INNOVATION IN AN ADOLESCENT CLUSTER: THE CASE OF THE DUTCH MULTIMEDIA CLUSTER

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This paper is the result of an ongoing research interest in the innovativeness and competitiveness of the Dutch Information and Communication cluster at Dialogic Innovation and Interaction. The research reported here is largely based on the ClusterMonitor Multimedia performed for the Dutch Ministry of Economic Affairs (see den Hertog et al.) as well as research performed within the framework of 'RTOs in the Service Economy' (RISE) project performed under the Targetted Socio Economic Research Programme, which also focusses on the Information and Communication cluster. This paper is mostly qualitative. Extensive quantitative figures on the development of the Dutch Information and Communication / Multimedia cluster are documented elsewhere (e.g. Brouwer & den Hertog, 2000).

CONTENTS

1. INTRODUCTION

Terms such as E-commerce, E-banking, E-marketing, E-learning and E-government signify that electronic infrastructures are being set up for the purpose of shaping interactive information, communication and transaction services in a wide range of activities. A growing number of varied businesses and organisations in the Netherlands are giving shape and form to such services and the associated products and infrastructures. For instance: businesses in the world of ICT, consumer electronics, telecommunications, content (AV/broadcasting, publishers, entertainment), advertising and marketing communications. Nevertheless, there is a growing group of what are often small and (meanwhile) medium-sized businesses operating at the crossroads of multimedia enabling, content distribution, content provision and E-marketing, combining all four worlds. These are occasionally businesses that originated from one of the aforementioned traditional sectors, sometimes they are developing, existing offline multimedia businesses, and surprisingly often they are dynamic start-ups that to a large extent are shaping the New Economy. Together, they produce an ever increasing variety of products and services (see box 1).

BOX 1: MULTIMEDIA PRODUCTS AND SERVICES: A CONTINUUM

Below is a list of the activities (which is by no means exhaustive) performed in those businesses active in the multimedia sector on the basis of the four segments of the multimedia cluster mentioned above. It can be regarded as a continuum with the pure hardware on the one hand, and on the other, the pure services, with many combinations in between.

MULTIMEDIA ENABLING

- The development and production of multimedia hardware, such as computer hardware, CD-ROM players, DVDs, modems, decoders, network components, domestic devices (consumer electronics), mobile telephones suitable for multimedia use, etc.
- The development of packaged software for the creation of multimedia applications, such as multimedia authoring systems, intelligent agents, search systems, content management systems, measuring website usage (Netstatistics), browser-based banking, etc.
- The creation of a development environment for certain kinds of application, e.g. E-commerce applications, a virtual learning environment, etc. Making existing back office systems Web enabled.
- Interface design.
- Web hosting.
- Integration (Web enabling) of existing back office systems with online applications.
- Advising on E-commerce and Internet strategies.

CONTENT DISTRIBUTION

- Providing access to the Internet (sometimes in combination with telephony and the distribution of radio and TV signals) through a variety of infrastructures.
- Access services, generally combined with forms of content aggregation (own portals) and the creation of communities.
- The distribution of multimedia devices and software.

CONTENT PROVISION

- The development of new formats, concept development and content creation (e.g. for combined TV and Internet).
- The production and maintenance of the content for websites, e.g. the production of E-magazines.

- Website quality assessment and comparison.
- The production of instructive CD-ROMs, DVDs for educational purposes for instance.
- The compilation and publication of multimedia titles.
- Electronic publishing.
- The development of new service concepts / new business models varying from virtual marketplaces, purchasing platforms, specialised portals, the creation of communities, etc.

E-MARKETING
- Webvertising, exploiting advertisement space on websites and portals.
- Online brand development / Online promotion.
- User profiling & user management (overlap with multimedia enabling).

What about the innovativeness, the dynamism and the future prospects of the group of businesses we are talking about? Is there really a functioning multimedia cluster in the Netherlands? Other questions relating to the multimedia cluster that spring to mind are:

- How is the assumed multimedia cluster structured?
- Are the conditions that relate to the development of the multimedia cluster favourable or unfavourable?
- To what extent is the Dutch multimedia cluster a part of international production networks, and might the cluster possibly be driven from abroad?
- To what extent are the relevant parties able to reach constructive collaboration in a positive spiral of knowledge generation and knowledge transfer (without damaging the element of competition)?
- To what extent do demanding clients provoke the multimedia cluster to innovate on a constant basis?
- How do the players in the multimedia cluster innovate? Is there a specific style of innovation involved?
- How do the players in the multimedia cluster perform in terms of business economics and innovation?

Within the framework of the further expansion and development of the cluster policy, the Netherlands Ministry of Economic Affairs has had an analysis instrument developed, the so-called ClusterMonitor (see Berenschot, Dialogic & Technopolis, 2000), for the purpose of answering these questions. One of the pilot studies related to the Dutch multimedia cluster referred to above (den Hertog et al., 2000). In the next section we shall deal in brief with the analysis instrument of the ClusterMonitor (section 2). We then move on to present an extensive summary of the results of the first application of the instrument on the Dutch multimedia cluster (sections 3, 4 and 5). We then conclude by giving a summary of the bottlenecks we observed and the potential options for improvement (section 6).

2. CLUSTER MONITOR AS AN ANALYTICAL TOOL

The instrument of the ClusterMonitor supports the identification and analysis of clusters[1] and comes up with specific suggestions relating to innovation, cluster-formation, and the improvement of competitive strength with regard to the actors in the cluster (businesses, knowledge organisations and other intermediary organisations, and policy-makers). The basic idea here is that innovations today more frequently occur in networks and clusters of activity (including the associated infrastructure in the broadest sense, such as the educational and the knowledge infrastructure) and that the way in which innovation takes place differs from one cluster to another. Because of this, the provision of information and analysis must also take place at cluster level.

The ClusterMonitor as a method is experimental. It was developed in concept in the period November 1999-December 1999. Subsequently, the method was put to use on three clusters in the period December 1999 – March 2000 and reported on definitively in May 2000[2].

The core of the monitor methodology is formed by the relation model illustrated in Figure 1 which can be used to study the aspect of competitive strength and degree of innovation. This model is used as the basis for both the quantitative and qualitative collection of data. It contains indicators of a cluster's performance, determinants which both characterise the characteristics of a cluster and are able to explain the performances and relations measured between the indicators and the determinants. The relation model, and the nine dimensions set out therein, offer an initial stepping stone to better describe the **basic characteristics**, the **functioning**, and the **performance** of the cluster on which the ClusterMonitor is carried out.

BOX 2:THE QUANTITATIVE COMPONENT OF THE CLUSTERMONITOR

Developing the 'analysis instrument' of the ClusterMonitor resulted in us building up a large database in association with the CBS (Central Bureau of Statistics) in which are linked the various statistics at the level of individual business enterprises (the micro level). This means that a total of 32 indicators are now available for 46,900 businesses. These indicators are coupled to the nine dimensions

[1] A cluster is defined as 'chains of suppliers, customers and knowledge centres (universities, research institutes, knowledge-intensive services, intermediary organisations) that: have the disposal of complementary competences (1); are interconnected through production chains or value chains (2); improve joint industrial processes and end products (3); and (possibly) participate in networks focused on innovation and technology development (4).'

