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Original Citation:

Sinozic, Tanja and Tödttling, Franz (2014) Adaptation and change in creative clusters: Findings from Vienna's New Media sector. *SRE - Discussion Papers*, 2014/01. WU Vienna University of Economics and Business, Vienna.

This version is available at: <http://epub.wu.ac.at/4091/>

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SRE-Discussion 2014/01

2014

Adaptation and change in creative clusters: Findings from Vienna's New Media sector

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Abstract

This paper explores cluster change using the case example of New Media in Vienna. It addresses the question of how cluster elements (such as firms and institutions) interact to shape and transform the thematic and spatial boundaries of clusters as they shift along their developmental stages.

Clusters go through different phases underpinned by technical change, renewing and destroying previous cluster specialisations. Creativity is a key feature in modern economies underlying competitiveness in a range of sectors which cluster in urban areas. Sectors such as software and computer services, advertising and market research, printing and reproduction of recorded media, motion pictures, creative arts and entertainment are supported by regional conditions that enable creative processes in local interacting firms, and the translation of ideas into innovative products and services. These perspectives are used to explore the New Media cluster in Vienna based on 25 semi-structured interviews with firms specialising in New Media technology areas.

When analysed using a life cycle perspective of clusters, the findings in this paper suggest that cluster thematic boundaries are shaped by change in technological variety via complex processes such as inter-disciplinary problem-solving in projects, re-activation of latent local and global networks, and firm capabilities to respond to rapidly changing client needs in devices, communication and design.

1. Introduction

Creative industries have been identified as growing sectors of modern knowledge economies and have been the focus of much research in recent years (for example, Power and Scott, 2004; Cooke et al. 2008; Pratt, 2008; KMU Forschung, 2012). Creative industries are described as a group of diverse sectors such as software and computer services, scientific research and development, advertising and market research, printing and reproduction of recorded media, motion pictures, video, television production, architecture and engineering, creative arts and entertainment (Florida, 2002; Lazzeretti et al., 2012).

Creative industries tend to be located in urban areas, where large cities act as “hubs” for individuals and firms specialised in creative services (Cooke et al., 2008; Lazzeretti et al., 2012). Highly qualified labour, diversified knowledge inputs, infrastructure and direct access to clients make cities a fertile ground for creative service firms (Cooke et al., 2008; Lazzeretti et al., 2012). Some recent studies have also shown that supportive conditions can exist in

smaller cities and suburban areas (Lazzeretti et al. 2012, *Regional Studies Special Issue 2/2013*). Trippel et al. (2012) showed that in Austria CIs are mainly concentrated in Vienna and other urban areas, with some patterns of suburbanisation and dispersal.

A less explored research area is how creative industries clusters adapt and transform under changing technological, cultural, and local/global conditions and, in turn, how they initiate and support change. Cluster life cycle theory posits that cluster elements interact with changing local and global factors to expand and contract their thematic and spatial boundaries, and thereby shift the cluster along developmental phases such as emergence, growth, maturity and transformation or decline (Menzel and Fornahl, 2009). Evolutionary theorising suggests that sectors may take different routes such as further specialisation, emergence of new subsectors, or diversification into new areas, shaped by interactions between firm capabilities, industry life cycles, and networks (Ter Wal and Boschma, 2011). Cluster change is constrained and supported by regional path dependencies such as cultural conditions that have shaped similar industries in the past (Simmie, 2012).

In this paper we continue our previous investigations of the Vienna creative industries where we provided a historical account of changes in growth and sectoral composition from 1910 to 2012, and relative changes over time between creative industries in Vienna and Austria overall, based on secondary data (Sinozic et al., 2013). This paper further explores the creative industries in Vienna by focusing more closely on the New Media sector, and investigating it through a perspective of cluster life cycles underpinned by evolutionary processes. Cluster features such as firms, institutions, their thematic boundaries (such as technology, capabilities), spatial boundaries (such as local demand and membership in global value chains), and convergence and divergence processes rooted in technical change, and changes in interactions between organisations, are studied to understand cluster evolution. Using primary data collected in 25 face-to-face interviews, this paper addresses the following research questions:

- How do cluster elements (such as firms and institutions), thematic and spatial boundaries transform over the cluster life cycle?
- What is the role of technological heterogeneity in adaptation and change in cluster stages?
- How and why do the interconnections within the cluster, and between the cluster and other actors, change as the cluster transforms?

The remainder of this paper is structured as follows. Section 2 provides the conceptual framework of the paper, synthesising the main approaches to cluster change and highlighting aspects of creative industries that have been found to be important in previous empirical studies. Section 3 gives a brief overview of the research context and describes the survey method used. Section 4 presents the results and analysis, focusing on changes in cluster firms, institutions, thematic boundaries, spatial factors, and interconnections over time. Section 5 concludes the paper by summarising the main findings and their relevance for cluster change theory.

2. Conceptual framework: cluster evolution and features of creative industries

A number of perspectives have been put forward to analyse change processes in clusters, such as the life cycle metaphor (Hassink and Shin, 2005; Bergman, 2008; Menzel and Fornahl, 2009), the evolutionary view (Ter Wal and Boschma, 2011), routines and memory (Maskell and Malmberg, 2007) and local sectoral variety and its degrees of relatedness (Frenken and Boschma., 2007). A further group of studies have highlighted sectoral and technological specificities as important factors for explaining evolution of localised industries (for example, Garnsey and Lawton Smith, 1998; Feldman, 2003; Lazzeretti, 2008). In this section we summarise the central themes of cluster change theory and sectoral approaches, and thereby provide the theoretical scaffolding and rationale of the paper, which is to explore the inter-relationships between cluster change aspects and characteristics processes of the creative industries sub-sector New Media in Vienna.

