



Creative Knowledge Environments

**Sven Hemlin, Carl Martin
Allwood and Ben R. Martin**

Göteborg University, Lund
University and SPRU

Presentation to Atlanta Conference on Science and Technology
Policy 2006, 'US-EU Policies for Research and Innovation',
Georgia Institute of Technology, Atlanta, 18-20 May 2006



Introduction

Creativity vital for research & innovation in the 'knowledge society'

Extent to which creative potential fulfilled depends on work environment

Need to analyse interactions between individuals/groups & work environment

Concept of 'creative knowledge environment' (CKE)

Framework to understand envt'l interactions, & hence design env'ts & formulate policies promoting creativity



Definition

CKEs are “those environments, contexts and surroundings, the characteristics of which are such that they exert a positive influence on human beings engaged in creative work aiming to produce new knowledge or innovations, whether they work individually or in teams, within a single organisation or in collaboration with others”



8 Components of CKEs

1. Task characteristics
2. Discipline/field
3. Individuals
4. Group characteristics
5. General work situation for individuals
6. Physical environment
7. Organisation
8. Extra-organisational environment



Three 'Dimensions' of CKEs

1. Different levels

macro – global, national & inter-organisational levels

meso – research institutions, business companies, regions

micro – research groups, work teams, individuals

CKEs a set of *nested layers* of environmental factors

2. Different institutional types

In Triple Helix, 3 types – academe, industry and government

But these quite heterogeneous + other 'Mode 2' hybrids emerging



Three 'Dimensions' of CKEs

3. Stage in task/problem process

e.g. problem-identification, idea-generation, idea-elaboration, evaluation, and 'selling' stages

Appropriate conditions for each of these stages vary across different institutional types of CKEs

3 'Dimensions' of CKEs

Scale level

Stage in task process

Institutional type of CKE



Review of Creativity Literature

Amabile (1999) – 3 sets of **determinants** of creativity

1. Intrinsic motivation more important than extrinsic (e.g. payment)
2. Domain-relevant knowledge generally essential
3. Creativity-relevant skills – individ's need time to practice & learn

Personal characteristics of creative persons – more open to experience & ambiguity (Stoycheva & Lubart, 2001)

Certain personal characteristics fostered by work env't
e.g. tendency to work hard enhanced by appropriate reward structure



Review of Creativity Literature

CKE Vs. view of creativity as property of gifted individ's

‘**Sacred spark**’ theory (e.g. Cole & Cole, 1973) – creativity comes from few outstanding, v motivated, hard-working individ's

Social aspects of creativity important (Csikszentmihalyi 1999; Sternberg & Lubart 1999; Stoycheva & Lubart, 2001; Woodman *et al.*, 1993) – e.g. identification of a product as ‘creative’ involves interaction of individual, domain, and field

Creativity involves **interactions** between individuals, epistemic bodies, situations, contexts, products and evaluators

i.e. dependent on features of environment and on interactions between researchers and CKE



Literature on CKEs

Three main categories

1. Research environment studies
2. Innovation environment studies
3. Work-team environment studies



1. Research environment studies

A successful creative research environment has

- clear coordinated objectives
- primary focus on research
- genuine research culture
- positive group climate
- group members participate actively in leadership of research
- flat decentralised organisational structure;
- internal and external communications
- basic resources for staff – time, funding, equipment, premises etc.
- diversity in size, age, experiences etc. of group
- high motivation and job enjoyment, good career structure and rewards
- well managed staff selection
- good individual competencies
- excellent visionary leadership;
- quality control (although not too intrusive)
- institutional base with established reputation and visibility

Sources: Andrews (1979), Bland and Ruffin (1992), Hollingsworth and Hollingsworth (2000), Martin and Skea, (1992), Pelz and Andrews (1966) and Stankiewicz (1980)



2. Innovation environment studies

Kanter (1996; 1997) – creative organ's emphasise diversity, have multiple links, flexible/permeable boundaries, pride & faith in individuals, and emphasise collaboration & teamwork

Kanter – 4 stages in innovation process; (i) idea-generation (ii) coalition-building (iii) translation of ideas into a product/process (iv) diffusion of the innovation

Different stages may require different envt'al conditions



2. Innovation environment studies

Important concept = **creative tension** both between individuals and between individual & domain

i.e. some discomfort in social relationship or ambiguity towards a knowledge claim – can bring about creative changes (Amabile, 1999; Hemlin *et al.*, 2004; Pelz & Andrews, 1966)



3. Work-team environment studies

Unsworth and Parker (2002) – main contextual factors influencing creativity and innovation =

- task and work design
- social characteristics
- organisational characteristics

Factors differ in importance over time (e.g. idea-generation cf. implementation phase)

Studies on social characteristics of work teams show social interactions important for creativity



Literature on CKEs

Literature shows task & work design as well as social & organisational characteristics can influence creativity

No simple 'recipes' for promoting creativity by suitably engineering the environment

But can draw certain conclusions

- **individuals** are important actors in CKEs, especially in early phases when ideas generated
- a successful CKE embraces certain **management and working styles** (e.g. considerable autonomy)
- work teams should encourage **diversity** among members so an element of creative tension exists and conformity is not over-emphasised
- **different phases** may require different conditions for creativity



Stimulating CKEs

How best to stimulate CKEs to be more creative and innovative?

