence – company checks before business decisions	Y

Corporate Intelligence – studies about the business area and risk analysis. Report according to the client requirements	Y
In-country Assistance – facilitation services to the companies according to their interests for doing business in Africa	Y
Exclusive Briefings – in-depth sessions to cover information about foreign business dealings	N

The practice has showed that knowledge about the market must be excellent before any business actions. Each case has a lot of alternatives. Even if the service provider can make surveys, analysis on the „paper" or prepare a list of clients and/or partners, the final success factors in practice are right people in the right time at the right place. As a result of contact network developed during CLUSME project several Estonian and Finnish companies have held negotiations between partners in Africa and some of them have already gone into the business.

2. **CASE 2. Cooperation in subcontracting (network of local SME-s (FIN-EST) and companies from Africa)**

Objective: To find the opportunities for Finnish and Estonian companies to produce value-added products for large companies in Africa.

During preliminary visit at least two opportunities rose from the talks with different partners of South Africa (SA). One of this is high-tech components or high-tech industrial automation. There is growing automotive industry in SA, but most of the factories are tightly connected to global car manufacturers and their systems. Also selling components to automotive would require manufacturing near the factories. Starting business with this market would require time and larger investments than we would think is feasible.

Bell Equipment was recognized as a potential target company for a business visit to introduce companies and their technologies from our region. Bell is world's largest manufacturer of articulated dump trucks for construction and mining purposes. They have global sales network and manufacturing sites in SA and Germany. Their headquarter situates in Richards Bay, eastern part of SA.

Advantages of Bell Equipment

- World's third largest manufacturer of articulated dump trucks
- Assembly of John Deer earth moving machines.
- Large dealer network in southern Africa
- Representative of Kobelco, John Deer Forestry, Bomag, Kamaz etc.

- Company was estimated to use and need similar systems that are already in use in Finland. Bell was also estimated to make most of their components themselves because of rather isolated HQ and manufacturing site in Richards bay.

Opportunities:

- System and component sales to South Africa is attractive as Bell needs new ideas like all manufacturers over the world.
- Component sales for assembly plant in Eisenach, Germany. Potential is in high value parts like cylinders, tyres, cabins etc. Also special steel parts are needed to be welded for parts that have been made and assembled in S.A.
- Machines that would be sold through Bell supply chain in S.A. and surrounding countries.

During the business visits organised for Finnish and Estonian SMEs arrangement for future cooperation was agreed between companies and Bell Equipment.

Preliminary visit 12/2016

Idea generation and first list of 15 companies 05/2017

Consult selection 06/2017

First possible visit date 10/17

Second possible visit date 11/2017

Final visit date 02/2018 with 4 companies

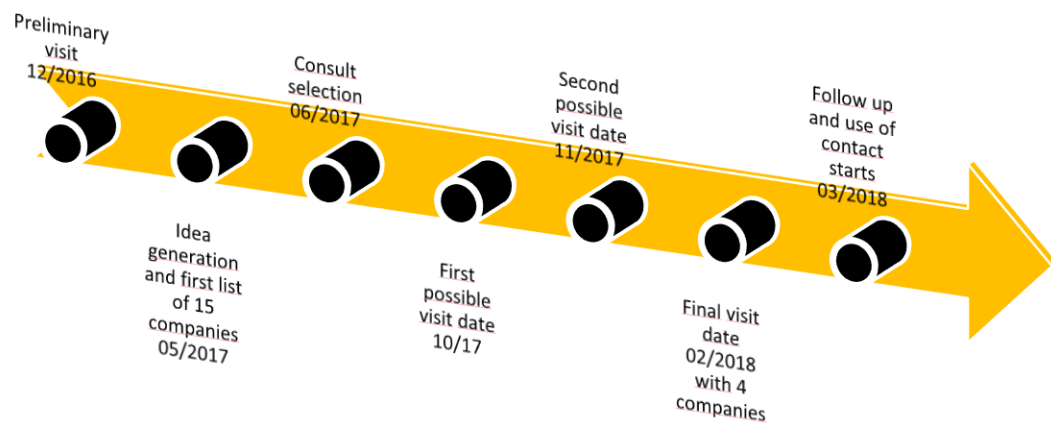Follow up and use of contact starts 03/2018

