CREATIVITY TRANSFER: EXPERTISE POOLING & AMPLIFICATION FOR A KNOWLEDGE ECONOMY[1]

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Introduction

The long recognised role of universities and research centres as key resources for economic and societal development has received increasing attention[2 3 4 5] since knowledge has tended to replace materials as the raw material of production: that is, with the advent of the 'Knowledge Economy'[6 7]. A substantial body of policy[8] and practice has grown up and the field of **'***Knowledge Transfer' (KT)* has become prominent. In this paper, we reflect on our experience and explore how to improve KT, introducing a new idea of *Creativity Transfer (CT)*[9] designed to catalyse a broader debate about interaction between academia, business and the public sector, often called the *'triple helix'*. We also propose a format for further linking such studies with practice and application. The growing global importance of the Knowledge Economy was highlighted in a major OECD study[10]: 'It is estimated that more than 50% of GDP in the major OECD economies is now knowledge-based.' However although, as this suggests, the Knowledge Economy (KE) is of growing importance, it does give rise to unprecedented challenges: It is global, and therefore opportunities and challenges are present 24/7; competition is fierce and can come from anywhere; change can happen so fast that ALL our partners' skills and capabilities must be effectively allied.

New approaches for an era of new challenges

Historical examplars of the benefits of combining arts/culture and science/technology, as seen in the work of Leonardo Da Vinci, have been echoed recently by prominent business leaders. Eric Schmidt, Executive Chairman, Google[11]: '…need to bring art and science back together'; and Steve Jobs, CEO, Apple Inc., 'The Macintosh turned out so well because the people working on it were musicians, artists, poets and historians – who also happened to be excellent computer scientists'[12]. Recognition of the need to fuse art/culture with business, science and technology, introduces the key theme of this paper – that a complete spectrum of expertise with effective instruments to build understanding and permanent partnerships between them is required.

A number of major new resources support knowledge economy partnerships: Firstly, *Open Innovation* (OI) introduced by Chesbrough[13] is widely accepted as the way forward to work effectively for economic progress in the modern world. Since the key aspects of OI rely heavily on collaboration and partnership, we suggest that the dynamics and flow of OI relationships need to be investigated and understood more thoroughly, as Joyner[14] has proposed.

Secondly, in response to the widely recognised need for clear principles to make university-business collaborations work reliably for the benefit of all parties, 10 guidelines for effective *'Responsible Partnership'* (RP) have been issued in a 2005 publication[15]. These were developed by leading European networks representing universities, corporates, and research and technology organisations; furthermore, their relevance have been confirmed by SMEs. Two key principles underline the guidelines: *maximum beneficial use of public funds and responsible use of public research*. RP represents an invaluable toolbox for the knowledge economy. However, interactions between the guidelines at different times and under different conditions, and any clustering and hierarchy of priorities, needs to be understood better in each situation in order to make full use of the guidelines as an effective toolset for knowledge economy partnerships. East and Joyner [16] have already

provided suggestions on how this might work in an earlier presentation, but we propose that a further, wide-ranging exploration of these two major instruments is urgently needed.

New ideas for an era of new challenges

The work of physicist Prof David Bohm FRS, contains a rich vein of expertise, insights and ideas that can be applied directly to this Knowledge Economy development journey. His contribution to many fields of study is scoped in a collection of essays[17] and followed by a joint publication with Dr. David Peate[18]. This work, based on thinking at the interface of many disciplines - science, arts, culture, philosophy, behavioural and social sciences - addresses themes such as: *Philosophy as a key paradigm; Renewed emphasis on ideas rather than formulae; Emphasis on the whole rather than fragments; Focus on meaning rather than mechanics; "Implicate" order folded within an "explicate" order; Knowledge as a process' (*our summary from refs 17, 18*)***.** Evidently, a partnership of wide-ranging expertise will be needed to explore and apply the Bohm and Peate approach.

Knowledge Transfer – a learning journey

Armed with the above major instruments and new ideas, we propose to explore in this paper how to work better to respond to the current Knowledge Economy (KE) challenges. Our key approach is to corral ideas and idioms from disparate fields and bring these together for KE collaborations. The fields of culture and philosophy are especially appealing here because they provide a rich source of imagination and motivation. Bangor University, Wales [19] has a strong track record of innovative collaborations[20] [21] [22], especially with SMEs[23], in particular through the UK Knowledge Transfer Partnership (KTP). This Programme addresses clear business problems and challenges in partnership with academia, employing a full-time graduate for a period or 2 or 3 years to work on a well-defined business-facing project with both academic and industrial/business supervision. KTP is recognised as making a substantial contribution to business growth (see e.g. KTP Annual Report 2009/2010 [24]). KTP was originally focussed on science and engineering based collaborations but it has increasingly supported a broader spectrum of expertise including arts and humanities; business and management; and social/behavioural sciences. Success here represents effective *interpretation and partnership building,* between actors in three different spheres, with an initial concept developed into a funding proposal, usually framed in a project management and business language.

