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Inclusive innovation processes - experiences from Uganda and Tanzania

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Inclusive innovation processes – experiences from Uganda and Tanzania

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It has been well known since the 1960s that developing countries need to improve their capacity to use science and technology and that more efforts must be put into R&D that would benefit poor countries and people. Serious efforts to accomplish this exist but they are still too few and small in relation to the size of the problem. Whilst the supply of knowledge and competent people slowly has been growing, there is still a continued lack of demand for domestic knowledge. Foreign consultants dominate knowledge supply to government, industry and aid donors. Small firms and farms are not used to articulate their demand for knowledge. Such weak demand and timid articulation are typical signs of emerging innovation systems. Despite this, there are signs of a fragmented domestic creative potential that could be mobilised to increase innovation for inclusive development. In this article, practical experiences in Uganda and Tanzania illuminate possibilities to articulate and address the knowledge demand from firms and farms through cluster formation. In this type of cluster formations, universities have key roles as knowledge providers and as intermediaries that assist in building the ties and linkages necessary to move the innovation system to a higher state.

Keywords: clusters, developing countries, emerging innovation systems, inclusive development, learning

Introduction

A fair society is an important prerequisite for an innovative society, perhaps its most important long-term prerequisite. Now, is having a strong innovative capacity important to reach a fair society? What seems to be widely accepted is that development processes need substantially more than importing knowledge and technology (Arocena and Sutz 2012a, 148).

Innovation systems in developing countries must meet a set of challenges different from innovation systems in technologically leading countries. Developing countries need to move from disadvantageous situations in the global economy; their firms must identify and meet demand from global markets but not forget about the needs of poor people. Households in developing countries need to find ways to generate more income, particularly families who find themselves below the absolute poverty line. These challenges relate to situations of inequality and are much more socially complex than the ones met by the technologically advanced countries. In these, innovation systems have evolved together with a market economy and state support over historical time to reach a certain level of predictability. Developing countries must meet these complex challenges with a much more fragmented and deficient resource base as regards economic and human capital, with an *emerging innovation system* (Djeflat 2011), and within a situation of extreme unpredictability. In addition, developing countries often lack or are currently formulating political

strategies for innovation, including strategies for learning in industry, government and academic institutions.

Innovation is commonly regarded as artifacts in advanced technology such as in nano technology. However, as Lundvall and colleagues (see e.g. Berg Jensen et al. 2007) have repeatedly pointed out, learning by doing, using and interacting (DUI) is more common than and just as important as scientifically driven innovations (STI). Morceiro et al. (2011) show that stepwise innovations are common in traditional industry with strong connection to use of natural resources. These innovations focus more on improved production processes than on new products. The researchers claim that classifying technology as high, medium or low-tech is no longer relevant. Stepwise innovations built on smaller improvements are intertwined with advanced knowledges from different areas of knowledge.

In developing economies, recognition of these different aspects of innovation has a strong impact on the structure of emerging national innovation systems, including the identification of relevant key stakeholders, fruitful collaboration networks and use of intermediaries, and the balancing between cooperation and competition to achieve socially responsible as well as competitive innovation systems.

One current effort to address these aspects is through *cluster initiatives* that are established in collaboration between local businesses, universities and government institutions through a triple helix structure, with focus on rural and small scale activities (see e.g. PACF, n.d.). The ambition is to establish closer relations, develop mutual trust and learning for the development of

businesses towards diversification, value-added products and competitive quality measures. The individual firms engage in ‘coopetition’, which means they collaborate with researchers and government and other cluster firms on shared issues while continuing to compete with their products in relation to customers.

After seven years of practical experience in promoting cluster development in a selection of African countries, it is now time to revisit the theoretical framework. During these years, we have seen an increased interest from Western innovation researchers in the situation in developing countries, but also the upsurge of innovation researchers coming from developing countries and studying the experience of their own countries. This has led to a much richer source of empirical evidence and theoretical approaches to get inspired by. This material is available for example through the Globelics network, with the *Handbook of innovation systems and developing countries* (Lundvall et al. 2009) as a guide to the topics that are of particular interest in this context.