Menzel and Fornahl (2009:210) state that “clusters display long-term growth if they are able to maintain diversity”. Diversity is found, for example, in firms and technology areas in a cluster. The cluster moves through its various developmental stages (emergence, growth, maturity/sustainment, and decline/renewal) by exploiting the processes of technological convergence and divergence of firm knowledge bases. Cluster elements highlighted as important in this process are firms and institutions, and the momentum they create through their internal mechanisms and interconnections to change cluster thematic and spatial boundaries. For example, a cluster may emerge as a firms’ knowledge base grows and interacts with other local firms expanding the thematic boundary of the cluster (Menzel and Fornahl, 2009). The locational specificities of the cluster influence the differentiation between the life cycle of the industry (which is global) and the life cycle of the cluster. Specialisation is reflected in relative homogeneity of the cluster knowledge base and a clear cluster structure. If a cluster finds itself in a phase of maturity with insufficient internal diversity to create novel technological focal points for local firms, it is vulnerable to decline (Menzel and Fornahl, 2009). Cluster life cycles have different degrees of change (adaptation, transformation, and renewal). Adaptation corresponds to relatively young clusters that through their adaptation processes are still able to shift back to a growth phase from a phase of maturity (Menzel and Fornahl, 2009). Transformation and renewal are more fundamental and radical changes which are required when a cluster is in a state of decline (Menzel and Fornahl, 2009). Change encompasses all processes in cluster dynamics and evolution.

Diversity is also emphasised in an earlier perspective on industrial change in regions with the concept of related variety (Frenken and Boschma, 2007). It is suggested in this view that agglomeration of firms (e.g. Krugman, 1991) on its own is insufficient in creating growth over the long term. Endogenous features of clusters, such as the degree of relatedness of sectors at the local level, influence growth factors such as the propensity of people to find jobs (Frenken et al., 2007). A central role of interactions between endogenous features of clusters is also clearly argued in Ter Wal and Boschma’s (2011) co-evolutionary view. Clusters change because of the dynamics that are created through firm capabilities, industry life cycles, and networks (Ter Wal and Boschma, 2011). Pioneering firms initiate the emergence of clusters, but their sustainment of force is dependent upon regional assets such as qualified labour and infrastructures, their position in and structure of networks, and the stage of industry life cycle (Ter Wal and Boschma, 2011). Cluster stages are relatively difficult to predict because of the uncertain nature of innovation (Ter Wal and Boschma, 2011).

Maskell and Malmberg (2007:604) state that change at the cluster level is constructed by micro level routines, search processes, memory and history. Routines are processes in firms

that are built up over time, and determine what a firm can and cannot do. Boschma and Frenken (2006), building on Nelson and Winter's (1982) seminal contribution of viewing organisations as competing on the basis of routines built up over time, suggest an explanation of local industrial transformation as changing distributions of routines at the spatial level. Boschma and Frenken (2009) suggest a co-evolutionary perspective of routines and institutions, in particular for understanding evolution of product innovations and branching into different product areas which may give rise to related but differentiated clusters.

Cluster evolution is also affected by what occurs outside to the cluster, and during interactions between cluster elements and extra-cluster phenomena. Regional path dependence theory suggests that aspects of a region condition the development of its industries in one direction or another (Storper, 1997; Boschma and Lambooy, 1999; Martin and Sunley, 2006; Simmie, 2012). Regional features of economy, technology (for example, paradigms and regimes) and institutions act as constraints or supports to local firm activities. Simmie (2012) suggests that endogeneity and exogeneity do not exist, but that change is dependent upon how individual agents draw their boundaries and contribute to the creation of new paths. Unpredictability is also underlined in this literature by Martin and Sunley (2006:22) who state that different regional paths are created through chance or through historical accident, and these can also be a trigger for the development of a cluster.

A growing body of work has given meat to the bones of theory by exploring empirically how individual actors (firms, institutions) and their groups (such as sectors) perform their activities and shape change at various levels. Given the empirical focus of this paper we summarise features of work processes in creative industries such as project-based work, networks and creativity.

Creative industries tend to develop and sell products and services organised in projects (DeFillippi and Arthur, 1998; Lorenzen and Frederiksen, 2008). Project-based work has features such as a firm 'renting' its human capital and organising work along temporary structures (ibid.p.125). Characteristics such as uncertain markets and demand make more stable structures expensive and risky (ibid.). Interactions between skills (human capital) and work relationships (social capital) are important for membership in projects, and for a smooth workflow (ibid.).

At the local level, project-based work connects local communities (Grabher, 2001:354). Projects are highly oriented towards client needs, and thus these influence the interactions between creative organisations (such as advertising) (ibid.). An important driver of inter-organisational interactions is technological diversity within projects, such as for example in advertising firms, client needs may not only be advertising by also marketing and communication strategies (ibid.). Because knowledge needs to be constructed through cooperation (such as in projects) it depends upon social relations of the individual (Brown and Duguid, 1991:48). A further feature of communal ways of working is that the processes cross organisational boundaries and include people from outside the organisation (ibid.).

Projects in creative industries tend to be based upon, and over time create, stable networks between individuals and organisations in the region (Sydow and Staber, 2002). Over time, individuals who repeatedly worked together in film production created stability in relationships through routines and practices (ibid.). Moreover, what is learned from previous collaborations can then be used to "formulate common strategies for future projects" (ibid. p. 219). Sydow and Staber (2002) find that important features of project based networks are the institutions that hold them together. Using the example of the film-making sector in two

German regions, they find that for example the relationships that network members (authors, broadcasters, producers, directors, technical services providers, and nontech service providers) cultivated with local politicians was an important institution adhered to in the more successful Cologne/Duesseldorf region in contrast to the less successful Berlin/Babelsberg region. Projects can be temporary, and the interactions over the duration of the project can change as requirements change. As a consequence of organisational transience, networks are not always active. Indeed, latent networks ensure that the requisite skills and agents can be combined when a similar project is needed again (Grabher, 2001:361).