Knowledge Transfer and beyond – the Stages of Development

We propose that Knowledge Transfer has followed four *Stages of Development* over the years:

Stage I) Collaboration engaging corporates; science and engineering focussed and research based.

Stage II) Collaboration extending to SMEs; more applied.

Stage III) Collaborations extending to micro-SMEs, including arts/humanities etc.; increasingly interdisciplinary.

Stage IV) Collaborations involving a complete range of stakeholders; with multiple transactions and breaking new boundaries.

The latter is framed in less specific terms, which gives us the opportunity to imagine how the 'Knowledge Transfer' *ascent* can be extended to engage in new ways with the complex modern world. Supporting this, a recent publication of the EU Inter-Reg IVC project TOOLQUIZ references the need to bring creative skills to bear on non-traditional fields: *'Creative skills are not only for cultural workers and artists. They are skills that can be used to bring innovative solutions across all sectors throughout Europe's regions'***.** [25]

With this background, we propose to coin the phrase *'Creativity Transfer' (CT)* to highlight our extension of Knowledge Transfer. CT deliberately links arts, culture and 'softer' skills which reflect a broad approach, whilst linking our new ideas through terminology with the field of Knowledge Transfer is appealing because the latter is well established in many countries.

Introducing Creativity Transfer.

'Creativity Transfer' is meant to sound specific yet broad-ranging, reflecting the well established knowledge/technology transfer systems, and intended to emphasise *harnessing 'softer' capabilities*. It therefore provides a good platform for adopting new ideas and approaches, and to give impetus to identify clear parameters and processes to encourage this wider 'CT' engagement. *Figure1* shows the concept behind Creativity Transfer – it is a more comprehensive approach which extends, builds upon and may include the others. Further work is needed to map out to what extent it can embody a defined set of methodologies, and how it can catalyse a broader and yet deeper means of collaboration to contribute to economy/society.

Use of Physical Models as idea-development tools

Having established that broader thinking is needed, we explore the use of physical models as a means of portraying ideas on aspects of collaboration in the knowledge economy. This can provide a rich vein of new ideas and may itself be useful in 'speaking' both to the science/technology and arts/cultural communities in an intermediary language. Hopefully, this will be useful to build bridges of understanding and thus to catalyse cooperation.

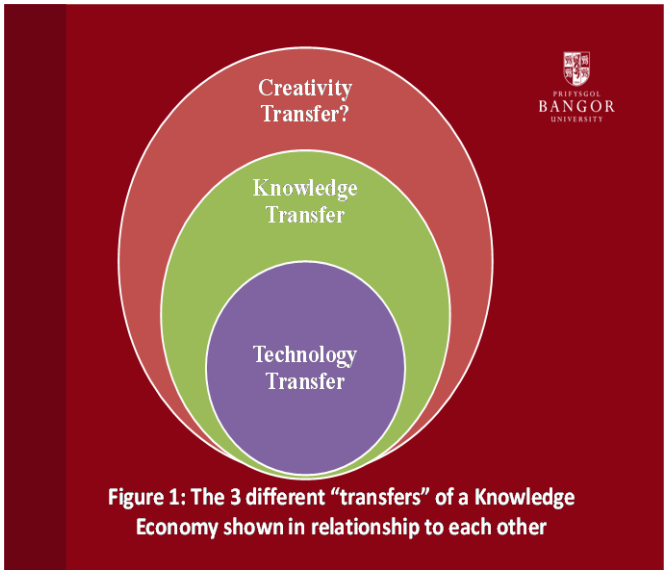

Figure 1: The 3 different "transfers" of a Knowledge Economy shown in relationship to each other

Figure 2 shows an example of using the Synchrotron particle accelerator as a model for partnership, presented by Joyner[26] in 2009, using the French national 'Synchrotron Soleil'[27].

In this accelerator, electrons are energised in a small ring (marked as zone 1), then injected into and accelerated round a large ring (zone 2). Light of a wide and continuous range of energies, emitted from the periphery of ring 2, is collected at experimental stations tangential to the large ring (zone 3).