Aim

This article focuses on how cluster initiatives in East Africa relate to and respond to some of the core elements of innovation systems in developing countries, such as emerging innovation systems, socially inclusive approaches and the need for intermediate organisations. The structure within which clusters have been introduced will be presented together with four cases that exemplify some of the important aspects. Our research questions are:

- What is the relevance of current theoretical frameworks for emerging innovation systems, innovations for inclusive development and the role of universities as intermediaries and co-creators of knowledge in cluster development?
- How have clusters developed through co-creation of knowledge?
- How can the continued elaboration of the theoretical frameworks and the cluster practice mutually benefit from such co-creation?

Theoretical framework

Innovation systems in developing countries find a set of challenges that are different from innovation systems in technologically leading countries and countries trying to catch up on this leadership. These challenges are related to how the developing countries are situated in the global economy, as regards macro-financial frameworks, access to knowledge and position in value chains. Further, the socio-economic situation of many firms and households puts a specific challenge to innovations to become instruments for economic, political and social improvements. This particularly concerns the need to help strata of the population to raise their living standards beyond the absolute poverty line.

Emerging innovation systems

The scene set for the cluster development programme is well captured by Djeflat’s (2011) definition of ‘emerging innovation systems’ (EIS). In the EIS, actors and/or their relationships are not sufficiently developed for the country to start a process to catch up with technologically more advanced economies. According to Djeflat, innovation systems in Africa are still under construction and they are characterised by a number of bottlenecks. Neither academic nor corporate R&D have evolved to a level where they contribute significantly to the production of goods and services, and the absorptive capacity for new technologies in firms is low. There are few interactions between firms and local institutions, states are not actively involved in promotion of innovation and much of the learning is done through imitation. Most of the characteristics of an EIS are well known in development studies and in the practice of development aid. Djeflat’s contribution is to put these characteristics into a systemic whole, thus making their interrelatedness visible. This visualisation makes it possible to see that the situation in the emerging innovation systems of developing countries is not hopeless. There is a largely decentralised creative potential which could be mobilised for innovation and to increase the demand for R&D results.

As suggested in the aim, this article will in particular interrogate how cluster formations contribute to such mobilisation, and opportunities and barriers for such mobilisation to take place. Michael Porter’s (1990) ideas on cluster development to increase competitiveness was a great influence for the setup of the cluster development programme studied, alongside with the triple helix approach (Etzkowitz and Leydesdorff 1997). These approaches had been promoted in Sweden by the governmental innovation agency VINNOVA. This agency approached the Swedish International Development Cooperation Agency, Sida, in 2003 to spread cluster ideas to Eastern Africa. A programme took form, and the implementation was outsourced in 2007 to the Scandinavian Institute for Cooperation and Development, SICD at the Blekinge Institute of Technology. The idea was that the clusters formed should involve actors from governmental agencies, private enterprises and universities. Their distinctive roles were supposed to complement each other in the innovation process and also generate a co-evolutionary learning process that would mobilise the adequate resources to spur product development and work processes, policy formulation and new academic research.

Applying the triple helix approach in an emerging innovation system poses a number of problems, of which we will look into three. First, we need to understand barriers and opportunities for policy formulation regarding emerging innovation systems in developing economies, especially in contrast to well established IS. Second, we address the particular need to include weak groups and sectors in the EIS to achieve poverty

reduction and broad societal development. Third, we raise the need to define the intermediary functions that can help in bridging the gaps in the emerging innovation system, particularly as it comes to mobilise and organise the decentralised creative resources. Since the cluster programme was formed by initiatives from the university, we particularly focus on a better understanding of the challenges to the university in this role. As the triple helix approach is far from a comprehensive theory, we have thrown a wide net in search of theories and concepts that can help to improve a scholarly understanding as well as practical implementation.