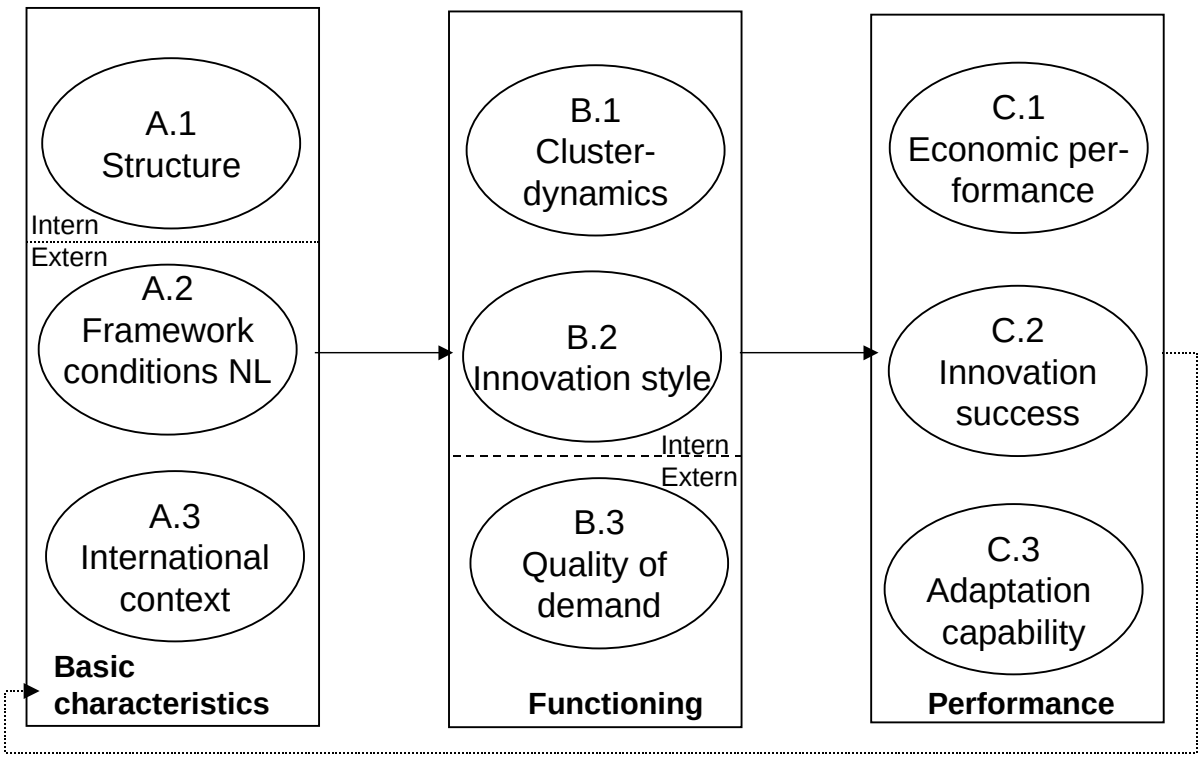
[2] This resulted in three clustermonitor studies that can be typified as pilot studies: the multimedia cluster (see den Hertog et al., 2000), (parts of) the construction cluster (Verwey et al., 2000), and the Cluster around Electro Magnetic Power Technology (Boekholt et al., 2000). The application of the experimental cluster monitor has since been assessed (Berenschot / Dialogic / TechnopolisB, 2000) and on the basis of this assessment the ClusterMonitor was adapted and defined definitively (see Berenschot / Dialogic / TechnopolisA, 2000). The latter was for the purpose of codifying the method and thus making it transferable.

contained in the relation model presented above. We were, however, forced to limit ourselves to businesses with more than 10 employees. This unique linked ClusterMonitor database can be used in three different ways.

1. To construct a total of 26 tables on the basis of the ClusterMonitor file providing insight into the basic characteristics, the functioning and the performance of the relevant cluster, as well as the observed subclusters.
2. To determine the relationships between the nine dimensions set out in the relation model and the underlying indicators, and especially to consider which relationships are significant, single correlations were determined at the micro level and per subcluster. These are reported on separately (Berenschot, Dialogic & Techopolis B, 2000).
3. The ClusterMonitor file can also be used in a more experimental way to estimate a cluster model and subject it to further analysis by multivariate statistics. A determination can also be made as to the extent to which the cluster performance is connected with the actual functioning of the cluster – and the associated innovation success – or arises from the specific characteristics (structure, limiting conditions, international environment). This work has not been completed as yet.

The tables referred to under point 1 have been published separately in English (Brouwer & den Hertog, 2000). The main objection is that the data – in addition to the fact that they can be out-of-date for a cluster like multimedia – hardly covers the multimedia activity found at the core of the cluster outlined below. This is not only because it frequently concerns young, fast-growing businesses, but also because the statisticians do not have the correct classification to incorporate the businesses referred to in the regular statistics. The tables are more likely to give an insight into the activities in the broader Information and Communications cluster, of which the multimedia cluster is a sub-set. Following in the footsteps of the CBS, a differentiation is drawn between four sub-clusters, namely: ICT hardware, telecommunications services, IT services, and content.

Figure 1: Relation model



In order to work structurally and gain an understanding of the competitive strength and innovativeness of the Dutch multimedia cluster – and, where possible, to formulate options for improvement – the ten steps set out in the table below were followed systematically. The quantitative analysis, focused on the quantitative determination of indicators and determinants of competitive strength for the identified cluster (see box 2), was carried out in association with the CBS. In addition to desk research, the qualitative analysis consisted of a series of 25 interviews with businesses and organisations active in the relevant cluster, plus discussions on the subject with members of the sounding board group. Where possible, a connection was also made with the nine observed dimensions in the qualitative study too.

STEP	ACTIVITY
1. Selection	Establish the cluster to be investigated, key concept, points of departure and associated questions
2. Orientation	The initial characterisation of the cluster and its approximate demarcation
3. Demarcation	The 'supported' demarcation of the cluster to be investigated
4. Specification	Adapt the basic ClusterMonitor model to meet the needs of the relevant cluster
5. Desk data	Determine the quantitative indicators and determinants
6. Qualitative information	Collect cluster-specific qualitative information (interviews)
7. Analysis	Establish the performance profile and statements on the basis of steps 5 and 6
8. Improvement actions	Convert the analysis into potential actions
9. Reports	Report on the outcomes and plans for improvement
10. Completion / evaluation	The ClusterMonitor's completion and its evaluation

The multimedia cluster is defined as 'those businesses and organisations that actively shape online[3] information services, communication services, and transaction services for intermediaries and end users, whereby several media are combined and interactivity is one of the main features'. The businesses and organisations selected were mainly those that:

[3] The difference between online and offline multimedia is diminishing in significance. Producing a multimedia presentation is a skill that has nothing to do with the medium used. On the understanding that consideration is given to the aspect of downgrading beforehand, it is often a case of multimedia presentations being downgraded to a variety of different formats. Businesses that produce online multimedia are often engaged in the production of offline multimedia as well. When producing multimedia applications, it is important that the designers anticipate the fact that the information can crop up in many different environments for the user (a variety of different sorts of carriers, user interfaces, usage environments). For the designers, this results in an 'accumulation' of different requirements.

- realise a substantial part of their turnover (>50%) from multimedia products and/or services, or
- play, or will play in the near future, a major role in the cluster on the basis of their strategic positioning, or
- are recognised and accepted by market parties as belonging to the cluster.