Using the Synchrotron as a *model for partnership (Fig, 2A)*, we imagine the actors entering the structure, now seen as a vehicle for Knowledge Economy collaboration. We first place the *core collaborators* in the small ring (zone 1). Their joint expertise and partnership provides the energy for the process and is available to be harnessed in the next stage. The *core combined expertise, capabilities and skills* are now established in the main ring (zone 2), following 'injection' from the partnership preparation area (the small ring, zone 1). Thus, effective partnership is seen as the 'core group' constantly generating the partnership energy. At the workstations (zone 3) other groups (three are shown) are ready to *apply the development potential* produced at zone 2. Different practical applications are studied at various workstations.

An interesting aspect of the Synchrotron as an idiom is that the particles are *constantly accelerating* (we use this as a picture for constantly progressing the partnership but remain as a group within this large ring, so there is ongoing collaboration development effort (i.e. partners are 'accelerating jointly round ring 2).

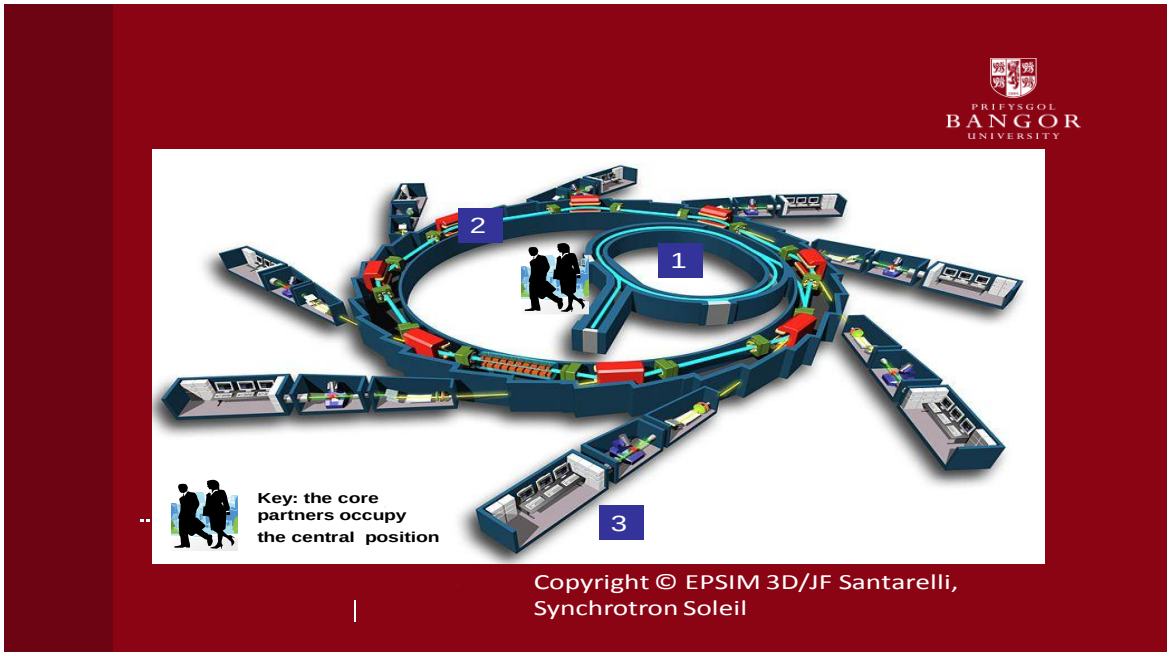

Fig. 2A: The Synchrotron Accelerator as a Model for Knowledge Economy Partnership