Policy formulation in emerging innovation systems

The ideas to promote innovation through policy intervention are a reaction to a failure of ‘market failure’ explanations to why some countries or sectors are lagging behind in the use of science and technology. This reaction is provided in articles by Jacobsson and Bergek (2007) and also by Cimoli et al. (2009), in both cases, with different words, arguing that market failures are ubiquitous and therefore cannot provide any guidance in defining the problems connected to innovation. The arguments proceed to suggest that a wider array of social, political and economic areas need to be addressed.

Cimoli et al. (2009) are proposing policy interventions in seven policy domains. Each of these domains are agglomerations of various policy issues. Their listing covers issues such as science policy, education policy, research and development policy, industrial policy, regulations for domestic markets as well as for international trade, intellectual property rights, antitrust and competition, labour markets, information sharing, etc. Their own hesitation before this exhaustive list is that few of these areas could be subject to national policy interventions only; many areas would require paradigmatic policy shifts at an international level. Adding to their own critique, we would argue that most countries with emerging innovation systems would be dependent on donors for formulation and implementation in most of the listed policy areas. As policy formulation has become a main tool for donor agencies to ensure that economic and political reforms are market friendly and that aid becomes efficient in market terms (Kjellqvist 2013), the recipients countries must provide strong evidence for deviating from the current paradigm of market omnipotence (Cimoli et al. 2009). Another observation is that the list is so extensive that it covers most policy areas, which in most cases are fragmented into different ministries. Policy coherence is always difficult, and requires external influence on, and supervisory coordination of, the various policy owners.

Evidence-based policy formulation as proposed by Jacobsson and Bergek (2007) might be one such external influence. These authors have an interest in emerging innovation systems that does not limit itself to countries

aiming for catch up. They find similar problems of emergence in new technology areas. Their solution, in both cases, is that policy formulation should be based on analysis of the seven key functions they defined for the innovation system at large. Policy formulation and implementation should enhance the opportunities for ‘the direction of search, knowledge development, resource mobilisation, market formation, legitimation, entrepreneurial experimentation, and development of external economies. It is likely that an exercise along these lines would end up in the same wide array as proposed by Cimoli et al. (2009). The difference lies in the point of departure, and also that Jacobsson’s and Bergek’s (2007) model allows for incremental and intermediate changes in policy, and that the changes need not necessary be at the legislative level. Policies may thus be changed from below.

An experimental approach to policy making is suggested by Chaminade et al. (2009). These authors also suggest interventions that could be incremental and intermediate. This contribution differs, though, from the analytical approach of Jacobsson and Bergek (2007) in that it is much more prescriptive. Chaminade et al. (2009) recommend that experimentation start from competence building, with a strict sequence from engineering and design capabilities, followed in sequence by managerial competencies and research competencies, with an assumption that this also follows a logic of firm development from simple to advanced stages. They propose that formal education should be complemented with the concept of ‘learning organisations’, so that firms can experiment and learn within their specific contexts.

Another path in the suggested policy experimentation focuses on building the networks to link partners in larger, well established companies with local firms and domestic universities. A further contribution highlighted by Chaminade et al. (2009) is the relationships between domestic producers and users. These relationships require policies that promote user competencies and the build-up of trust between the actors. Another important link is between the formal and informal economies, Chaminade et al. (2009) propose procedures such as business regulation, intellectual property rights and anticorruption measures to enhance these linkages. The experimentation should engage as many players as possible, in interaction with sectoral and regional initiatives, linking experiments to industrial, educational and trade policies.

There is a great resemblance between Jacobsson & Bergek (2007) and Chaminade et al. (2009), and the practical experiences of the cluster development programme as regards the areas that need to be in focus for policy making. The difference lies in how the analytical and the prescriptive approaches allocate sequencing and weights between the functions or components. The issue of sequencing goes beyond the issue of which functions or components to promote first. In Jiang’s

(2011) experience from China, reducing transaction costs by joining efforts to involve collaborative partners is far less complicated and time consuming than efforts to change political situations, and is thus recommended by Jiang.