Interactions in projects requiring creativity tend to be ambiguously structured because it is a feature of the creative process that requirements change over time, and it is impossible to predict where the next idea or problem will arise (Hatch, 1999:85). Barrett (1998:609) compares structural ambiguity in creative projects to playing jazz. For example, the struggle to find the next idea forces you to break habits and routines, and to play something new, accept errors as a source of learning, uncover the assumptions and patterns and habits (not hide them) so that new mental structures can be formed for new initiatives (Barrett, 1998:609). Creativity is sometimes defined as out-of-routine, even though it can be dependent upon history and be target oriented (similar to learning as defined by Levitt and March, 1988) (DeFillippi and Arthur, 1998).

Firms that depend on creativity to get their work done need to create contexts in which members can "...continually learn and experiment, think systematically, question their assumptions and mental models, engage in meaningful dialogue, and create visions that energize action" (Barrett, 1995:36). This is more easily done when traditional boundaries are changed or are non-existent at the outset (e.g. in project-based organisations), and also when functional divisions which separate specialists are broken down.

3. Sectoral background and methodology

Vienna's creative industries have a rich history. Resch (2008) did a comprehensive analysis of growth and change in the creative industries in Vienna using Austrian national census statistics from 1910, 1951 and 2001, of which several important features will be briefly reviewed here¹. First, in 1910, the creative industries in Vienna (composed at the time of traditional CIs, such as architecture, audio-visuals, visual arts and the arts market, performance art, print and publishing, music, museums and libraries) employed around 200,500 persons. Between 1910 and 1951 Vienna underwent major change in its position in Europe, causing a decline in sectors such as graphics, fashion and design, and museums and libraries. During the same period, spurred on by new technology and growing demand, the audio-visuals and music sectors grew. Between 1951 and 2001 some sectors went through dramatic growth phases (especially architecture, museums, libraries, advertising, architecture and audio-visuals. Graphics, fashion, design, print, publishing and music all declined during this period, and never really recovered to the full size they enjoyed when Vienna was the centre of the Austro-Hungarian Empire. Most importantly, for the purposes of our study, this was also the period of the emergence of the global ICTs industry, and the start of New Media. Indeed, between 2000 and 2010, the sectors that have converged to form the New Media cluster in Vienna (such as advertising, software and computer services) have grown by approximately by 40%, the most dramatic growth of all CIs during that period. These sectors

¹ For a more detailed review see Sinozic et al. (2013).

have also been the major focus of government subsidies during this period (such as departure, and impulse).

In order to investigate the processes and factors underpinning growth in Vienna's New Media cluster, we adopted mixed qualitative-quantitative methods approach (Menzel and Fornahl, 2009:232). While cluster phases can be usefully identified using quantitative data on changes in firm size and employment, qualitative data is required to uncover the endogenous processes and aspects that construct such change, which may otherwise remain buried. A process study can allow for the exploration of descriptive and causal components and characteristics of phenomena which are difficult to separate and bound (Yin, 2009), such as for example firm activities, interconnections, cluster themes and spatial scales. The research presented in this paper is guided by the theoretical framework, and is therefore inductive rather than deductive (ibid.). To investigate relationships between the rich concepts described in Section 2, we have posed 'how' and 'why' questions because of the wide variety of variables determining cluster evolution (such as firm activities, regional factors, technology types, sectoral specificities) and the many different possible outcomes (for example, adaptation, transformation, and the emergence of specialisations and paths). The research is guided by economic geographers and regional scientists who have studied change in relationships between firms, clusters, technologies, and localisation (for example, Saxenian, 1994).

The unit of analysis is the cluster, defined as interconnected companies and institutions in a similar field which are also geographically concentrated (Porter, 1998), because it is broad enough to incorporate elements, processes and their interactions that are alluded to in the framework. We selected the New Media cluster, a sub-sector of creative industries, in Vienna because it is a dynamic cluster that has attracted research and policy attention (for example, Ratzenboeck et al., 2004; ZEW, 2008). We designed a semi-structured interview guideline based on the concepts and conceptual relationships provided by the framework.

It was difficult to bound the New Media sector because it is rapidly changing and NACE codes are not up to date with the changes in sectoral classifications. To remedy this, we stuck as close to previous studies as possible (in particular Lazzarotti et al., 2008), and selected the following sectoral NACE categories: advertising (7311), film and video production (5911), ICTs (7311; 6209), publishing (1812). Based on these selection criteria, in 2013 the New Media cluster in Vienna had a total of 480 firms, from which we selected a random sample of 25 firms. Interviews were carried out face-to-face with all general managers of the firms, and lasted between one and three hours. The results were generalised to cluster features (not to the population) as provided by the framework, using a mixed methods approach combining qualitative analyses such as ordering and coding, and basic descriptive statistics.

4. Results and Analysis

4.1 Firm activities, interconnections and cluster thematic boundaries

New Media firms in Vienna are a highly heterogeneous group which has evolved from specialisations in advertising, ICTs (software and gaming), design, publishing, communications, consulting, and data management. The convergence of these skills into New Media activities (such as digital advertising, design and creation of application for digital devices, and, in some cases, their subsequent bundling with consulting and strategic services) occurred in the early 1990s (KMU Forschung et al., 2010), about a decade later than the pioneer New Media firms in London (Lash, 2001) and thus at a later stage in the global

industry life cycle. Table 1 below shows that the majority of firms (64%) in our sample were founded after 1996, a dip in foundation occurred in 2001-2005, and an increase thereafter.