Figure 5. **Activities roadmap**

Companies have sent feedback that business visits organised were very useful to plan further activities and work for contact development made during business-to-business seminars. It was also positive that Bell got information about our region production and noticed that there could be possibilities to supply components like wheels, cabins and hydraulic cylinders to

Bell's European assembly plant in Germany, as already some components manufactured in Europe like engines, transmissions and coolers are supplied directly, there avoiding custom duties of SA. In the other hand, welded parts could be interesting for European manufacturers imported from SA. These post-visit actions are planned as continuing activities under developed metacluster.

CleanTech Cluster

The main goal of the CleanTech Cluster is to drive sustainable regional economic development, on a global scale. Estonia and Finland have many innovative SMEs and organisations whose knowledge and developed technology is very valuable for target countries. Our companies are interested in new markets outside Europe and looking for organisations who can support by contacts and networks.

As a meta-cluster our partners provides access to chosen markets, knowledge and capital. to develop cross-border business collaboration. During the CLUSME project and our activities in Uzbekistan, our new partner in Estonia became the umbrella organization of Estonian green technologies - Cleantech ForEst.

Cleantech ForEst (Cleantech for Estonia) is an Estonian non-profit that supports and funds early stage green technology startups, advances environmental education and supports energy experts. In addition, they are the cleantech network organization where the aim is to accelerate Estonian green innovation and tackle major environmental challenges, like climate change. Cleantech ForEst runs hackathons, mentoring programs and accelerator for green startups in solar, green building materials, energy efficiency, storage, electric mobility, circular economy innovation, waste, water, and for other solutions that reduces global warming. They offer supportive community, and build collaboration between green businesses, government organizations and research, to create viable investment and business opportunities. Through their programs they give finance, mentoring and share vital knowledge to selected startups.

These services are very important for metacluster to offer full package to companies who need support for their good ideas and innovative startups. The mission of this CleanTech Cluster is to broad the awareness and to promote cross sector cooperation with community and networking events, promote and accelerate entrepreneurship (including the competitiveness of cleantech business), export of products and services, research, development and innovation.

Also the very important role is to fund and support startups and sustainability experts, via Climate-KIC Accelerator, ClimateLaunchpad and Pioneers into Practice program.

Quality Management Services Cluster

Quality is a very important feature for all the companies. Demands for quality are going stronger. For mechatronics companies – producing tools; instruments; different devices; cars, trucks or parts for them; robots and other industrial equipment; mobile phones or electronic instruments, etc. the quality is extremely important. ISO 9000 defines quality control as a part of quality management focused on fulfilling quality requirements. Quality control is a process by which entities review the quality of all factors involved in production. Quality requirements are described in technical documents for manufacturing.

The surveys in the companies have pointed out the problems with quality assurance and quality control.

Quality management services cluster integrates the **service provider** – Machine Technology Centre Turku and the **service users** - companies from Finland and Estonia. The role of Metacluster and IMECC is to disseminate and introduce the possibilities for quality control in MTC Turku.

QUALITY CONTROL MODEL

TARGET

The Machine Technology Center Turku Ltd. (*Koneteknologiakeskus Turku Oy* - KTK) quality management service aims to promote cost-effective and high-quality measurement and calibration services for the business and export conditions of companies. The service is available to anyone who needs services - companies, research organizations and individuals.

PRICING

For measuring and calibration services, the KTK charges a fee based on the cost of the services. Quality Management Services Costs consist of:

- leasing and maintenance costs
- the status of the rent
- the cost of the measurement laboratory
- personnel costs

The KTK is a non-profit limited liability company whereby any excess overheads will be invested in the development of the operating environment and personnel training.

OPERATING MODEL

The quality management agreement with the companies also includes a confidentiality agreement that assures the proper handling of confidential information during the process.