BOX 3: SOME DEFINITIONS OF MULTIMEDIA & MULTIMEDIA CLUSTERS

Multimedia is usually defined in technical terms. In this sense it signifies a combination of a variety of media available in a digitized format that can be accessed interactively. We consider multimedia to be a networking technology. Our definition is geared towards the end product of a potential multimedia chain or value network in which a variety of actors can be present. These actors include, among others, network operators (for online multimedia), hardware producers (servers, computers, etc.), the media industry, service providers, software producers and the entertainment industry (Pavlik, 1999. P. 81).

..the merging of traditional audio, visual and print media through digitization in an interactive format. Our study of multimedia firms includes established corporations that have moved into the field of multimedia such as graphic design companies, computer software developers, and book publishers. It also comprises newly developed 'multimedia-only' firms, whose core business offering is the development and production of multimedia products based on CD-ROM, Internet/Intranet, Kiosks and so on. (Brail & Gertler, 1999, p. 98)

The provisional analysis and identification of bottlenecks and points in need of improvement were discussed at a workshop held on 7 March 2000 with some 35 participants engaged in this field. The outcomes were incorporated in the final report (den Hertog et al., 2000); the report on which this paper is largely based.

3. BASIC CHARACTERISTICS OF THE MULTIMEDIA CLUSTER

As yet, there is no established multimedia cluster in the Netherlands. It is more a case of a dynamic, rapidly growing cluster in its puberty (an *adolescent cluster*). With regard to multimedia a distinction is made between four types of activity, namely:

1. *Multimedia enabling* activities: the production of ICT hardware and software, consumer electronics, design and business consulting;
2. *Content distribution*: distribution via a variety of electronic infrastructures;
3. *Content provision*: broadcasting, entertainment, publishers and associated business activities such as AV productions and printing;
4. *E-marketing*: advertising, direct marketing, media acquisition and marketing communication.

These are the pie slices shown in Figure 2.

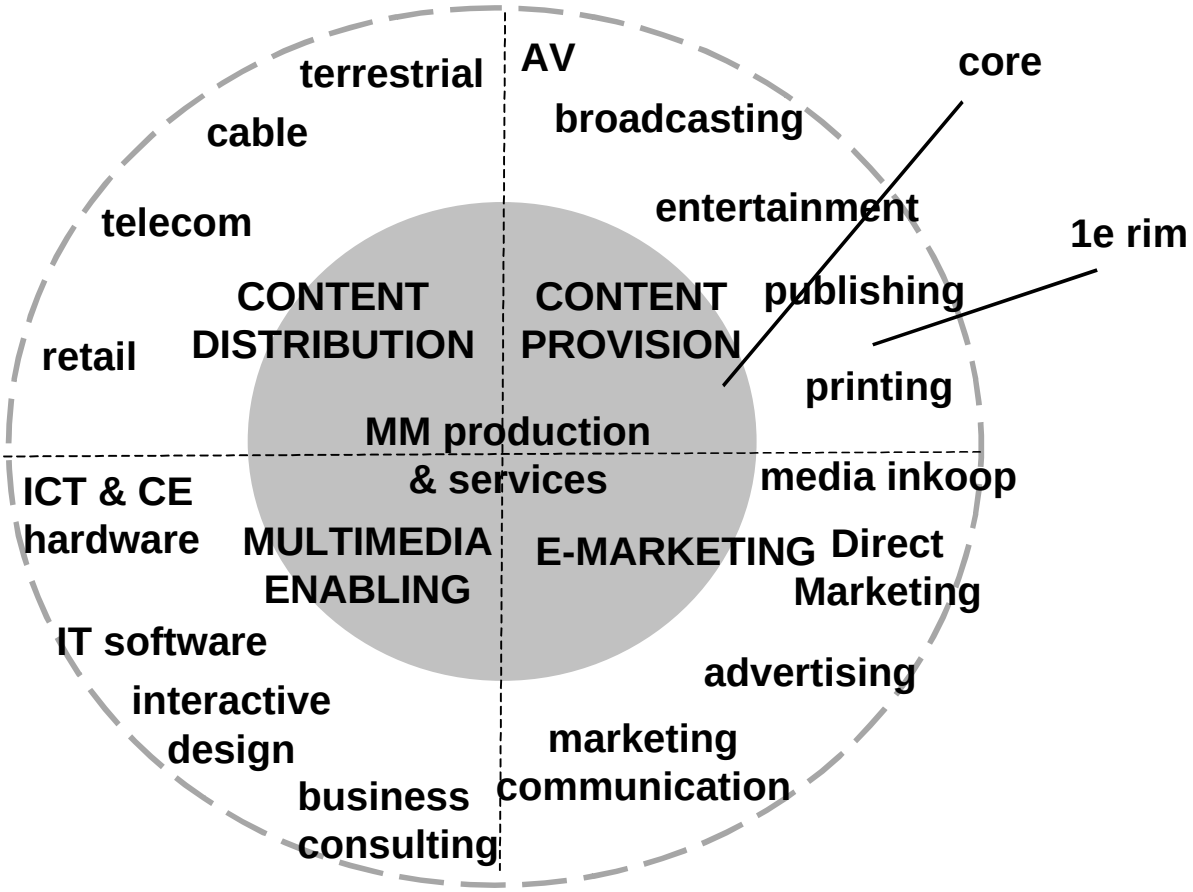
The core of the cluster consists of an estimated 500 to 1,000 businesses (freelancers and sole traders excluded), which are to a large extent dependent on giving advice on, contriving, designing, building and maintaining multimedia applications. These are the pure multimedia businesses such as Lost

Boys, Bitmagic, Razorfish, Jamby, NOB Interactive, Virtual Affairs, Netlinq, Nedstat, Agency.com, Inforay, Motion Container, SQR, ACSi, ICATT, etc. Their role consists of manipulating content, refining it and making it suitable for *platform-independent distribution*. Especially the innovative players active in this core are able to link up the world of *multimedia enabling* with the worlds of electronic distribution, *content provision* and *E-marketing*. This is the shaded area in Figure 2. These are often small to medium-sized businesses which in by no means all cases have all the knowledge in house needed to realise full multimedia applications. In addition to a few product developers that (wish to) market new products, and have the world market as their frame of reference, these are for the greater part service providers who on the basis of available technology realise multimedia applications usually for business customers. Among the service providers we now see several – sizeable – businesses presenting themselves as *full service providers*, aiming at concluding long-term contracts with major clients. This core is augmented by parties that aggregate content, package it and are able to make it suitable for a wide public (end consumers) by, among other things, creating communities (i.e. World Online, Planet Internet, @Home, Chello, Veronica Digitaal, Ilse, BOL, Macropolis). These businesses must also be counted among the businesses that operate at the core of the cluster.

A group of businesses operating in a ring immediately surrounding these core businesses focuses more or less on multimedia and thus contribute towards the production and application thereof. The main difference from the core businesses is that they have a clearly established position in one or several of the supplying disciplines and sectors, and yet have mastered (virtually) all disciplines, and the ability to link them together, to a lesser extent than the core businesses. They do not yet always recognise the omnipresence of the new multimedia products and services and move towards the core at varying speeds. It is significant that the established ‘ring players’ have a valuable asset at their disposal (unique content, extensive distribution network, thorough knowledge of an area of application) and often already act as both the supplier and the customer for the core businesses. Nevertheless, by no means all the businesses in this ring have already developed into full providers of or eminent clients for multimedia products and services. They are often the large to extremely large parties who are themselves considering entering online media services, but who stipulate the aspect of ‘mass’ as a requirement. For instance: they can allow their online applications to develop into massive services by using their client base, their distribution potential, their public profile or their capital. The players at the core of the cluster are often dependent on these ‘consolidators’ for their economic survival.