Table 1: Year of foundation

Year (5 year interval)	Percent (freq)
1966-1970	4 (1)
1971-1985	0 (0)
1986-1990	12 (3)
1991-1995	12 (3)
1996-2000	40 (10)
2001-2005	12 (3)
2006-2010	20 (5)

N=25

The New Media cluster in Vienna is composed of a high proportion of micro firms. These firms are typically highly creative but less resilient to market and demand volatility which are key features of this sector. In Table 2 below it is shown that the number of firms in the micro and small categories declined, whereas the number of firms in the medium and large categories increased (the firms in the sample grew in the period 2010-2013).

Table 2: Size of firms (2010-2013)

Size category (number of employees)	% of firms (freq) (2010)	% of firms (freq) (2013)	Change in % points
0-9 (micro)	44 (11)	36 (9)	-8
10-19 (small)	28 (7)	20 (5)	-8
20-49 (medium)	20 (5)	32 (8)	12
50+ (large)	8 (2)	12 (3)	4

N=25

Table 3 below presents the self-reported stage of firm development. The main points that stand out from this data are that the highest proportion of firms stated to be in the transformation stage (48%) and in the growth stage (40%). Firms referred to the transformation stage as a change in organisational structure coupled with a change in product orientation. For example, one firm was reorienting its previous new media/advertising activities for the soft drinks industry, to the design and co-production of a novel product environmentally friendly car, in combination with an increase in the consulting component of its new media services. The growth stage was mainly characterised as a stage following transformation, indeed the majority of the firms in the sample reported to have gone through various stages of restructuring followed by growth, and a need to restructure to avoid decline.

Table 3: Stage of firm development (self-reported)

Stage of firm development	Per cent (freq)
Emergence stage	4 (1)
Growth stage	40 (10)
Maturity stage	8 (2)
Adaptation/Transformation stage	48 (12)

N=25

Firm activities associated with firm growth were sales of existing products in IT systems, data management and security, corporate publishing, and digital design services. Adaptation and transformation in firms was closely associated with innovation in products and services to adapt to changing technological requirements mediated by changes in client needs. The table below shows the innovative activities of new media firms in Vienna. Overall, new media firms are quite innovative, 88% innovated in novel products or services, indicating a growing and vibrant sector.

Table 4: Innovation activities of New Media firms in Vienna

Type of innovation	Per cent
Introduction or improvement on products or services	88
Introduction of a new product to market	60
Use of new or improved process, component or material	76
Use of new or improved strategy	64
Use of new or improved organisational structure	56
Introduction of a new or improved marketing concept	40

N=25

The main innovation activities which caused firms to adapt were making existing software and design processes compatible with novel digital devices (such as for example smartphones, tablets, touchscreens and cloud computing). For example a gaming firm in our sample was previously developing games for consoles, and presently developing games for mobile devices. As our interviewee stated: “(...) before you would go to a shop and take a game off the shelf and play it on your PC, you would finish the game and then go and buy a new one. Now people are playing games on their mobile phones, which they are getting for free, and they play it for years. We no longer make money by selling the game, but by selling in-game components”.

Adaptation was also a process occurring as firms were modifying their existing software to different sectors such as changing markets from telephony to the healthcare sector. A further set of firms was renewing its services by changing their client base, based on changes in cultural interests: “A few years ago we were making strictly new media platforms, for new media communities, now we are changing to political interest communities”.

Firm adaptation processes are characterised by meeting the requirements of innovation such as software renewal (when the product has reached the end of its life cycle) or increased project complexity. As our interviewee stated: “When a software product reaches the highest possible functionality before it becomes too complex, then you are left with the question do you re-engineer the same code (for example, keep the core functions but connect them to new platforms) or do you create a completely new software product (which is never the case because each firm is using some of what it has learned from the past)”.

A further set of processes are to do with the adjustment of internal firm structures to technological change. Changes in new media technologies do not only affect whether existing products and services survive on the market, they also affect the ways in which individuals in firms work, and thereby their organizational structure. One of our interviewees stated: “We transformed our firm to fit the changes in work processes. At first we were one large New Media firm, now we are several small highly specialised firms which are stand-alone entities based on client needs. It has become much more complicated to navigate the convergent technologies that are currently on the market, and they are constantly changing, and it is easier

for us to do that with small teams. So far our new structure has proven to be good, but new technological changes may come which may mean we have to restructure again”.

An important feature of cluster evolution is changes in organisational interconnections (Menzel and Fornahl, 2009). The table below shows that 45% of all network partners for New Media firms in Vienna are firms in the same sector, indicating a degree of technological convergence. The main reasons for networking given by our interviewees were know-how on changing (IT) system components, and for individual New Media projects the reasons were the complementary design, content and technical skills required to meet highly specific client needs during the project duration.

Table 5: Type of innovation-relevant network partners for New Media firms

Type of partner	Per cent (freq)
Subcontractor	4 (3)
Client/customer	17 (14)
Firm in same sector	45 (38)
Firm in different sector	2 (2)
University	20 (17)
Government agency	12 (10)

N=25. Total network partners in sample where type was specified: 84

The majority of partners of New Media firms in Vienna are located in Vienna (see Table below). A variety of reasons were found for this (these are further elaborated in Section 4.2). The majority of respondents stated that face-to-face contact was important for project work. A further reason was the firm capabilities in the Vienna cluster, which were sufficient for staying competitive. As one interviewee put it: “Vienna, together with Berlin, is second in Europe for New Media services (London is first).”

A further important finding is that 31% of innovation partners are global, indicating a new media cluster with a global network (national and EU level partners are less important). Global firms were mainly important for technical products (such as systems and programmes).

Table 6: Location of innovation-relevant network partners for New Media firms in Vienna

Location	Per cent (freq)
Vienna region	49 (42)
Austria nationally	12 (10)
EU	15 (13)
Global	31 (27)

N=25. Total network partners in sample where type was specified: 86

An important feature of interconnections between clustered firms is that over time as the cluster evolved their collaboration has become more virtual (digital). As one interviewee put it: “At first when we did not know each other well we met face-to-face, until we got more experience with working together and we could carry out our work virtually, now we do a lot more over cloud computing”. This finding resonates with the well-known view that through experience the tacit component of knowledge is embodied (Polanyi, 1966), reducing the need for face-to-face interaction (Nonaka and Takeuchi, 1995).