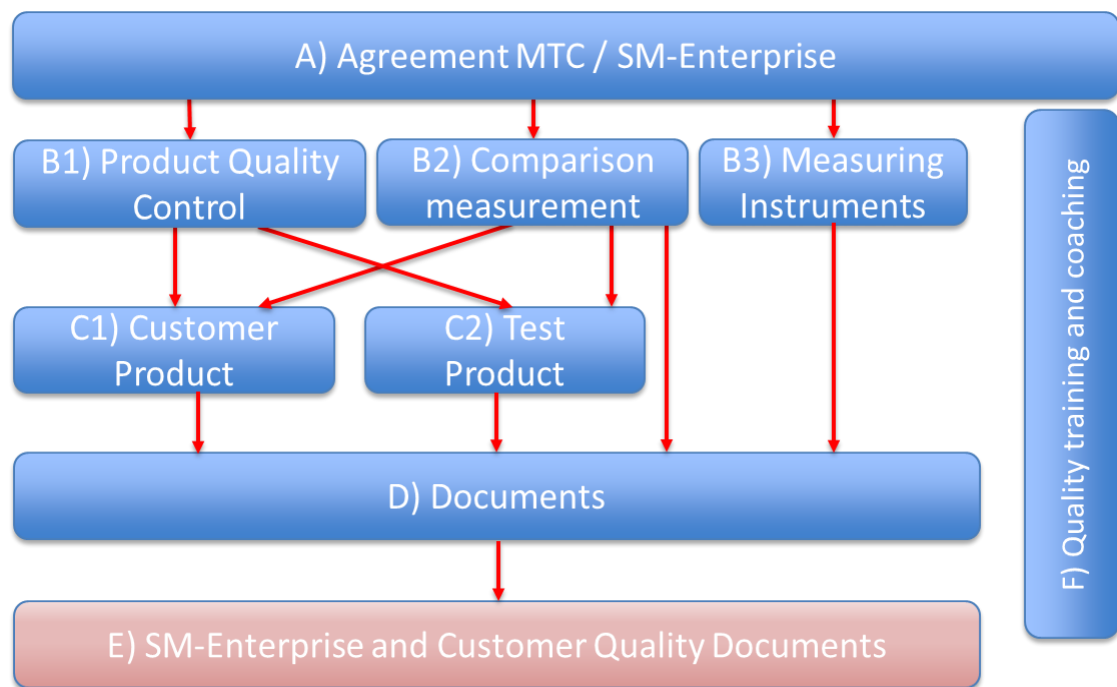The Management Service Model is shown in figure below.

Figure 6. **KTK Quality Management Service Model**

A) **Agreement procedure**

   With the companies KTK aim to make an annual contract for quality management services, but service is also available to companies through ad hoc agreements. The annual agreement establishes the scope of cooperation, the terms and conditions of delivery and the pricing principles that enable companies to price their own supply.

   The Quality Management Agreement is concluded with companies in writing. In addition to the pricing of the service, it is agreed that the procedures and timetables are to be used. The agreement may include product quality assurance, measurement method reference measurement, and / or calibration of measuring instruments.

B) Services

1) Product Quality Control

To verify the quality of business products to their customers, the KTK will make agreed measurements and the results will be documented. The accreditation of the activities of the KTK ensures the traceability of the measurements and the independence of the operations.

2) Reference Measurements

By means of reference measurements, companies are able to maintain their own measurement and production accuracy and to determine their own measurement uncertainty by comparing their own measurement results with the measurements made at the KTK laboratory.

In the reference measurements, the companies perform measurements of the agreed piece and the same piece is measured with KTK under laboratory conditions and more accurate measuring devices. Based on the comparative measurement results obtained, the company can estimate and determine its own measurement uncertainty.

For manufacturing reference measurements, the company manufactures an agreed copy (eg NAS, BAS), measures it with its own metering devices, and then copies it to a measuring laboratory in the KTK. Based on the results obtained, the company is able to define the machine manufacturing accuracy and development.