Obviously, there is need for more empirical and theoretical work to understand the co-evolution of policy and practice related to innovations. The concept of reflexive governance as proposed by Voss and Kemp (2006) might be helpful as it seeks to address the heterogeneity, uncertainty and path dependence related to sustainable development. Reflexive governance appears as highly relevant also to emerging innovation systems, especially as expectations on inclusive and sustainable development are high on the agenda for the development plans and visions in countries experiencing this situation. The increased degree of complexity when an innovation policy addresses issues beyond competitiveness calls for interactive anticipation, iterative and participatory goal formulation and interactive strategy development. Voss and Kemp (2006) propose these as fundamental characteristics of reflexive governance. They also call for distributed control capacities, which would fit well with Djeflat's (2011) expectations that a decentralised creative potential should be mobilised to evolve the emerging innovation system. Rip (2006) calls such a co-evolutionary approach 'steering from within'. We will argue that such a co-evolutionary governance model is emerging within the cluster development programme, where co-evolutionary learning in the clusters is floated to the national level as well as into a regional, pan-African level of governance.

Emerging innovation systems and inclusive development

One of the major challenges when strengthening emerging innovation systems in developing countries is how to address poverty, inequality and social relevance. The approaches related above on emerging innovation systems do not immerse by themselves in such discussions. Djeflat (2011) is concerned with the global inequality aspect as expressed by the ideas on catch-up of economic growth. He does not particularly concern his work on EIS with a distributive growth within the EIS itself. Jacobsson and Bergek (2007) in turn are concerned with innovations for sustainable development, but primarily address technologies of general interest to sustainability, but not linked to the specific situation of people in the most vulnerable positions. In this section we will look at the possibilities of merging the approaches to emerging innovation systems with ideas on inclusive growth or inclusive development.

Cozzens and Sutz (2012) are two champions for directing innovations towards inclusive development (IID). They suggest a research agenda that may 'improve the connections between innovation, livelihoods, and problem solving there' (2012, 5). The focus would be

what they call 'informal settings', which locates the livelihood in the places where people live (households and communities) and work (the informal sector). They are aware that 'marginalized people are not confined to living and working in informal settings; and the actors in informal settings are not all currently marginalized people' (2012, 5). They also admit that it is difficult to define the boundaries for what is informal. Still, by drawing our attention to informal settings, they outline and concretise the challenges of innovations for inclusive development in a constructive way. Among those challenges is the fact that many innovations for inclusive development would never show up in the statistics researchers can use to describe an innovation system as emerging.

There are various reasons for marginalisation or polarisation of societies, thus the measures for meeting inclusion must be linked to different situations. Cozzens and Kaplinsky (2009) suggest a framework of crosscutting dimensions to describe the variety of situations. Vertical inequalities occur between different households and firms, and horizontal inequalities relate to gender, ethnicity and geographical inequalities. Natural environment can be a base for inequality, as well as social environment, and the size of a firm in relation to other firms.

We use the functions of emerging innovation systems proposed by Jacobsson and Bergek (2007) to deepen our interpretation of how to meet the challenges of innovations for inclusive development (IID). All of the seven functions; knowledge development, resource mobilisation, market formation, the direction of search, legitimation, entrepreneurial experimentation, development of external economies, would need to be more or less differently interpreted.

Directions for and legitimation of innovations for inclusive development IID require a different 'direction of search' and give 'legitimation' to other points of departure. One way to guide direction and provide legitimacy would be, as Arocena and Sutz (2012a) and Alzugaray et al. (2011) suggest, to link innovation policies with social policies to ensure their usefulness for poverty alleviation and inclusive development. We would also suggest adding environmental policies, as they often have an orientation that affects the economic base and the productive practices of vulnerable population groups.