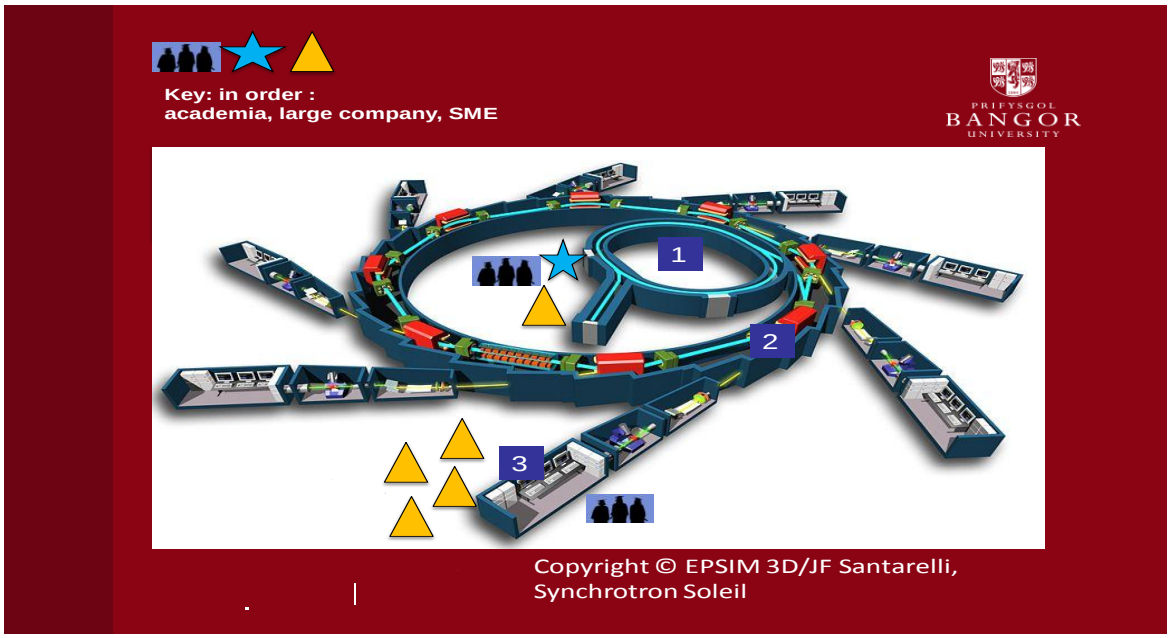

Figure 2B: Actors imagined in Partnership within the Synchrotron

In *Figure 2B*, we can extend the Synchrotron idiom to demonstrate the *dynamics of partnership* by placing actors from different organisations in relationship throughout the structure. A full real world partnership (i.e. involving a complete range of organisations (corporates, SMEs, public sector and academia) is exemplified. At *expertise assembly stage* (zone 1), a university, a corporate and a group of supply-chain or other SMEs is shown as assembling and forming a mini grouping, prepared to be injected as a continuing partnership into the large ring. *Output energy* is collected by different application groupings. For example, the workstation, zone 3 marked, has one university and four SMEs collaborating. The model has many interesting features and highlights the efficiency of a *comprehensive core partnership*, but it has the weakness that there is no possibility of a learning/experience feedback mechanism from partnerships at zone 3 back into the core expertise zone 2, and influencing the initial stages (zone 1). This is of course a *fundamental factor* in real, responsible partnering.

Mapping Creativity Transfer in a physical model

The above example highlights how application of a physical model to Knowledge Economy collaboration provides an instructive analysis of the issues involved and we propose that it is a useful approach. We shall now employ a physical model to generate an infrastructure which illustrates Creativity Transfer, first within a 2D- and then a 3D-format. In view of the fact that CT is a complex concept which is not fully detailed, this should help to make it more accessible to investigation and assessment. A 2D energetic model *(Fig. 3),* has *two zones of expertise* (arts and technology - representing the 'extremes' of approach to development) portrayed along the horizontal axis of the diagram, and two *'vaults' of resources* on the vertical axis. A capability or *'essential elements'* vault is shown below an horizon and outputs appear in a *'value-added'* vault above the *horizon*, which is thus a delimiter between usable expertise below and success, framed as value-added entities above. In the energetic model, development is seen as a process of rising up the diagram in a *'value added ascent'.* The advantage of this representation is that it presents all the key elements in relationship, enabling a ready assessment of the role of each element and helps us to explore the interaction of different parts for the knowledge economy.