3) Measuring Instruments

By calibration of measuring instruments, companies assure the reliability of the measuring devices. Companies supply measuring instruments to the KTK, the meters are checked / calibrated, and the results of the inspection report / calibration certificate are made. Some of the calibrations of the measuring instruments are accredited and some are currently outside of accreditation. Non-accidental calibration results are traceable but have so far been made so little that their reliability can't be demonstrated. The customer's measuring devices can also be inspected, whereby only the displayed ones are compared to the measured values. The measured instrument does not correspond to the calibrated measuring device of reliability. The KTK's accredited calibration laboratory complies with the ISO17025 standard.

C) Products measuring

The products to be measured are either songs supplied by the customer or pieces defined by the KTK.

1) Customer's Products

In customer-delivered products, the customer also delivers a drawing or CAD model to the KTK, which clearly demonstrates the surfaces to be measured and their tolerances. If possible, the customer will provide the CAD model with the

manufacturing information (PMI) that can be used to program the coordinate machine.

2) Test piece
The test pieces may be pieces of the KTK, the dimensions of which are well-known or are KTK-modeled and produced by the company (NAS and BAS). Of these, KTK has ready-made fasteners and measuring programs.

D) Documents

Quality Management Service documents provide reliable information to the customer about the measurement implementation and the significance of the results obtained. Documents are official documents that must be trusted to the customer and their customer.

The documents are always written in Finnish, but if necessary they are translated into the desired language of the customer. If the language versions have content that is to be interpreted, the original Finnish version is dominant.

E) Quality documents for a SME and their clients

Companies are doing business with their business partners and agree on quality management. The KTK has provided its annual contractual customers with the current price information that enables them to make offers and take into account the time spent on quality management during the delivery times. Pricing and delivery times are specified with the company at the ordering stage.

F) Quality training and coaching

The KTK organizes quality training and coaching annually for its customers and provides training and calibration technology training for companies. The training is carried out in co-operation with the network of measurement technology of the KTK.

The training programs are:

DEGREE TRAINING

1. Measurements of the mechanical engineering industry *(Professional level)*
   A. Compulsory quality components
   - Creating a measurement plan
   - Measuring with manual instruments
   B. Optional degree components
   - Measuring with measuring instruments
   - Measuring with a 3D measuring machine
   - Measuring with optical instruments

2. Calibration of machine measurement equipment *(Professional level)*
   A. Compulsory quality components
   - Creating a calibration plan
   - Measuring with manual instruments
   B. Optional degree components

- Calibration of manual tool
- Calibration of measuring instruments
- Calibration of 3D measuring machine
- Calibration of optical instruments

3. Mechanical engineering measurements – 10-week apprenticeship *(VET level)*
    - Measuring with manual instruments
    - Making a measurement report
    - Measuring with a 3D measuring machine
    - Good measuring methods

ADULT TRAINING AND COACHING

1. Measuring with a 3D measuring machine

    A. Basics of measurement and programming

    B. Demanding measurements

    C. Tailored coaching

2. RR-test – Evaluation of the measurer's competence

3. Basics of measurement technique

Cluster Policy – Linking Regions

The main focus is to find new possibilities in new markets to develop business for SME`s. The cluster policy is based on better and stronger contacts and collaboration between Finland and Estonia. Here we see three types of relationships and activities development.

1. A first type deals with the strengthening of triple helix relationships, mainly between countries (Finland, Estonia), regions inside the countries (Varsinais Suomi, Harju county, Viljandi county, etc) and selected institutions (development centres, associations, educational institutions, etc) inside the regions for developing the structure for cooperation (see Fig. 1).

2. A second type focuses in organizing links between SME`s from Finland and Estonia and meta-cluster initiators for mapping the interests and potential of the companies for enlarging their market area and having special objectives in the new markets.

3. A third type concentrates on development of long-lasting contacts between meta-cluster and strategic partners from the new markets (see Table 1, 2, 3, 4) for further actions. These collaborations could take place with R&D organisations or between the companies either horizontally (having the same or similar focus) or vertically (along the whole value chain).