The perspectives of innovation to address inequality, put forward by Cozzens and Kaplinsky (2009), bring to the fore the issue that is usually lost when introducing innovations. Not all are winners, and the innovation literature holds many references to 'disruptive innovation'. A respectful analysis of possible consequences of innovations should be performed, not least containing an analysis of the power perspectives brought forward by Cozzens and Kaplinsky (2009).

Resource mobilisation and entrepreneurial experimentation for inclusive development IID and sustainable development goals would, as Fu et al. (2011) argue, be

better achieved if ‘resource mobilisation’ for innovation and technological development is domestic and locally driven. Letty et al. (2011) find it important to encourage the innovative capacity within and among individuals rather than to involve them in outside initiated research projects. This will strengthen an informal innovation system which should be supported by the formal actors and stakeholders. With this perspective, progress and success would be larger when moving forward in small, well defined steps and when practical activities dominate over intellectual debate (Seyfang and Haxeltine 2012). The results are not only material gains, but increased experience-based knowledge as driving force.

These are measures that would be democratising innovation as von Hippel (2005) puts it. He identifies the lead users, who have the interest to drive and improve on innovations to advance their routine activities. Their drive may be to innovate on something that the market cannot yet provide or to improve on something that is available in the market but insufficient to their needs. This category of people may choose to disseminate or produce the innovation to other users. In von Hippel’s model, such user driven innovations may be taken up by manufacturing/service firms, which spread them to people who are mainly interested in the use aspect. This resembles the co-creation within the IID research agenda that Cozzens and Sutz (2012) advocate.

With the resource mobilisations, the arena is set for ‘entrepreneurial experimentation, another of the functions proposed by Jacobsson and Bergek (2007). This implies ‘a continuous probing into new technologies and applications, where many will fail, some will succeed and a social learning process will unfold through the course of these experiments. An IS without a vibrant experimentation will stagnate and, indeed, without the initial experiments, it will not be formed’ (2007, 692).

Market formation for inclusive development

This brings us to a point where the literature on IID is very fragmented and ambiguous. The debates on IID are not straightforward when it comes to the attitude towards markets. There are approaches claiming that grassroots innovations could be a remedy when markets are small and demands for innovations are locally specific (Bhaduri and Kumar 2011). In a similar vein, Seyfang and Longhurst (2013) place grassroots innovations in the social economy outside of the market economy. The bottom of the pyramid (BoP) approach claims that the market opportunities among the poorest are underestimated and should be explored by multinational companies (Pralhad and Hammonds 2002). The below the radar (BRI) perspective shares the notion of market opportunities with the BoP, but doubts that the traditional value chains could play a role, and puts more hope on increased capacities in the developing world and on a labour-intensive mode of production (Kaplinsky et al. 2009).

These perspectives all look at the marginalised as potential consumers or users of innovations, although the grassroots innovation perspective, and to some extent the BRI, also see them as producers of the innovations. The innovation producer perspective is also important when local innovative firms and farms move upwards in global value chains (Cozzens and Kaplinsky 2009). Another market opportunity for local innovations is the domestic markets that are growing, not the least because of an increased demand for consumption at the middle of the pyramid (MoP) (AfDB 2011). In the cluster development programme we have seen various attempts to reach this market with import-substituting products. The MoP approach has received very little research attention overall, also so in the literature on opportunities for innovations for inclusive development.

Jacobsson’s and Bergek’s (2007) function of ‘market formation’ could help in bringing order into this scattered picture of non-markets and invisible and unreachable markets. They propose a sequence from ‘nursing markets’, to ‘bridging markets’ to finally, after decades, reach a mass market. The success rate of course depends on how the other functions of the EIS evolve during the process of market formation.