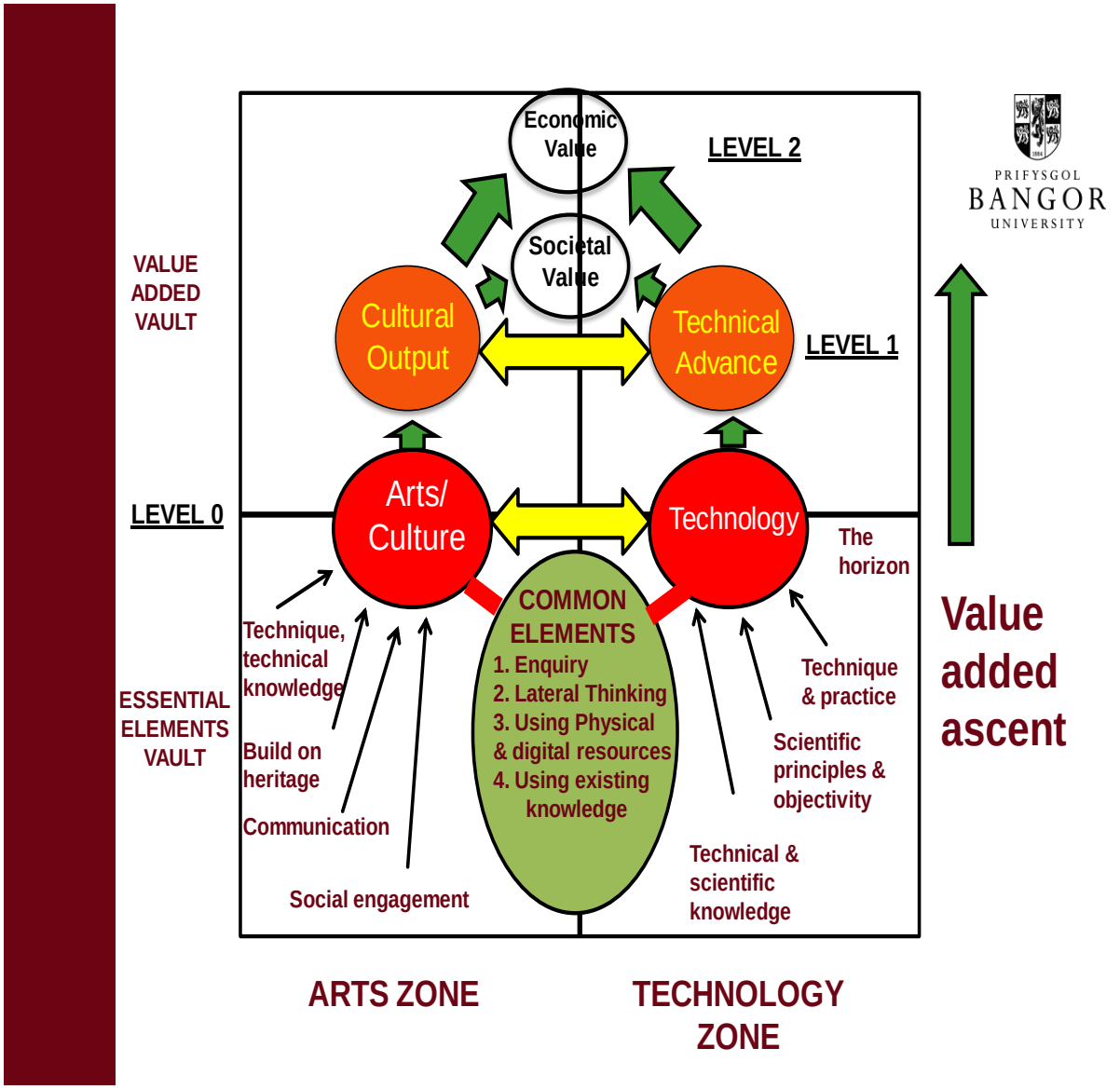

Figure 3: Creativity Transfer (CT) within the 2D "energetic" model [CT processes are shown as the yellow arrows]

We describe in turn each element of the framework of *Fig. 3*:

1. *The Technology-based Essential Elements:* The technology vault is highlighted as being formed of three 'essential' elements and it 'sits' at the horizon as a composite resource ready for exploitation in the energetic ascent, once the horizon is breached. The ascent is *thermally colour-coded*, so as energy rises, colours progresses from red to orange and white. Yellow is used for Creativity Transfer arrows.

2. *A Region of Common Elements* which are relevant both to technology and the arts is also shown at the interface of the two zones. The suggested elements have been identified anecdotally but need in future work to be assessed more rigorously. Detailed study of these separate and common elements is required, because in each application, the act of identifying such resources can be highly instructive for optimising the development process.

3. *Value-Added Outcomes:* Two types of value-added (VA) outcomes are shown: *Economic VA (EVA)* and *Societal VA (SVA)*. By displaying these two alongside each other, effort can be made to identify separately the benefits in these two arenas. Often, pressure to show economic value of projects, leads to down-playing of societal aspects or artificial 'shoe-horning' of societal into economic VA. This region of the framework is key, as it can help catalyse a new approach to Knowledge Economy collaboration, when each arena is comprehensively populated, with outputs distributed between EVA and SVA following debate and deliberation of their relative value in these two areas.

4. *The Technology-based Ascent :* The right hand side of Figure 3 shows a complete development process in the technology zone, with technical advance at level 1 (horizon being marked as level 0) and value added outcomes at level 2, separately in the economic and social spheres, giving better overall analysis of the benefit of developments.

5. *The Arts & Culture-based Ascent*: A similar energetic development is shown for the arts/culture zone. The essential elements on the left hand side are presented as being different but in essence the two processes (left and right) are synergistic and share the common elements within the green lozenge. Combining both sides then *completes* a 2-zone arts/technology analysis.