Structure analysis around 8 components of CKEs

1. Task characteristics

Task characteristics affect what form of CKE will be most effective

Routine tasks may have negative effect – give to specialised staff

Select staff suited to task characteristics – e.g. integrated tasks better handled by groups having a broader knowledge base – ‘heterogeneity thesis’

Generating ideas different from structuring and promoting ideas – may require different stimuli



Stimulating CKEs

2. Discipline/field

Academic CKE – much knowledge production bound to disciplines, but shift to more interdisciplinary ‘Mode 2’ res focused on ‘problem solving’?

Interdisciplinarity often associated with creativity (e.g. Hollingsworth & Hollingsworth, 2000) cf. disciplines may hinder

Organisational structure – if based on disciplines, may constrain creative interdisciplinary research

At macro-level, government policies should not constrain interdisciplinary res

UK Govt encourages researchers to relate to ‘users’ e.g. in industry → interdisciplinary research, but ‘Research Assessment Exercise’ (RAE) biased against such work?



Stimulating CKEs

3. Individuals

In CKE framework, creativity enhanced in envt's where

- individual autonomy
- communication flows easily
- individuals have expert domain knowledge
- contact with neighbouring research areas

Researchers who **change fields** more creative as have access to unusual knowledge and ideas cf. colleagues (e.g. for creative metaphorical thinking)

Abrupt change in field better than gradual change – generates more unusual thought associations, although riskier and more difficult for the individual (Ziman, 1987)



Stimulating CKEs

4. Group characteristics

Influences on creativity – integrated Vs. loosely coupled, inward Vs. outward-looking, leadership style, degree of tension or harmony, heterogeneity Vs. homogeneity of group

Heterogeneity of group generally beneficial but more effort needed to manage group so ‘costs’ may be > benefits (Katz & Martin, 1997)

Harmonious social atmosphere not necessarily better – different cognitive styles causing some ‘irritation’ may generate beneficial ‘**creative tensions**’ (Wilke & Kaplan, 2001)

Leadership often crucial – leaders with wide experience, who express clear goals and grant autonomy promote more creativity

Changes in group membership at different stages may be beneficial (but not too great)



Stimulating CKEs

5. General work situation for individuals

Each individual should have a number of tasks which mutually benefit each other + enough time for each task

Interaction with other disciplines fruitful for creativity (but takes time and effort)

ICT, databases and libraries conducive to creativity if provide access to relevant, reliable information

But more casual browsing may also → new ideas



Stimulating CKEs

6. Physical environment

Need to balance

facilities making it easier for individuals to contact one another

VS

facilities offering solitude for creative thought



Stimulating CKEs

7. Organisation

Organisational structure – ‘flat’ structure better

Dougherty (1996) – 4 **tensions** to be balanced

- internal Vs. external
- old Vs. new
- top-down Vs. bottom-up
- responsibility Vs. freedom

Some **job security** good for creativity but staff not ‘stretched’ if taken too far

Conversely if insecurity too great, demotivating effect on creativity

Leaders need to balance intrinsic tensions



Stimulating CKEs

8. Extra-organisational environment

Researchers in developing countries lacking resources may have to depend on developed nations

‘Openness’ in society and free exchange of information beneficial to creativity

Greater job opportunities and voluntary mobility also enhance creativity

In firms, markets play vital role – competition encourages firms to seek creative responses to new demands



Policy Implications of CKEs

1. At micro-level, **some of elements required for creativity can be taught**

Policies need to ensure knowledge workers furnished with skills for creativity

General creative abilities, not just domain-specific knowledge

- e.g. openness to experience, tolerance of ambiguity, clear oral and written communication skills

2. **Leadership** crucial in stimulating creativity – establishing a ‘climate’ of trust & open communication for members to express creative ideas and be flexible

Researchers need to receive training in aspects of leadership vital to a CKE



Policy Implications of CKEs

3. If Mode 2 growing, institutions need

- appropriate organisational structure
- recruitment policies to ensure range of disciplinary skills
- staff development to develop skills required

4. If knowledge production increasingly cross-institutional and cross-sectoral, policies and management strategies need to provide suitable incentives, and to encourage mobility of researchers

e.g. policies to encourage emergence of **'relational entrepreneurs'** who build bridges between different organisations and sectors – play essential role in 'wiring up' of regional and national systems of innovation (Martin & Johnston, 1999)



Policy Implications of CKEs

Policy-makers & managers need to take into account:

1. A managerial approach stressing increased ‘efficiency’ may mean less ‘free’ time’ for creative contributions – i.e. over-emphasis on ‘efficiency’ detrimental to creativity
2. ‘One size fits all’ policies too crude – different fields, technologies & ind sectors have different needs; also need to take account of specific form of NSI
3. Dealing with a complex, multi-level system, so policies aimed at one level have implications at others – CKE framework offers means to achieve ‘joined up’ policies