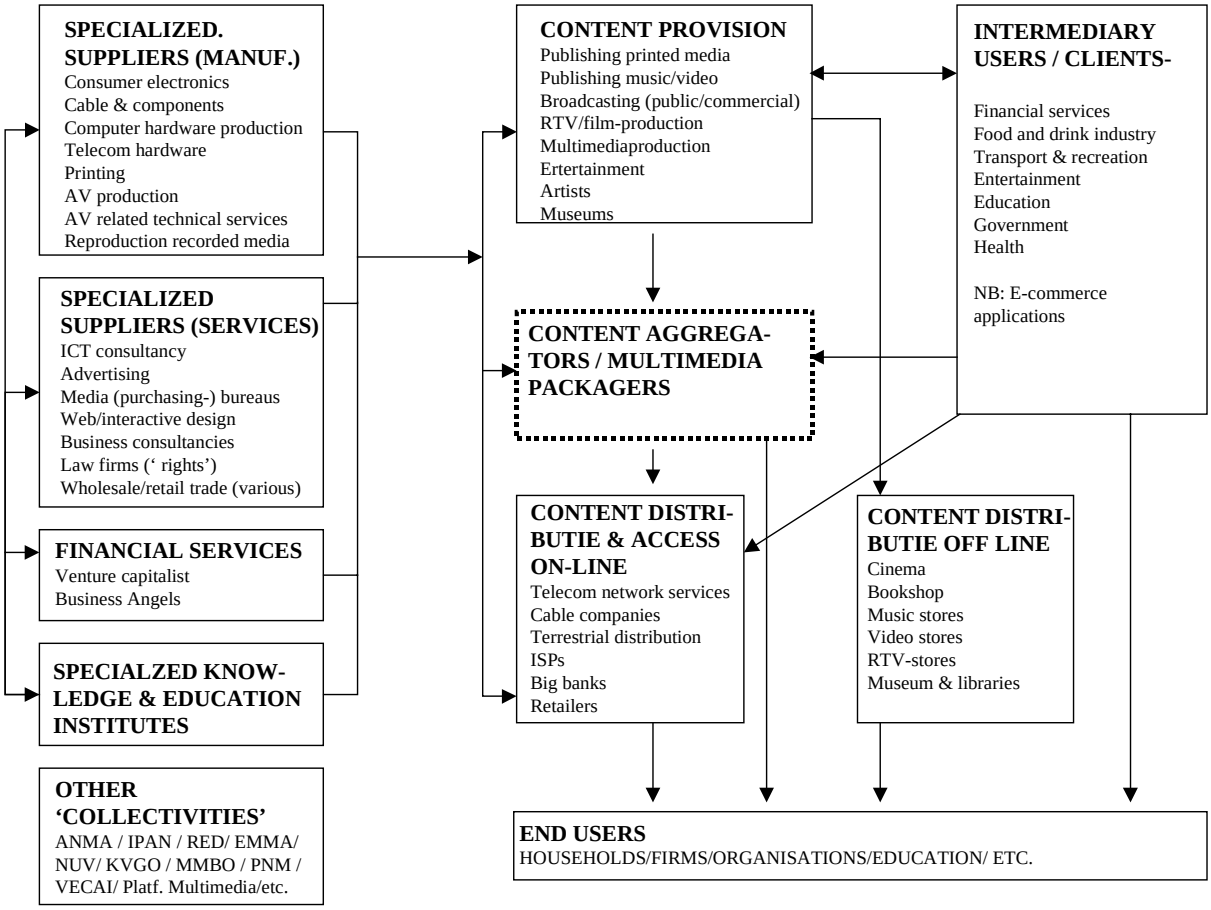
Figure 3 again sets out the most important players in the multimedia cluster more in the shape of a value chain or value network. The figure shows that very different businesses are contributing towards the creation of multimedia products and services.

Figure 2: Four segments of the multimedia cluster



There are still no distinct cluster ‘directors’ or ‘regisseurs’. At the core of multimedia production and services are the first larger companies only just starting to emerge (> 100 employees); these will probably serve as role models but will certainly not direct the cluster as yet. There are several parties in the first ring of (potential) multimedia businesses that could, but do not, act as the director. Philips is mainly internationally oriented. The broadcasting companies (perhaps with the exception of VPRO initially, Veronica, and now probably the EO) and publishers fail to fulfil the sort of guide function which they could play on the basis of their position in the world of content. At the distribution end we see that KPN Telecom is a major player with an involvement in virtually all online media initiatives, and together with aggressive American concerns like UPC, Excite@home, play an important role for example in the provision of broadband network services.

Figure 3: Players in the multimedia cluster



The strong market demand means a high number of newcomers (also from outside the Netherlands). However, the current comfortable market growth means that less innovative and efficient businesses will, at least for the time being, be able to survive.

The aspect of internationalisation is emerging. On the one hand, major foreign players see the Netherlands as a good stepping stone to Europe. Companies like UPC and, even closer to the centre of the cluster, Agency.com (which took over the relatively large Twinspark Interactive People in August 1999) are illustrative of this. It is also apparent that alongside the Dutch informal investors, foreign parties – Scandinavian businesses for instance – have an interest in taking over and participating in those Dutch multimedia businesses that operate at the core of the multimedia cluster. At the hardware end and, the application development for broadband services, Gigaport, and therein Gigaworks[4], have

[4] In the period 1999-2002 the Dutch government will invest Dfl. 142 mln. in GigaPort network and GigaPort applications. Gigaport actually is the upgrading of the present SURFnet 4 research network into one of the world's fastest research networks (a direct link to the US Internet 2 networks is already available). GigaPort applications relates to the development of applications made possible by the Gigaport network, i.e. a huge playing ground for creating new electronic applications and services.

a pulling effect on foreign parties wanting to experiment such as Lucent, IBM, Ericsson, Nokia and Cisco[5]. On the other hand, Dutch companies at the multimedia core are starting to ogle at foreign markets. These are the rare product businesses that [wish to] launch a standard for the world market such as Nedstat (Webstatistics software), Oratrix (multimedia presentation authoring tool) and Tryllian (intelligent agent technology). These businesses have the world market as their frame of reference. Service providers are as yet mainly locally and nationally oriented and make use of internationally available technologies, knowledge and tools. And yet a number of the smaller service providers do indicate that they are thinking about internationalisation, either to be able to serve multinational customers abroad, or to collaborate with like-minded businesses in foreign countries on opening up foreign markets.

Comparative advantages of the Dutch multimedia cluster are said to include: strengths in content provision; reasonably advanced telecom facilities (there is, however, a need for the quick availability of low-cost broadband networks); the availability of capital (meanwhile), and the spirit of enterprise; the suitability of the Netherlands as a testing ground environment and an experimental market, and the high quality of education and research. A more complete list of the comparative advantages and disadvantages is set out in table 1.