6. *CREATIVITY TRANSFER (CT)* is shown as yellow arrows (a relatively high energy colour) both at the stage of assembling expertise and resources (on the horizon, level 0) and at the output stage (level 1). CT can strengthen either or both sides of the activity.

This infra-structure offers the advantage that different types of expertise, different paths for development and their interactions can be seen in overall context. It provides a framework for investigating Creativity Transfer, which may be an idiom for creative processes and/or a short-hand for a wider engagement beyond knowledge transfer. By outlining all the aspects in a single chart, new ideas may be catalysed and the benefits of engaging a wide range of stakeholders and different types of expertise should be optimised.

Beyond the Arts/Technology Distinction

This Creativity Transfer Framework encourages us to think beyond the obvious in the Knowledge Economy interchange world. The Bohm thesis of '*emphasis on the whole rather than fragments'* (ref. 18) helped us to realise that the attempt to bridge the disparate worlds termed in shorthand as 'arts/culture' and 'technology' was too crude a distinction (i.e. too 'fragmented'), We therefore introduce a *circular framework* shown in *Figure 4*, named *Den Karpendonkse Paradym* (DKP) reflecting, in Dutch, the key discussion in location 'De Karpendonkse Hoeve', Eindhoven, NL[28] between the present authors. DKP represents a strategic placing of the complete range of expertise that is needed to harness our knowledge economy.

The geometry of Fig. 4 is crucial: each expertise has an equal, permanent and unchangeable (in the long term, global view) position from the centre; all are 'permanent representatives' with equal voices and there are no vetos; the binary view of the earlier CT framework is replaced by a paradigm with 8 elements. Therefore, interaction between different areas of expertise can be established, introducing the idea of going beyond inter-disciplinary collaboration. The *energetic model* applied to this then acts to draw the group of expertises together so they catalyse each other, build on and feed the common elements, and act as a strong basis for applying CT - see the two types of tensioning processes within and without the ring of expertise. Now the 2D model in Fig. 2 above is no longer sufficient. To represent 8 elements rather than two, we require a *3D model* in which DKP lies in the horizontal plane and we use the energetic model to form the vertical plane.

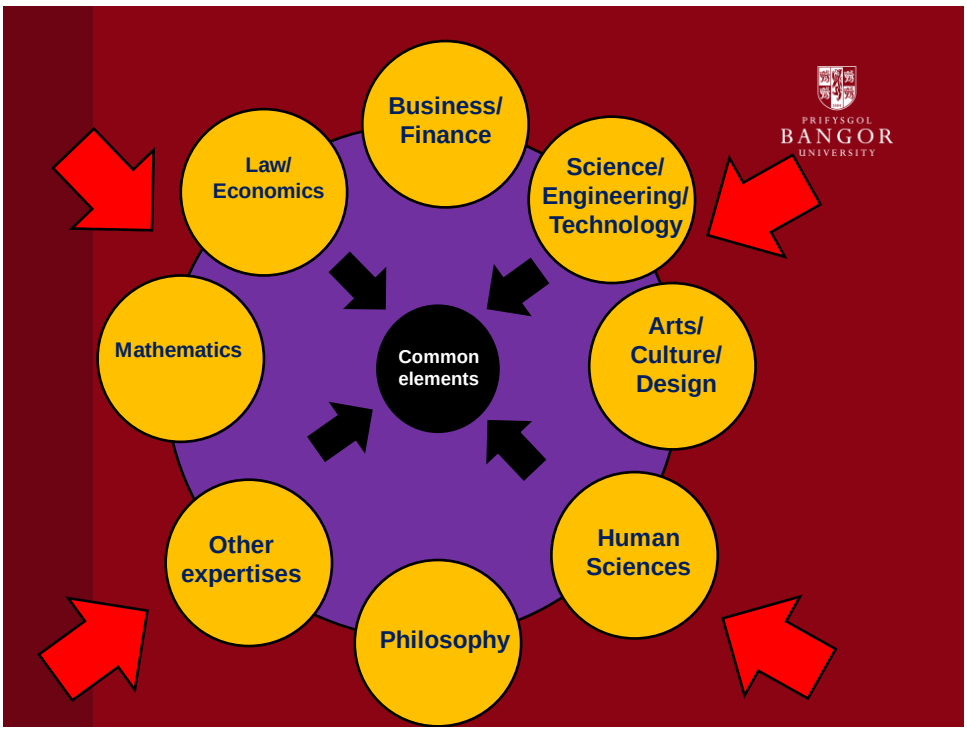

Figure 4: The comprehensive range of expertise needed for the Knowledge Economy assembled in a crucial geometry

[The arrows indicate that 'tensioning' activities – an idiom for developments due to collaboration and building understanding – both push and draw in the disparate areas of expertise together with resultantly greater effectiveness as a resource].