A further related feature in the evolution of the New Media cluster in Vienna has been the institutionalisation (formalisation) of interconnections over time and increasing network stability. One of our interviewees described this in the following way: “At the beginning everything was project dependent and we worked with each other informally, and we did not protect ourselves or make contracts. Now over time we are changing this, we are making our collaborations more formal, with contracts, and we work together in a more structured way. For example, we are making lists of all our partners, and in which steps of the process of service development they are important”. In sum, at the early stage of cluster formation when projects experimental cluster knowledge is too heterogeneous to formalise, and networks are not stable, gradually stabilising and becoming more formal as characterised in later stages of cluster development (Ter Wal and Boschma, 2011).

4.2 Shifting importance of spatial levels

Change in spatial boundaries of clusters is considered an important feature of cluster evolution (Menzel and Fornahl, 2009). In this section we explore the adaptation of spatial boundaries of the cluster within its developmental processes by looking at its relationships with regional, national and international aspects.

New Media firms in Vienna are highly locally oriented in terms of skills, demand for their services and the importance given to regional networks. The table below shows that these factors have increased in importance for the firms over time (for example, regional skills have increased in importance from 48% of firms finding local skills very important previously, to 64% presently) indicating that spatial boundaries of this cluster are shifting inwards.

New media firms in Vienna are highly dependent upon the local labour force and place much importance on local graduates for recruitment of IT, design and text staff. The important role of local culture, taste and aesthetic values in new media services were said to be tacit, so that it is difficult or impossible to obtain them from international labour. Moreover, the temporary type of employment which is required for project-based work in new media is more easily achieved under conditions of physical proximity. As one interviewee put it: “I employ more or less the same people for the last ten years, the same designers, texters and programmers, but when there is no project my firm has only one employee (only me). I can only do that because all of these people live in Vienna and they can jump on a project at short notice”.

Table 7: Importance of regional factors for firm development

Regional factors		Importance of regional factors in the last 3 to 5 years (%)	Importance of regional factors in 2013 (%)
Skills	Very important	48	64
	Important	16	20
	Neutral	24	8
	Of little importance	4	0
	Unimportant	8	8
Universities and research institutes	Very important	2	16
	Important	3	12
	Neutral	6	20
	Of little importance	8	32
	Unimportant	5	16
Demand regionally	Very important	28	36
	Important	28	8
	Neutral	20	20
	Of little importance	4	8
	Unimportant	20	28
Other firms in the region	Very important	24	32
	Important	36	32
	Neutral	28	32
	Of little importance	0	0
	Unimportant	12	4
Investors and finance regionally	Very important	4	8
	Important	20	8
	Neutral	8	16
	Of little importance	12	8
	Unimportant	44	48
Regional networks	Very important	32	44
	Important	16	24
	Neutral	24	12
	Of little importance	8	8
	Unimportant	20	12
Regional subsidies	Very important	12	20
	Important	12	20
	Neutral	16	4
	Of little importance	4	8
	Unimportant	48	40
Regional regulation	Very important	4	4
	Important	0	0
	Neutral	8	8
	Of little importance	16	16
	Unimportant	56	56
Regional directives	Very important	0	0
	Important	0	0
	Neutral	12	12
	Of little importance	12	12
	Unimportant	60	60

N.B. N=25 for all factors apart from “universities and research institutes” and “investors and finance regionally” for which N=24 (1 missing value because of “no answer”).

The table below presents the change in importance of national factors for the firms. Of these, several important dimensions stand out. First, the same national factors – skills, demand, and other firms and networks – shaped firm activities as regional factors, indicating that the operative region for New Media firms in Vienna is all of Austria. This is partly explained by the fact that new media firms in Vienna recruit nationally, indeed many firms did not

distinguish between the skills supply at the regional and national level (once an employee is hired at the national level, they tend to relocate to Vienna easily). The increase in importance of networks at the national level (a total of 52% of firms found national networks as very important or important previously, and 60% presently) show a formation of a national network over time.

Table 8: Importance of national factors for firm development

National factors		Importance of regional factors in the last 3 to 5 years (%)	Importance of regional factors in 2013 (%)
Skills	Very important	40	56
	Important	16	24
	Neutral	28	4
	Of little importance	0	0
	Unimportant	16	16
Universities and research institutes	Very important	4	12
	Important	8	12
	Neutral	28	20
	Of little importance	32	32
	Unimportant	24	20
Demand nationally	Very important	40	44
	Important	24	4
	Neutral	16	20
	Of little importance	4	8
	Unimportant	16	24
Other firms in the country	Very important	20	28
	Important	36	32
	Neutral	28	32
	Of little importance	0	0
	Unimportant	16	8
Investors and finance nationally	Very important	4	4
	Important	16	8
	Neutral	12	16
	Of little importance	12	12
	Unimportant	44	48
National networks	Very important	28	36
	Important	24	24
	Neutral	16	16
	Of little importance	8	8
	Unimportant	24	16
National subsidies	Very important	12	12
	Important	12	20
	Neutral	12	4
	Of little importance	8	12
	Unimportant	48	44
National regulation	Very important	8	8
	Important	4	4
	Neutral	12	12
	Of little importance	12	12
	Unimportant	48	48
National directives	Very important	4	8
	Important	4	4
	Neutral	16	12
	Of little importance	8	8
	Unimportant	52	52

N.B. N=25, except for the following factors: “universities and research institutes” (N=22), “other firms globally” (N=24), “international subsidies” (N=23), “international regulation” (N=22), and “international directives” (N=22). All missing values are due to “no answer”.