Table 1: Comparative advantages and disadvantages of the Netherlands with regard to multimedia activity

COMPARATIVE ADVANTAGES	**COMPARATIVE DISADVANTAGES**
■ Geographical location / international accessibility ■ Reasonable study programmes ■ International orientation / advantage of multilingualism ■ Availability and quality of the telecom infrastructure ■ Availability of sufficient capital ■ Labour is relatively cheap, certainly when compared with the USA ■ Strength of and tradition in consumer electronics, publishing, AV production, graphic design and, to a certain extent, film (documentaries) ■ Specialisation in constituent areas, e.g. educational CD-ROMs ■ Completeness of the cluster and the presence of powerful players (Endemol, NOB,	■ Small domestic market ■ Lack of human resources ■ The need for better coordinated training courses ■ Adaptation of education to the online media is only moderate ■ Interface between the knowledge infrastructure and the commercial world is moderate? ■ Lack of ambition ■ Lack of a tradition of product ideas (Dutch people are traders) ■ Limited knowledge of the top companies of the Internet ■ Obstacles in legislation and regulations (copyright, privacy) ■ Too much regulation (e.g. cable) ■ negative self-image (thinking small)

[5] Some of these foreign companies have had major divisions located in the Netherlands for some time now (also development units) and are consequently already integrated in the Dutch IC cluster.

publishers, KPN, UPC) ■ Adequate room for innovation (ideas) ■ The Dutch market has the characteristics of an experimental market / testing ground ■ High-quality knowledge institutes and is strong in interdisciplinarity ■ Liberalised telecom market ■ Availability of governmental innovation instruments	

The main bottlenecks associated with the basic characteristics of the multimedia cluster are:

1. the lack of transparency and – the associated – low level of organisation in the multimedia cluster. Even the parties that *are* active in the cluster are not always aware of one another's knowledge and skills. The high level of focus on the present, rapidly-growing market means that less attention is spent on jointly improving factorial conditions (supply of qualified labour, exchange with education and research) and limiting conditions (government policy, export focus, 'intelligence'). This is amplified due to the lack of a useful cluster index (activities, products and services), outdated statistics and the resulting limited insight into the cluster's economic significance;
2. the parallel operation of regional multimedia crystallisation cores with different specialisms without sufficient attention being given to consolidating these different cores. Various regions profile themselves as the ICT, or more specifically, *the* multimedia region, for instance: Greater Amsterdam (communications and content), Twente (manufacturing), Hilversum (AV), Eindhoven (the cluster surrounding Philips) and Rotterdam. This gives rise to the danger of optimising cluster conditions at too low a scale level;
3. the widely experienced lack of suitably qualified manpower, for the time being this is concentrated in the multimedia enabling side (a part of the more general lack of ICT specialists), and the fact that many training courses appear to be inadequately attuned to the requirements of business practice.

4. MULTIMEDIA CLUSTER FUNCTIONING

The functioning of the multimedia cluster is partly determined by the characteristics of the cluster and *vice versa*. Hence dynamism in the multimedia cluster is to a large extent linked to the ease with which the core players and ring players – the (in practice) difficult-to-achieve collaboration between relatively small, young and relatively large, established businesses – are able to find one another. The players in the multimedia cluster also have to deal with the framework conditions discussed above, yet these too are subject to change: training courses are slowly starting to change their curricula; venture

capital was once a limiting factor, but this changed a long time ago; broadband is not yet available everywhere but the emergence of different networks encourages innovation in the cluster. It also goes without saying that internationalisation – both incoming and outgoing – takes care of new impulses. Aggressive foreign parties do not automatically conform to the existing structures on the Dutch market and are conspicuous, for example, through their quick actions. National players must at least become familiar with new technologies and developments on foreign markets for them to remain competitive. Below we deal in brief with the dynamism in the cluster, the style of innovation (including the relationship between businesses and the knowledge infrastructure) and the quality of the demand.

4.1 Cluster dynamism

An important part of the actual dynamism in the multimedia cluster is the result of the market parties' ability to combine the four basic ingredients of multimedia (*multimedia enabling, content provision, content distribution* and *E-marketing*). The question that then arises is to what extent are the parties successful in combining these different sorts of knowledge and in realising the required strategic alliances and joint ventures. For the time being it would appear that most of the dynamism stems from the *multimedia enabling* and *content distribution* segments (technology-driven and supply-driven innovations), but that especially the knowledge of the players in the *content provision* and *E-marketing* segments is required to create successful products and services for specific target groups. Dynamism in the multimedia cluster is also expressed in a different way, i.e. in the exuberant forming of alliances (1); working together on projects, which is very common among the smaller providers in particular (2); and kinds of regional network forming (3).

1. The strong increase in the number of strategic alliances and special formations in the cluster is typical of the cluster's current dynamism. The *stand-alone* scenario of businesses that want to do everything themselves is becoming uncommon. Temporary joint ventures on the basis of complementary competences are typical. Not only the well-known major players are involved, or are seeking involvement (broadcasting companies, publishers, ICT businesses, KPN), but also numerous other new businesses which are essential for the creative component of the cluster. It is clear that large and small have a need for one another. A good idea is no longer enough. Economies of scale and being able to push out a service or an infrastructure means that only the very wealthy players in the cluster (*venture-backed firms*) can play this game. That parties form alliances is by no means unique in the multimedia cluster, yet given the enormous investments and the associated risks, a stand-alone scenario in the cluster is hardly imaginable (e.g. the joint venture between World Online and Shell, UPC's take-over of SBS).
2. Joint ventures at project level is very common. The actual production of a multimedia application generally calls for a wide range of specialist knowledge and although the larger businesses in particular give themselves the proverbial pat on the back on the fact that they are full service

businesses, reciprocal supplies and contracting work out to one another is accepted. This is even more the rule than the exception for many smaller businesses and the relatively large group of freelancers. However, also the larger businesses rent components, for instance for shooting AV material, bringing in the Netstatistics component, the farming out of *webhosting*, etc. Considerations of capacity cause also the larger businesses to maintain contact with smaller businesses and freelancers so that they are able to fulfil their obligations should their manpower become inadequate. Smaller businesses in particular have informal networks of businesses and freelancers they can engage should they conclude a major contract and *vice versa*. The smaller businesses make joint quotes and are alternatively the contractor and subcontractor.

3. In addition to project-linked networks, parts of the multimedia cluster are also characterised by social and regional networks. People know one another from training courses, have worked together in the past, chat together at meetings, come across one another in the various platform organisations, etc. This is apparent in Hilversum, Amsterdam and Eindhoven. In Amsterdam, for example, Amsterdam New Media Association (similar to the New York New Media Association)[6] and Internet Society Netherlands (ISOC) contribute to regional network forming by organising meetings and events. In a similar fashion, local organisations are also active in other regions such as Digital Region Eindhoven (RED) and Eindhoven MultiMedia Association (EMMA), the Stichting Teleport in Twente, the Platform Multi Media Hilversum, etc.[7] The emergence of the Twinning Centres[8] – whether or not associated with science park type initiatives – also contribute towards the birth of local concentrations and networks of multimedia activity.