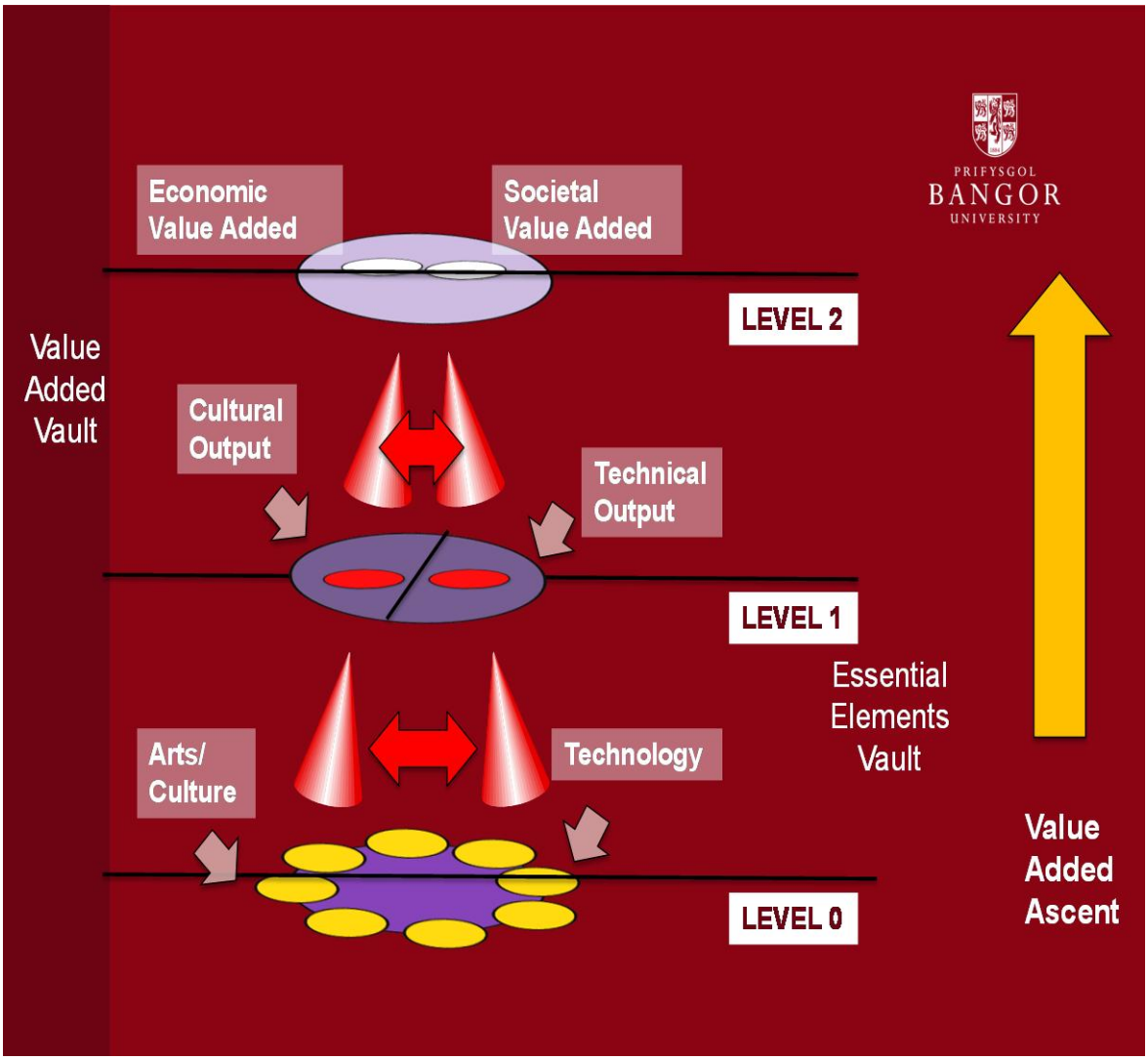

Figure 5. Creativity Transfer within a 3D Framework and 'energetic' physical model.

Mapping Creativity Transfer within a 3D Framework and 'energetic' physical model.

A 3D model of Creativity Transfer *(Fig. 5)* can now be constructed starting with the vertical axis of Creativity Transfer of *Fig. 3*. Den Karpendonkse Paradym *(Fig.4)* is applied as a horizontal axis, so we now have a 3D framework building up.