Table 9 below further confirms the importance of Vienna and Austria as dominant for sales for New Media firms. The low level of entry into global markets is indicative of, on the one hand, local demand, and on the other hand, difficulties with internationalisation and expansion to the global stage that comes with this sector because of cultural specificities surrounding

design services and the need for face-to-face contact (as stated by the interviewees) in creative new media services.

Table 9: Market areas

Geographical level	Average of market areas in percent
Regional (Vienna)	32.96
National (Austria)	40.05
EU	22.93
Global	3.22

N=25

Generally, international level factors are not considered as important for new media firm activities as factors at the regional and national levels. Of the international factors, the most importance was given to skills, international demand, other firms globally, and international firm networks. These three sets of factors are echoed as most important at all three (regional, national and international) levels, confirming that they are most connected to firm competitiveness overall. These findings confirm the capabilities and network perspectives put forward by, amongst others, Ter Wal and Boschma (2011), who argue for the interplay between knowledge, the position of the firm in the regional network, and its industry underlie the evolution of clusters.

International networks which are particularly important are those associated with IT, advertising and design. International networks are considered as an important route for keeping up to date with fast-changing products and services, as are relationships with other global firms. International IT skills are gaining in importance because of the shortage of programmers in Vienna and in Austria nationally. The international competition for IT skills has made recruitment more difficult and driven wage prices up (according to the firms interviewed).

Table 10: Importance of international factors for firm development

International factors		Importance of regional factors in the last 3 to 5 years (%)	Importance of regional factors in 2013 (%)
Skills	Very important	20	32
	Important	20	28
	Neutral	16	16
	Of little importance	8	8
	Unimportant	36	36
Universities and research institutes	Very important	0	4
	Important	8	8
	Neutral	12	12
	Of little importance	20	12
	Unimportant	48	52
Demand internationally	Very important	20	44
	Important	16	12
	Neutral	32	24
	Of little importance	12	4
	Unimportant	20	16
Other firms globally	Very important	20	24
	Important	12	36
	Neutral	28	12
	Of little importance	12	0
	Unimportant	24	24
International investors and finance	Very important	0	4
	Important	4	16
	Neutral	12	8
	Of little importance	8	0
	Unimportant	72	68
International networks	Very important	12	28
	Important	4	24
	Neutral	40	24
	Of little importance	16	4
	Unimportant	28	20
International subsidies	Very important	8	12
	Important	0	8
	Neutral	12	12
	Of little importance	12	0
	Unimportant	60	60
International regulation	Very important	4	8
	Important	0	12
	Neutral	8	12
	Of little importance	20	8
	Unimportant	56	48
International directives	Very important	4	4
	Important	0	12
	Neutral	8	12
	Of little importance	16	8
	Unimportant	60	52

N.B. N=25, except for the following factors: “universities and research institutes” (N=22), “other firms globally” (N=24), “international subsidies” (N=23), “international regulation” (N=22), and “international directives” (N=22). All missing values are due to “no answer”.

In order to explore changes in spatial boundaries of the cluster, we further asked firms about their views on the importance of regional, national and international factors not just for the firm but also for the *cluster*. Of these, several findings stand out. First, from the regional factors, skills were considered the most important local factor for the development of the cluster both during its history, and presently (overall 84% of firms found local skills as very important or important in the previous 3 to 4 years, and 92% found them very important or important presently). This suggests that, as in previous results for the firm level, the importance of skills has increased over time. The reasons for this given by our interviewees are the increasing complexity of the technologies and services, the increase in specialisation (IT skills and design) and the fast paced changes in the new media sector overall which call for flexible and highly skilled individuals who are able to keep up with the changing demands of the marketplace.

Second, further important regional factors are networks (60% found networks to be important or very important in the last 3 to 5 years, and 74% presently), and other firms in the region (56% found other firms in the region to be very important and important for the Vienna new media sector previously, and 68% presently). This confirms similar conclusions for individual firms. New media activities are highly interactive, and firms rely on one another to acquire new projects (a lot of which has to do with maintaining a good reputation in the community) and delivering projects (which are highly inter-disciplinary and for which work practices are interactive and collaborative).

Third, both regional subsidies (56% previously and 56% presently) and universities and research institutes (44% previously, and 44% presently) were considered as very important by the majority of firms. In contrast, these two sets of factors were not important for the firms individually. This may mean that the regional science base and subsidies act as supportive framework conditions for sustaining the sector, and are understood as having a very important but indirect role for New Media in Vienna. Moreover, these factors are also considered to have not changed in importance over time, indicating that their role in pushing the cluster through its various growth phases are not as relevant as other factors for the cluster. Finance was repeatedly stated as more important for the sector than for firms individually, but because of its limited availability (some parts of the gap being filled by government subsidies) their importance for the cluster is perhaps overstated.

Table 11: Importance of regional factors for cluster development

Regional factors		Importance of regional factors in the last 3 to 5 years (%)	Importance of regional factors in 2013 (%)
Skills	Very important	72	80
	Important	12	12
	Neutral	12	4
	Of little importance	0	0
	Unimportant	0	0
Universities and research institutes	Very important	28	36
	Important	16	12
	Neutral	24	16
	Of little importance	8	12
	Unimportant	12	12
Demand regionally	Very important	24	24
	Important	20	36
	Neutral	32	12
	Of little importance	8	12
	Unimportant	12	12
Other firms in the region	Very important	32	40
	Important	24	28
	Neutral	32	28
	Of little importance	4	4
	Unimportant	4	4
Investors and finance regionally	Very important	12	24
	Important	20	12
	Neutral	28	20
	Of little importance	4	8
	Unimportant	28	28
Regional networks	Very important	40	52
	Important	20	24
	Neutral	28	16
	Of little importance	4	0
	Unimportant	4	4
Regional subsidies	Very important	28	44
	Important	28	12
	Neutral	8	8
	Of little importance	0	0
	Unimportant	28	28
Regional regulation	Very important	4	8
	Important	8	12
	Neutral	12	8
	Of little importance	12	12
	Unimportant	48	44
Regional directives	Very important	0	4
	Important	8	12
	Neutral	12	8
	Of little importance	12	12
	Unimportant	52	48

N.B.: N=25, exceptions are: N=24 for “skills”, “demand regionally”, “other firms in the region”, and “regional networks”. N=23 for “investors and finance regionally” and “regional subsidies”. N=22 for “universities and research institutes”. N=21 for “regional regulation” and “regional directives”.