The complement of collaboration is competition. Multimedia product businesses compete on the world market in terms of quality, speed and participation in standardisation processes. Knowledge and innovation is essential for these businesses and they generally have a somewhat formalised innovation process at their disposition (a separate software development unit). Multimedia service providers compete in terms of price, quality (actual interactivity, ease of use, integration with existing information systems) and a complete package of services (the full service concept). For these businesses, it is more the case that they work on the basis of internationally available tools and knowledge. Even the fact of making sure that you are well-informed, and keeping it so, calls for a considerable effort to be made. It is also remarkable to see that a number of service providers indicate

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6 The ANMA organised 32 meetings for its members in 1999. The total number of member businesses is now 350. In addition to the relevant component, it is mainly the networking and informal knowledge transfer taking place at these meetings that is important for the cluster effect.

7 In their (highly recommended) comparison of the three clusters Silicon Valley, Silicon Alley and Route 128, Hulsink et al., (2000) make reference, among other things, to the importance attached to networks and platforms (communities) for the collective creation of knowledge and protection of interests, the exchange of information and the establishment of new contacts. How these contacts are moulded exactly differs from one regional cluster to another.

8 Incubator centres for ICT start ups sponsored through the Ministry of Economic Affairs. ICT Twinning Centres are located in Amsterdam, Twente and Eindhoven.

that the main competitors are those businesses that commission work to them, for instance because they also implement web-based systems themselves.

4.2 Style of innovation

If we look at the style of innovation, then we see that in many multimedia businesses innovation is strongly linked to projects and that different sources of information are used alongside one another. One important source of information is obviously the Web. Especially the technical specialists make frequent use of this medium to keep themselves informed about new tools, to discuss with colleagues, etc. Information which is important for innovation also reaches these businesses through (alternating) project partners, through customers, through their own personnel, study tours, suppliers and competitors (what applications are they working on?). In turn, some entrepreneurs stress that in respect of technology the aspect of timing is extremely important. Lagging behind, as well as being too far ahead is risky: the important thing is to make use of just-proven technology. Customers are not always ready for certain technologies or solutions. Some service providers consequently fail to see an innovation problem, but rather an application problem at their customers.

Nevertheless, it is perceptible that very little formal R&D is carried out by the multimedia service providers. Yet we can ascertain a growing need for knowledge management, especially among growing businesses (> 20 employees). The larger businesses develop some form of knowledge management, and in some cases work with competence centres.

Many respondents in the (technology-oriented) knowledge infrastructure particularly stress the importance of a thorough knowledge of at least the technological basis or the most crucial field of technology or knowledge (e.g. a knowledge of server technology, content management systems, a standard) for the current, and particularly the future competitive strength of the businesses in the multimedia cluster. A large number of parties are able to enter the market at the present time on the basis of high expectations and the immaturity of the market. It must be stated that the parties that will be capable of maintaining themselves in the longer term (also internationally) will be those parties that have a thorough knowledge of the ‘underlying technology’ and are able to exploit that knowledge in the commercial sense. In this context we first think of the ‘real product businesses’, which generally have a more formal innovation process (often a software development unit), sometimes run independently, and are engaged in product development.

There are various differing opinions as to whether there really is a gap between the knowledge infrastructure and the business community. On the one hand it would seem that particularly the multimedia service providers operating at the core of the sector do not have the means, or the know-how, or the willingness to spend time on closing that gap. Not in the last place because of the

completely different planning horizon. The, often extremely, market-driven businesses have their hands full in the actual running of their businesses, ensuring of growth, and in carrying out assignments. Businesses themselves say that they are hardly aware of what knowledge can be obtained from the knowledge institutions, and do not always believe that these institutions have the sort of knowledge that is relevant in their particular case, and take very little time to find out. The pressure of projects is often heavy, and the planning horizon is frequently limited to a period of three months due to the quickly changing technology and markets. They are worlds apart. This is only partly true for the typical product businesses, sometimes because they have stemmed from a knowledge institute or because they have a deeper need for technological knowledge in order to succeed on the world market. On the other hand, a number of institutes do have good contact with trade and industry, and not in the last place thanks to spin-offs, practical training agencies, working with lecturers who are also engaged in the practical side of business, and the growth of business centres in the vicinity of the knowledge institutes. The established, larger (ring) businesses do find their way to the knowledge institutes.

Just the same, laying more stress on a knowledge of the changes that take place in the Internet economy and the Internet community, changing business models, changing life styles, distribution patterns, and a knowledge of electronic markets as well as the didactic and educational side of multimedia applications, might possibly narrow the gap mentioned above between the knowledge institutes and the multimedia service providers. This non-technological multimedia knowledge is currently difficult to track down in the knowledge infrastructure.

4.3 The quality of the demand

Opinions differ with regard to the quality of demand, an aspect that can contribute towards realising innovative-oriented collaboration, particularly concerning the quality of the demand among business users[9]. The producers of multimedia products say that they do not attach all that much importance to the quality of the Dutch market. Their frame of reference is first and foremost the world market, not in the last place because the limited size of the Dutch market offers insufficient support for the development of products primarily intended for sale on the Dutch market.

Various opinions are expressed among the service businesses operating at the core. There are several providers who complain about the fact that the demand for multimedia services is badly specified (clearly indicative of a *me too* market) and that customers often need educating. Customers are said to have difficulty in articulating their demand and often fail to fully realise that the introduction of multimedia services also has consequences for the organisation of internal business processes. This

[9] When compared with the business market the quality of the consumer market is said to be relatively higher. The market for devices (PC, modems, DVDs, etc.) and packaged software is generally a world market in which several Dutch

applies particularly with regard to the online multimedia products. A net presence is something different from the building up of a website to make transactions possible. Businesses that wish to add a distribution channel to their existing channels are not fully aware that such a channel must be maintained on a continuous basis, and that the background information systems also need to be brought into line with it. All the same, correctly advising those same customers as to the possibilities of multimedia and online business is a significantly lucrative source of income, also for those businesses that claim to prefer developing and building.

However, there are more differentiating stories to be heard. The quality of the demand is on average not thought to be exceptional, and yet a differentiation is made between those customers 'that have and those that have not understood'. Several customers have even invested in order to gain knowledge about interactive media (these are in fact the most important rivals of the multimedia providers!) and are now able to formulate the demand better. It is quite remarkable that some publishers and businesses in the financial services industry[10], for instance, and also players like Heineken or KLM, for example, are considered relatively advanced. It is also remarkable to see that because the demand for the provision of multimedia services exceeds the demand in several segments, some providers make a deliberate choice in terms of the parties for whom they wish to work. A choice is made for repeat business among customers they want to work for (because it is pleasant work, because we hit it off together) and who make product innovation possible, and the addition of several new accounts on an annual basis. Nevertheless, we came across examples of larger businesses in particular that were clearly engaged in a process of upgrading and chose to clean up their current customer portfolio, to discontinue their marginal customers, and to focus on a selection of their weightier, central customers with whom long-term full service contracts are concluded.

For that matter, many multimedia businesses do not always work direct for their clients in the long run. Especially smaller businesses make a contribution on the basis of their specialism to a much larger project delivered to the client by the general contractor. It is also remarkable to see that the large, established IT service providers and business consultants must be counted among the clients of multimedia businesses. They are not always capable of, or have insufficient capacity to elaborate or actually build the web-based systems or interactive concepts for E-commerce applications, for instance.