The crude distinction between arts/culture and technology is now replaced by the 8 element concept. Note that the binary arts/technology world view is replaced by the 8-elements but the ongoing presence of two disparate views, attitudes, expertises and approaches is retained with 'arts/culture' and 'technology' flags pointing inwards to the pool of expertise, above the 'level 0' mark.

Each region of the Creativity Transfer process is now added. The red cones highlight how expertise is funnelled or focussed upwards (as if it were represented by light beams or magnetic or electrical forces). Interactions between different elements produce upwards progress through the 'value added ascent'. Finally, the 3D framework represents a rich environment to explore the meaning, relevance and interactions between all the elements.

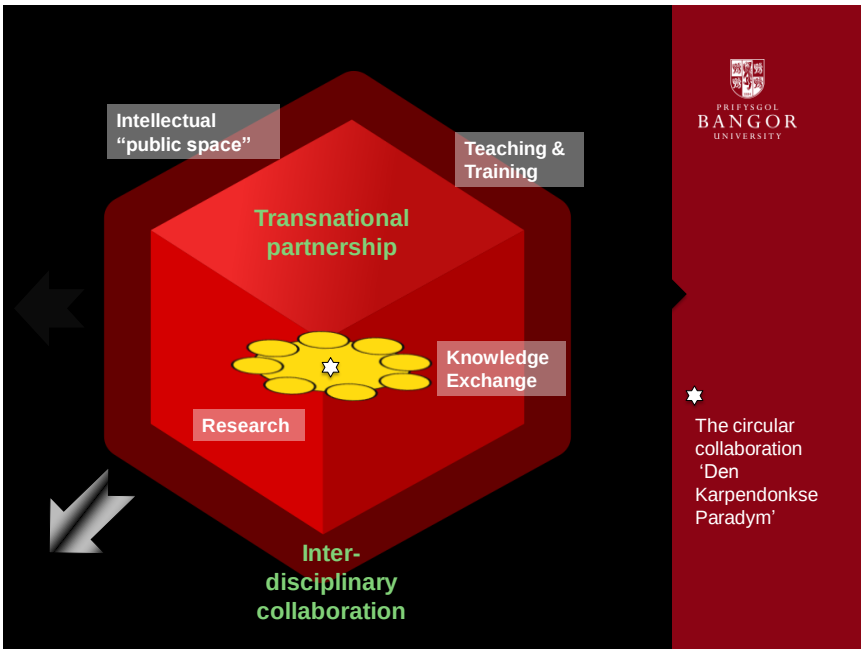

Figure 6. The 'cubic' model for the Centre for the Global Knowledge Economy

What is to be done?'

Albert Einstein said *'I think that only daring speculation can lead us further and not accumulation of facts'*[29] Our response to his challenge applied to this work is to plan a *'Centre for the Global Knowledge Economy'*- global both in the sense of the breadth of its embodied expertise and its global vision. Here, informed 'speculation' on a wide range of issues` related to KE can be explored, including the Creativity Transfer concept. Inter-disciplinary expert peer` review of developments will facilitate translation into practical tools, methods` and applications, drawing in new and wider collaborations. A 'cubic' idiom *(Figure 6)* introduced in our paper at Relais Culture Europe (ref. 1) gives a convenient representation, with the sides used to reflect the 4 roles of academia in economy and society, as determined in a study by UK Centre for Industry and Higher Education[30]: The upper/lower cube faces further represent co-operation (inter-disciplinary collaboration & trans-national partnership), giving the alliance its extensive engagement. Expertise at the heart of the cube is the broad-ranging 8-element circular expertise resource of Den Karpendonkse Paradym. Studies, with different clusters of expertise, partners and actions, are proposed to address a range of aspects, with the aim to contribute thought-leadership in the global knowledge economy.

Conclusions

The challenges presented by today's dynamic, global economy, with its emphasis on knowledge, demand broader and deeper links between universities, companies and other institutions. Based on wide experience of 'pushing the envelope' of Knowledge Transfer in a wide range of contexts, we assess that more can be done and coin the term 'Creativity Transfer' to catalyse new thinking and methods, noting that the arts and culture are crucial mediators/interpreters for this process. We have also shown that physically based idioms are valuable and applied an 'energetic' idiom to Creativity Transfer, first in a 2D and then a 3D framework. Finally, we propose adopting a broad approach through, e.g., establishing an actual and/or virtual *Centre for the Global Knowledge Economy*, to address a wide range of aspects of the global knowledge economy for both economic and societal impact.

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