The ‘nursing market’ provides a space for learning, which could be placed in local communities. It would be applicable to the emphasis put in BoP to adapt existing technologies in close producer-user interaction. Similarly, in the BRI perspective, the nursing market could provide the space for interactions between the growing local capabilities to develop innovations. Seen from both these perspectives the nursing market could bring the innovations up to visibility for other actors. The nursing market could also be the ‘niche market’ that Seyfang and Longhurst (2013) search for to develop grassroots innovations. They look particularly to the opportunities of using local financial non-monetary models to push innovations forward. Our own observations in the cluster programme also show a nursing of new products at local markets, initially funded by public funds and low opportunity costs in production.

There is clear ambiguity in the IID literature between, on the one hand, the social needs and ideological commitment and, on the other hand, economic aspirations and hopes to change socio-technical paradigms. To us it seems logical that some, but not all, innovations in the area of IID would reach a level of legitimacy and interests outside the nursing market. Reaching a bridging market requires, in Jacobsson and Bergek’s (2007) view, the entrance of new partners. Intermediaries could bridge between the innovational diversity of grassroots (non-) market niches and the commercial potential beyond the niches, according to Seyfang and Smith (2007). Kirwan et al. (2013) show how local voluntary organisations jointly with supermarkets could change socio-technical market

paradigms in local food production. The role of intermediaries could also be to mediate in the clash of interests between the redistribution within the social economy and the joining in market activities. In this context the intermediary also was instrumental for the adoption of market driven innovations in the local community (Inguaggiato et al. 2013).

Knowledge development for inclusive development

An innovation system aimed towards inclusive social development needs to recognise that the marginalised group may be unable to express what problems they need to address. Arocena and Sutz (2012b) point to the weak domestic demand for knowledge, persisting in spite of an increasing knowledge supply from academic institutions in developing countries. Representatives of NGOs or governmental organisations may identify the problem, but share the lack of connections to domestic academic researchers who could address them. Academic researchers may not identify the problems by themselves. Even after being alerted, they will need to formulate researchable questions to remain competitive within the academic system (Alzugaray et al. 2011).

In this context it is important to recognise that knowledge always is situated as it grows in specific contexts, as e.g. Haraway (1988) gives profound accounts of. Knowledge *transfer* is thus always difficult, and may be particularly so when people with scientific schooling, administrative drill and entrepreneurial skill move out of their habitual context to meet people in informal settings. Haraway's proposal is to recognise and admit the localisation of 'knowledges' in bodies, including our own, to be aware of the symbolic meanings of the knowledge that we hold and that it might differ from others' symbolic meanings. To live with and make use of the 'situatedness' '... we do need an earth-wide network of connections, including the ability to partially translate "knowledges" among very different – and power-differentiated communities' (1988, 580). If so, different ways of articulating a demand for knowledge might be recognised and acknowledged.

Knowledge has been shown to spread in locally established clusters, where social bonds and trust through face-to-face interaction facilitate sharing of relevant and specific knowledge, according to Fu et al. (2011). In relation to this, communication in larger networks between local initiatives is rewarding. In triple helix clusters, the original situatedness of the actors involved requires translation. Engaging themselves in the same practice gives a common context that facilitates the translation, and eventually transforms the different situated knowledges into a new, situated knowledge that is more inclusive. Organising cluster representatives in national and international networks increases the network

of connections for translation and transformation of situated knowledges.

Development of external economies in innovations for inclusive development

Another of Jacobsson's and Bergek's (2007) functions remains to be described. The development of external economies in their view is mainly about the entrance of new partners into the EIS. They are vague on the qualities and additions that new partners may bring to improve the function. Here the IID literature has significant contributions to make, not the least by putting 'intermediaries' or gap fillers into the system (see below).

Intermediaries supporting innovation for inclusive development

Chaminade et al. (2009) propose that *innovation intermediaries* are important to fill the gaps in innovation systems in developing countries. Howell (2006) suggested that successful innovation needs intermediaries who can assist in spreading knowledge and technologies and create links between actors. Linking actors is not enough, though, as the intermediary often also needs to translate between the actors to match supply and demand. According to Howell, the function of the intermediaries is to gather information, store and spread it to the key actors. They can also help one of the parties to formulate their needs.