At the national level, skills stand out as the most important factor, confirming the results for individual firms. The second set of factors in order of importance previously and presently are networks (60% found networks to be very important and important previously, and 72%

presently). These are followed closely by demand (60% previously and 60% presently), and other firms at this geographical level (52% previously and 60% presently). In sum, these four sets of factors confirm the results for the individual firm level in the previous section. In contrast, and similar to the regional-level factors for the cluster (previous table) the importance of universities and subsidies at the national level are considered to be much more important for the cluster than for the individual firms surveyed.

Table 12: Importance of national factors for cluster development

National factors		Importance of regional factors in the last 3 to 5 years (%)	Importance of regional factors in 2013 (%)
Skills	Very important	64	76
	Important	12	8
	Neutral	16	4
	Of little importance	0	4
	Unimportant	4	4
Universities and research institutes	Very important	20	36
	Important	16	16
	Neutral	32	12
	Of little importance	8	12
	Unimportant	12	12
Demand nationally	Very important	36	28
	Important	24	32
	Neutral	20	12
	Of little importance	4	8
	Unimportant	12	16
Other firms in the country	Very important	20	32
	Important	32	28
	Neutral	36	32
	Of little importance	0	0
	Unimportant	8	4
Investors and finance nationally	Very important	12	20
	Important	20	20
	Neutral	32	24
	Of little importance	0	0
	Unimportant	28	28
National networks	Very important	20	40
	Important	40	32
	Neutral	24	12
	Of little importance	0	0
	Unimportant	12	12
National subsidies	Very important	32	48
	Important	28	16
	Neutral	16	12
	Of little importance	4	4
	Unimportant	12	12
National regulation	Very important	8	12
	Important	8	12
	Neutral	24	20
	Of little importance	8	8
	Unimportant	36	32
National directives	Very important	4	8
	Important	4	12
	Neutral	24	16
	Of little importance	8	8
	Unimportant	44	40

N.B.: N=25, exceptions are: N=24 for “skills”, “demand nationally”, “other firms in the country”, “national networks”; N=23 for “investors and finance nationally” and “national subsidies”; N=22 for “universities and research institutes”; N=21 for “national regulation” and “national directives”.

The table below summarises the importance attributed to factors at the international level for the new media cluster in Vienna. As in the previous results, skills are the most important factor for the development of New Media in Vienna. Other firms globally are considered to be

very important for the sector as well (40% previously, and 60% presently), and to have increased in importance by 20% over time, indicating more intensive interactions between local and global firms (via products, processes and collaborative projects, according to our interviewees). In particular, global IT firms are important for Viennese new media firms, because of the high global (especially US) IT interdependencies within this sector. International demand and international networks are also considered as very important or as important by over a third of the firms (32%) and presently by over 60% of the firms. The large increase in importance of these two factors over time indicates that global firms are becoming more important, and that the sector is increasing its international presence.

International private investors were considered important by 28% of firms previously, and by 52% presently. This large increase is indicative of, on the one hand, an increase in international finance, and on the other, a lack of finance available domestically. It also shows that over time as the new media sector in Vienna has become more competitive, it has attracted international investors.

Table 13: Importance of international factors for cluster development

International factors		Importance of regional factors in the last 3 to 5 years (%)	Importance of regional factors in 2013 (%)
Skills	Very important	36	60
	Important	16	8
	Neutral	28	16
	Of little importance	4	0
	Unimportant	8	8
Universities and research institutes	Very important	16	28
	Important	16	16
	Neutral	8	8
	Of little importance	16	0
	Unimportant	28	32
Demand internationally	Very important	24	36
	Important	8	28
	Neutral	44	20
	Of little importance	4	0
	Unimportant	12	8
Other firms globally	Very important	24	40
	Important	16	20
	Neutral	40	24
	Of little importance	4	0
	Unimportant	4	4
International investors and finance	Very important	12	24
	Important	16	28
	Neutral	24	12
	Of little importance	8	4
	Unimportant	28	20
International networks	Very important	20	44
	Important	12	16
	Neutral	48	28
	Of little importance	8	0
	Unimportant	4	4
International subsidies	Very important	20	40
	Important	16	12
	Neutral	24	12
	Of little importance	4	4
	Unimportant	24	20
International regulation	Very important	4	20
	Important	4	12
	Neutral	20	12
	Of little importance	20	8
	Unimportant	36	32
International directives	Very important	4	16
	Important	4	4
	Neutral	20	16
	Of little importance	12	8
	Unimportant	44	40

N.B.: N=25, exceptions: N=23 for “skills”, “demand internationally” and “international networks”; N=22 for “other firms globally”, “international investors and finance” and “international subsidies”; N=21 for “universities and research institutes”, “international regulation”, and “international directives”.

Both international regulation, and international directives have grown in importance for the new media sector, quite dramatically. 8% of firms stated that international regulation was important for the sector previously, whereas 32% (an increase of 24%) consider it important

presently. Moreover, 8% considered international directives important in the past, whereas 20% consider them important at present. This was explained by the regulation of data protection, and IPRs for IT products, most associated with US firms and their patenting activities. These patenting of intellectual property in this sector was described by two interviewees as harmful for innovation in the sector, and as quite fierce, especially from the side of US firms.