In comparison with abroad, it is often said that while in Europe it is especially the Scandinavian nations that are in the limelight, the quality of the multimedia applications realised in the Netherlands

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parties play their role (Philips for instance). Consumers are prepared to experiment and the number of online consumers is rapidly increasing.

is high. On a world scale, there are many excellent examples of innovative products and services, especially in the United States. The business market there is not only much larger, it is also far more advanced in the sense that especially the online services have a stronger transaction character and the Internet business models are far more mature than here in the Netherlands.

Precisely in the first few months of 2000, several Dutch multinationals (e.g. Reed Elsevier, VNU, De Telegraaf, ABN Amro, DSM, Unilever) presented their Internet strategies, E-commerce strategies or interactive strategies. The question is to what extent the Dutch multimedia businesses will be able to accommodate the released budgets for interactive and multimedia strategies of the internationals (for instance the major banks, publishers, the retail trade). Can the businesses in the Dutch multimedia cluster strengthen the strong players in the Dutch economy even further by guiding them into the age of interactive media and E-commerce? While the actual scale of the Dutch multimedia service providers is probably inadequate to achieve this, it still offers a major opportunity. To this end it is at least essential that the multimedia businesses support these clients when they are innovating on the basis of multimedia.

In summary we see as the main bottlenecks associated with the functioning of the multimedia cluster the following:

1. the fact that by no means all multimedia businesses devote systematic attention to organising the intelligence function (systematically keeping up to date on new technologies and market opportunities) and the consequent upgrading of products and services;
2. the partial development of the interface between knowledge infrastructure and multimedia activity and, if present, the focus on the transfer of technological knowledge in the field of multimedia. One particular problem would appear to be the low level of interaction between multimedia service providers operating at the core of the cluster and the knowledge institutes;
3. the under-utilisation of the demand for multimedia products and services as pursued by the internationals on the domestic market. Supporting this category of clients with their multimedia strategies could make a significant contributions towards reinforcing the competitive strength of the Dutch multimedia cluster.

[10] It is, for example, also significant that various businesses in the financial services industry have close ties with the Telematica Instituut.

5. MULTIMEDIA CLUSTER PERFORMANCE

The performance of the multimedia cluster is co-determined by its character and the way it functions. For instance, the adaptation capability of the multimedia cluster reflects, among other things, the ability to achieve the following in good time:

- to establish a connection between the different sorts of knowledge and the associated activity;
- to select the appropriate partners to work with;
- to invest in the crucial fields of knowledge and the interface with knowledge producers;
- to be able to anticipate the demands of potentially major clients.

In a similar way, in turn innovation success implies the ability to timely and successfully convert investments in upgrading knowledge into innovative products and services, and also the successful accomplishment of a full service or niche strategy, or the introduction of a new business model. In short: 'performance' goes hand in hand with the characteristics and the 'functioning' of the cluster and *vice versa*, the 'performance' ('in a subsequent round') is the point of departure for the character and the actual 'functioning' of the cluster.

The business economic performance of players in the multimedia cluster is at the moment difficult to judge on the basis of only partial (and at least as important: outdated) statistical data. High growth figures (employment, turnover), for the time being large profit margins and a large number of newcomers point in the right direction. Additionally, among the multimedia service providers – also the full service providers – the consultancy element, particularly in the preliminary phase of creating multimedia applications, is still a major source of income. Sometimes more than the businesses want; after all it is their wish to create applications. The providers of products – of which there are only few – are characterised more by the boom or burst scenario. A certain amount of time is invested in masterminding and developing a new product, and the result is little or no turnover during this 'construction phase'. These businesses are uncertain about their future success and acceptance, and appreciation of the product in the market (also the financial market) is more important in the initial stages than turnover. At the same time these are the same businesses that are highly valued in accordance with the laws of the Internet economy in the event of a take-over or flotation. Only a small number of businesses at the core have already indicated that their exports are substantial. Exports, and being active on the international scene, are rare for the majority.

The absolute innovation performance would not seem to be exceptional. It is true that new products and services are inherent in this cluster but it is apparent that they do not always go hand in hand with sufficient attention to the innovative process in services and future-oriented R&D. The latter is

restricted to a few of the larger market players and players in the public (mainly technical) knowledge infrastructure. Nevertheless, in addition to innovation, the adaptation capability (here meaning the 'timely anticipation' rather than the 'passive reaction') is at least equally as important. The adaptation capability in the multimedia cluster means first and foremost speed. The willingness to invest in knowledge innovation in good time, in probing new fields of knowledge and business models, or the ability to work out an idea within the space of a few weeks and market a product (first mover advantages). In the second place, adaptation capability means having a knowledge of client groups, and the building up and obtaining a commitment from communities. The third important aspect of adaptation capability in the multimedia cluster is the fundamental willingness to continue investing in knowledge upgrading and multidisciplinarity in combination with a constant urge to experiment with new products, tools, infrastructures and applications. To this end it will frequently be essential to look beyond the borders of one's own business and branch of industry and to invest in teamwork with parties alien to the branch of industry, with players who have complementary knowledge. And last of all, adaptation capability in the multimedia cluster means the timely professionalisation of business processes (regular management, knowledge management) and the professionalisation of matters that transcend beyond the level of one's own business. The latter implies that in addition to carrying out projects, investments will also need to be made in matters that facilitate the functioning of the multimedia cluster as a whole. For instance: drawing up an agenda for the bottlenecks in the sense of limiting conditions for the government (labour market, training, the problem of rights, innovation incentives, telecom infrastructure specifications), and, for instance, the optimisation of knowledge transfer with the relevant knowledge infrastructure, the joining together of regional multimedia specialisms or the formulation of an export strategy. It will be clear that the adaptation capability of the ring players in the multimedia cluster in particular are currently being put to the test.

The main bottlenecks associated with the performance of the multimedia cluster are:

1. the insufficiency of both professional (regular) management and knowledge management in a number of expanding multimedia businesses at the core of the cluster;
2. the lack of an unambiguous position of the Dutch multimedia cluster for the clients, as well as the lack of an export strategy.