Paying more attention to the important role of intermediate organisations in developing countries is also suggested by Djeflat (2011), built on his studies of technology centres and technopoles. Szogs et al. (2011) give examples from research institutes, multinational organisations and agricultural cooperatives in Tanzania and El Salvador to show how intermediate organisations connect small business to food processing knowledge available in multinational companies active in the country, or to the knowledge available in domestic universities. They also have a role to connect users or consumers to the firms to establish networks regarding organic and fair trade products, for example. Vargas and Vera-Cruz (2011) exemplified how a local network of farmer organisations in Mexico helped farmers to formulate their needs into agricultural research questions. The network accessed a larger number of researchers than previous agricultural extension had provided. Dhamankar (2011) likewise indicates that intermediate organisations such as NGOs have the opportunity to translate between different situated knowledges. Another role is to mediate in conflicts, which suggests that the intermediate organisation should have a neutral role in the innovation system. According to Cummings and Cogo (2011), three different types of knowledge can be facilitated by intermediate organisations: (1) knowledge within the field of production, (2) knowledge about the actors connected to that field, and (3) knowledge about how to establish and negotiate networks between actors.

Many of the attributes of the above-mentioned organisations could also apply to the clusters in the programme studied. NGOs have not been explicitly involved though in many cases such organisations have played a role. Maybe the main feature of the clusters studied is the great involvement of ‘cluster facilitators’, who are the intermediary personalised. In many cases, these facilitators are university teachers and researchers. Besides contributing with their academic knowledge, they are trained and experienced in mediating between different interests and brokering with new partners.

This implies that the university allows faculty to take on new roles. Brundenius et al. (2009) conclude that linking universities closer to users is fundamental for their role in relation to economic development. The question is rather how such a developmental university should link up? Their first answer is that interaction should not be driven by the logic of profit, as this would impede the possibilities to interact with groups with big needs and little money to express their demand. Curricula for problem-based learning, teaching material based on research of the local context and training for interaction are some of the measures suggested by the authors.

To summarise this argument for the ethical discussion of innovation: new technologies, whether new-to-the-world or new-in-this context, will change things and they will change people and the relations between people. They are reality producing (Haraway 1991). The driving forces of technological change are reciprocally embedded in economic dynamics and in social structures, as much as they are embedded in our cognitive structures. Handling the ethics of innovation would be as much a question of analysis of the political, environmental, social and economic factors, as it needs to be introspection of our own symbolic values and moral directions. The issue at stake, according to Bauman (2011), is to avoid collateral damages striking at the most vulnerable in a socially unequal global age. These are issues to be considered by the intermediaries in innovations for inclusive development as well as for policy makers who want to promote the further evolution of emerging innovation systems.

Innovative cluster initiatives in East Africa

In the light of the theories and analysis presented above we want to expand our discussions on inclusive innovation and emerging innovation systems, focusing on specific initiatives in which we have been involved as development actors, cooperating partners and researchers.

The Innovation Systems and Cluster Development programme (ISCP) was initiated in 2003 when The Competitiveness Institute, TCI, organised its annual conference in Gothenburg, Sweden (see Andersson et al. 2004). On the initiative of the Swedish co-organiser VINNOVA (Swedish Governmental Agency for Innovation Systems) and funded by the Swedish International Development Cooperation Agency, Sida, a

group of African researchers was specially invited to the TCI conference 2003. The group was selected from an ongoing regional research cooperation initiative in the engineering sciences involving researchers from Mozambique, Tanzania and Uganda. The invited researchers all held senior positions in their faculties and were asked to involve representatives from the industrial sector as well as from government in the team from each country. The teams prepared papers on experiences of collaboration on innovation, which they presented in a parallel workshop at the TCI conference.