5. Conclusion

The Vienna New Media cluster is composed of a highly heterogeneous group of firms which have evolved from advertising, software, computer services, gaming, design, publishing, communications, and consulting, and converged upon digital activities such as digital advertising, digital design, creation and application of visual material for digital devices, and subsequent bundling with consulting and marketing services. The diversity of firm competencies and their activities is the first important feature affecting cluster thematic boundaries and change that stood out from our findings (confirming the importance of the micro for the meso level).

A second related factor underlying cluster dynamism was the high proportion of firms (48%) in our sample that reported to be transforming and adapting their internal processes, products and services to changing technological demands. Innovation activities which caused firms to adapt were, for example, making existing software and design processes compatible with novel digital devices (such as smartphones, tablets, touchscreens and cloud computing). Firm adaptation processes were also characterised by meeting the requirements of innovation such as software renewal (when the product has reached the end of its life cycle) or increased project complexity. A further set of processes were to do with the adjustment of internal firm structures to technological change. Changes in new media technologies did not only affect whether existing products and services survive on the market, they also affected the ways in which individuals in firms work, and thereby their organizational structure. Adaptation was also a process occurring as firms were modifying their existing software to different sectors such as changing markets from telephony to the healthcare sector, and thereby expanding the thematic boundaries of the cluster. Technological heterogeneity within the cluster and outside the cluster is not easily separated, but rather they are interconnected via different embodiments of technologies (such as products, services, modes of interaction, skills, and social and cultural changes).

As the cluster evolved over time interconnections between clustered firms become more virtual (digital), and more institutionalised (for example formalised in contracts), contributing to network stability and indicative of a maturing cluster. The cluster was roughly balanced in its interactions with local and global firms (49% of all network partners were located in Vienna, and 31% were located outside the EU). Moreover, 45% of all network partners for New Media firms in Vienna were firms in the same sector, supporting the hypothesis of convergence on technological focal points (Menzel and Fornahl, 2009) for clusters.

In terms of cluster spatial boundaries, the results in this paper suggest that the Vienna New Media cluster is locally oriented in terms of skills, demand for their products and services, and in regional networks. The important role of local culture, taste and aesthetic values in new media services are partially tacit, so that it is difficult or impossible to obtain them from international labour. In addition, the importance of face-to-face contact in the delivery of creative digital services, and that temporary employment which is required for project-based

work in New Media is more easily achieved under conditions of physical proximity, suggests that this is unlikely to change soon, despite the relative maturity of the cluster and its global orientation for other activities such as technical know-how.

Our study also found that the same national factors – skills, demand, and other firms and networks – shaped firm activities as regional factors, indicating that the operative region for New Media firms in Vienna is all of Austria. This is partly explained by the fact that new media firms in Vienna recruit nationally, indeed many firms did not distinguish between the skills supply at the regional and national level (once an employee is hired at the national level, they tend to relocate to Vienna easily). The increase in importance of networks at the national level (a total of 52% of firms found national networks as very important or important previously, and 60% presently) indicate a formation of a national network over time, and expansion of the spatial level of the cluster.

Factors which expanded the cluster space to the international scale were skills, international demand, other global firms, and international firm networks. International networks which are particularly important are those associated with IT, advertising and design. International networks were considered as an important route for keeping up to date with fast-changing products and services, as are relationships with other global firms. International IT skills were gaining in importance because of the shortage of programmers in Vienna and in Austria nationally. The international competition for IT skills made recruitment more difficult and drove wage prices up (according to the firms interviewed). These factors were most important for firm competitiveness overall (regardless of spatial scale), and the increase in their importance over time suggests that they are important drivers in cluster renewal.

Our research also investigated firm perspectives on the cluster and sectoral levels. Local and national skills, especially programming, design, and the combination of the two, figured most prominently in the reasons underpinning cluster growth. The reasons for this given by our interviewees are the increasing complexity of the technologies and services, the increase in specialisation (IT skills and design) and the fast paced changes in the new media sector overall which call for flexible and highly skilled individuals who are able to keep up with the changing demands of the marketplace. The importance placed on local and national networks and other firms in the region and Austria nationally, for cluster growth, confirmed similar conclusions for individual firms, and an alignment of firm and cluster requirements, which is in itself an important growth driver.

Regional subsidies and universities and research institutes were considered as very important for the cluster, in contrast to their low importance for individual firms. This indicates an influential role of the science base and government subsidies as framework conditions for sustaining the sector. For the New Media cluster investigated, these factors did not change in their influence over time, which suggests that their role in driving the cluster through its developmental stages is not as relevant as the other factors.

International skills and interactions with global firms (via products, processes and collaborative projects), international demand, and networks, have increased in importance for the cluster over time, expanding its spatial boundaries. In particular, global IT firms are important for Viennese new media firms, because of the high global (especially US) IT interdependencies within this sector. Over time the importance of international investors increased the cluster, partly influenced by its maturity and individual firm capabilities. A further important feature of cluster maturity was institutional. Over time, international regulation and directives have grown in importance, however not as a support but as a

hindrance, for the cluster, especially in the regulation of data protection, and IPRs in the global IT industry (most associated with US firms). This international dimension of institutions adds a further influence on cluster change over time.

Acknowledgements

This work was supported by the European Science Foundation European “Cluster Life Cycles Project” and by the Austrian Science Fund (FWF) (Grant number I 582-G11), and coordinated by Professor Robert Hassink, University of Kiel. We gratefully acknowledge the support of our project partners from the University of Kiel, Germany, the University of Hamburg, Germany, University of Bremen, Germany, Lund University, Sweden, University of Agder, Norway, Vienna University of Economics and Business, Austria, Charles University in Prague, Czech Republic, Silesian University in Opava, Czech Republic, University of Ostrava, Czech Republic, University of Neuchatel, Switzerland, and the INSEAD Policy Initiative, Abu Dhabi.

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