Main challenges of this policy are:

- Fostering innovation. The ability to innovate is crucial for the success of regions in general and industry in particular. Today the Industry 4.0 and corresponding technologies, big pressure to the green technology are accelerators of innovation processes and digitizing the economy.

- Fostering co-operation. This means fostering collaboration between industry, with special focus on small and medium size enterprises, research institutions and academia. Supporting cooperation projects increases the rate of innovation processes and the technology transfer from R&D institutions and academia to industry.

- Fostering internationalization. Especially SME`s have not enough resources and know-how to enter new markets. Therefore, meta-cluster is an essential factor for the companies to succeed in the global markets.

Company activity and behaviour

In business environment it essential to take care your competitive edge. Therefore, businesses do not public future business plans and products, R&D targets, profitability etc. in details. These are discussed between those who have interest to be part of the plan. Other parties are kept outside until it is time to market or otherwise publish something already in reality.

This behaviour in visible also in cluster co-operation and how openly companies are telling about their future. Companies mostly listen and comment only if asked. They can talk more openly when interviewed person to person situation or asked anonymously.

Only when certain long-term and trustworthy relationship and is created, company representatives can talk more openly. This usually means that they have previously got some help or advantage of being a part of cluster and its activities. There are naturally big personal differences between individuals.

Taking into account previous social phenomenon, the success factor of cluster is much in the hands of the key persons, their professionalism, social capacity and maybe also their past experience in industry or public organisations. Also, their personal networking capabilities are important.

The main motivation and reason why companies are participating cluster-type of cooperation are:

- Large companies are searching complementary knowledge and technology suppliers to their existing business line products. They are also looking opportunities to reduce cost. Important for them is to know about coming regulation and influencing into it.
- SMEs are looking for new business opportunities inside cluster or with the help of it. They also want to know what are the targets of large companies and trends that drive them. New technologies are looked for if it is going to influence their business somehow. Usually small and medium size enterprises are worried about their competitive situation inside and outside cluster.
- Start-ups are looking for funding and co-operation with other companies. They are also very interested to get some cash flow into their company and secure their start.

Cluster co-operation based on meta-cluster

As clusters are rather regionally organised and it takes long time to create trust between members and leading person, it is very difficult to grow cluster interregional or international. This kind of growth is possible only in thematical clusters like glass, rubber, oil etc. Competition also prevents much of the co-operation possibilities in thematical international clusters and they concentrate into standardisation and regulative issues.

The most practical way of cluster networking into meta-clusters is by networking the cluster managers. Mangers are usually in position that they represent independent and neutral party and can talk more freely about trends, opportunities and business in open way but not talking about details of members activities. Active cluster managers can take initiative activities outside cluster to fulfil the above-mentioned needs of different size of companies and mutually open the same opportunities to another cluster. Essential is how well cluster managers know their members and how well they can guide the partners to meet each other in positive way. This can also happen very slowly during time or very quickly depending of the partners business situation. In real world the difficulty lies in how mutual interest can be arranged to meet in rather tiny time window of few months when company have to find solution to their need one way or other. In this time window company must find solution from their own network or from outside cluster.

As the same rules apply into inter cluster operation than inside cluster, large companies can be very active and be drivers in the co-operation. SME companies are very worried about competition and are looking mostly something complementary to their business or their products. Start-ups are looking solution to their needs very actively everywhere so inter cluster operation is positive thing for them.

Conclusion

- In making inter cluster networking the active attitude and forward-looking strategical thinking must exist among cluster managers. In CLUSME this has been very much true.
- Funding for this work must exist as this goes beyond normal operations and is risky. CLUSME as a project has given funding for the basic work of the managers to meet and plan co-operation in the form of export activities. The process has been very practical.

- Normal CLUSME project meetings have been organised in the way that social capital has been forming. Also, pre-study trips to target countries have been useful in many ways in giving inter-cluster knowledge.
- During the commercial visits members have also met companies from other clusters.
- CLUSME has given longer term co-operation results than just the work done during project. This is important for the inter-cluster forming as meta-cluster.

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