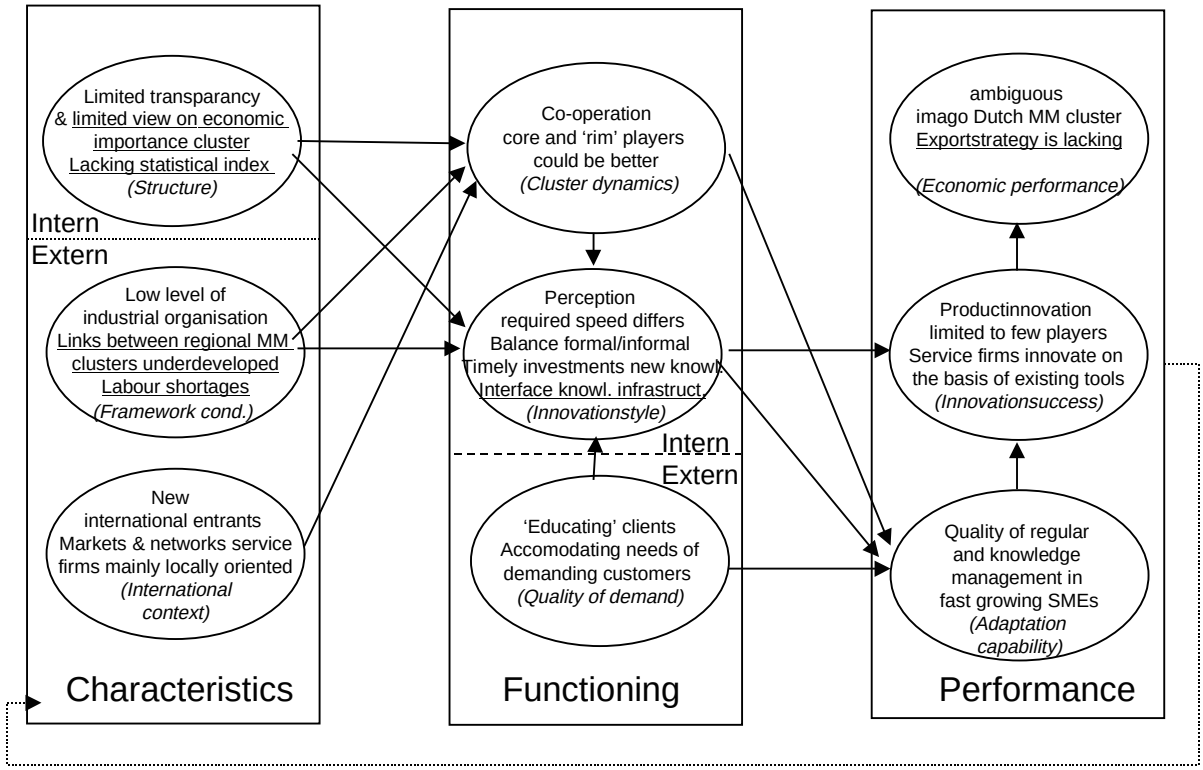
6. BOTTLENECKS AND IMPROVEMENT OPTIONS

In conclusion we see an extremely dynamic and fluid multimedia cluster which is not yet recognised and acknowledged as a cluster by all the players, but which has the potential to expand into an internationally competitive cluster. This is not only important because the Netherlands has a number of very significant trump cards for such a multimedia cluster, but particularly because a strong and

well-developed multimedia cluster is able to support the existing strengths of the Dutch economy (the financial services industry, publishers, agro-food, logistics services) in the application of multimedia and is thereby able to strengthen the position of these businesses in the unfolding digital economy (the enabling character of multimedia). The main bottlenecks that will need to be overcome to allow this Dutch multimedia cluster to grow into a flexible, pro-active, recognisable and competitive cluster which constantly upgrades and adapts itself have been discussed in the above, and their interrelation is summarised again in Figure 4.

In a similar fashion, the main options for improvement are set out in Figure 5. It also gives a prioritisation of the potential role for the government in the actions to be undertaken. These are to be found first and foremost in the sense of support as far as an improvement in the understanding of the structure and economic significance of a multimedia cluster is concerned. This can be achieved, for instance, by investing in the setting up of a statistic index of the cluster and by providing more insight into the economic significance of the cluster.

Figure 4 *The main bottlenecks in the multimedia cluster and their interrelations (the items underlined indicate a possible role for the government)*



The government can also give its support to initiatives which aim to improve incorporation of the multimedia component in present training courses and to promoting that the unmistakable regional

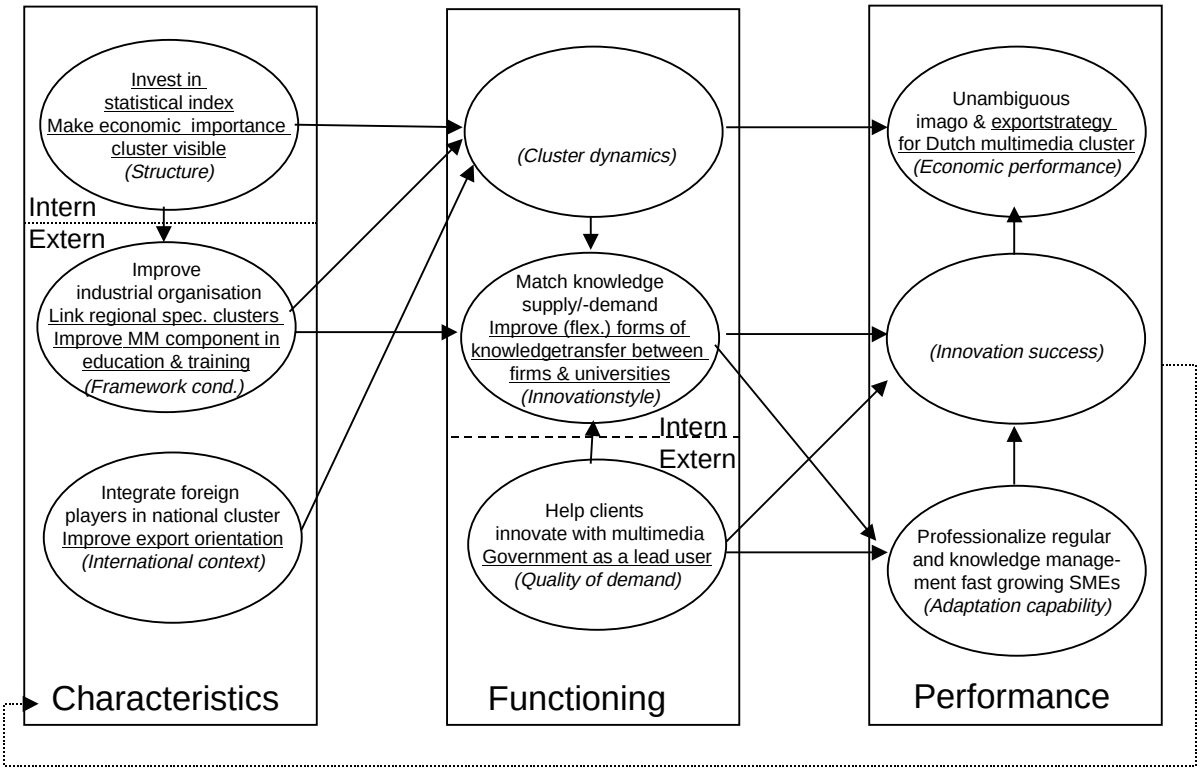
multimedia specialisms reinforce one another and are linked together. Both could give an impetus to the cluster's dynamism and innovation capability.

The second group of options for improvement is connected with promoting the division of knowledge among the various actors in the cluster. In addition to measures focusing on providing a greater insight into both the demand for and supply of knowledge in the field of multimedia (including the non-technological knowledge component), this will need to be realised chiefly by the joint undertaking of (knowledge) projects. This can be done by bringing the existing instruments of innovation policy into line with the speed and the characteristics of the multimedia cluster where necessary. In a number of fields of application the government could specifically act as the lead user and thus spur players in the multimedia cluster on to produce innovative products and services. One obvious field in this respect is that of the electronic government.

The third group of measures by which the government could help to improve the competitive strength of the Dutch multimedia cluster is related to improving the export orientation and supporting the formulation of an export strategy in the field of multimedia.

It is evident that businesses, educational institutes and knowledge institutes will also need to develop initiatives on all these points. Actions are also required to improve the level of organisation in the multimedia cluster, to invest in joint technology and market intelligence, and the professionalisation of regular and knowledge management. The latter applies particularly to those multimedia businesses expanding from small to medium-sized or large companies. They must be able to operate in alternating networks and alliances and be able to stand up to international competitors and demanding clients.

Figure 5: The main options for improvement in the multimedia cluster and their interrelations (the items underlined indicate a possible role for the government)



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