The TCI conference in 2003 inspired the teams from the African countries to endeavour to build cluster initiatives. It also inspired the seniors within TCI and VINNOVA to take an interest in competitiveness development in Africa. The regional research cooperation initiative approached Sida for funding of a series of conferences on innovation systems and cluster development, ISCD, to elaborate a model for implementation in the particular contexts of the countries. The conferences, held at regional as well as national levels, resulted in a series of proceedings (see e.g. Mwamila et al. 2004), and, primarily, in a model for cluster development in Africa, with the three countries as pilots. Largely, this model was based on VINNOVA’s practice of developing clusters in Sweden, combined with international experiences in the TCI congregation as well as extensive collaboration experiences in East Africa. These experiences stemmed from more than thirty years of research cooperation between Sweden and the African countries concerned. The collaboration experience included collaboration with research councils as well as with university management. The main experience was from direct collaboration between researchers on topics of joint concern and had the training of PhD candidates as the main component. This model had created a mutual respect and trust among the Swedish and African participants, and a learning model where positions change along the process, with increased control over time shifted to the African participants.

The cluster formation has been organised through national branches of the Pan African Competitiveness Forum (PACF) which was formally established in 2008. This pan-African endeavour was modeled on experiences from the ISCP East Africa network mentioned above. The first selection process and training workshops for cluster facilitators took place in Dar es Salaam, Tanzania in 2005. Eight pilot cluster initiatives were planned and started in 2006. During the following years a number of facilitator trainings have been conducted in Uganda and Tanzania resulting in the kick-start of numerous cluster initiatives in different sectors including several thousands of women and men. In 2011, Uganda had started 31 cluster initiatives and Tanzania 19 cluster initiatives. At the inauguration of PACF, South Africa joined with a number of cluster initiatives. In total 22 African countries

showed up with a keen interest in, or experiences of, cluster formation.

Facilitators, of which a majority are researchers or have some connection to academic institutions, function as links between cluster members – individual firms within the same business and geographical area – and relevant ministries, business chambers, private sector foundations, local administration and traders. Together with cluster members they define and pursue research projects to improve or diversify products and production processes.

Cluster initiatives have been evaluated both by internal and external experts (ISCP-U 2011, Msuya 2011, Rath et al. 2011). Evaluations and yearly reports show that some of the clusters prosper, others survive and others have reduced or cancelled their joint activities. In general, the cluster members have gained knowledge and developed production processes in ways that have improved their economic benefits (Rath et al. 2011).

National structures

A national coordination body for cluster initiatives offers opportunities for aggregated learning as regards best practices and challenging experiences for cluster management and innovations. In the cases presented it is the secretariat of the national chapter of PACF – PACF-Uganda and PACF-Tanzania respectively. A national coordination body should ideally consist of representatives from several clusters, from government and academia, banks and from private sector organisations as well as NGOs. With a wide range of stakeholders, the committee in itself becomes a body for advocacy in innovation-related policies and a consultative group for any policy process aiming at formulating evidence-based innovation policy. With strong links to the practices of firms and farmers in their daily strive, the national coordination body can identify areas of necessary policy intervention and propose improvements to existing institutions in the innovation system. The proposals may also include establishment of new institutions that may facilitate the innovation process, such as innovation parks and incubators, or for appropriate financing models of innovation.

In Uganda the Ministry of Industry and Trade is setting up an incubator programme based on cluster experiences. The achievements made by the PACF-Uganda in cluster formation and innovation persuaded the Ugandan government to make a special budget allocation to the Makerere University for innovations and clusters. In Tanzania the Commission for Science and Technology has made the programme into a national endeavour. Cluster facilitators have been commissioned to senior posts in the Tanzania Chamber of Commerce, Industry and Agriculture, TCCIA and the Small Industries Development Organization, SIDO, respectively. Both countries have increased their interest in innovations through cluster

initiatives, and this has contributed to intensified work with national policies.

Examples

Four cases of cluster initiatives are presented to illustrate and investigate some of the aspects of inclusive innovation and emerging innovation systems as outlined above. The information comes from our participation in cluster facilitator training, engagement in PACF East Africa and also from focus group interviews in the clusters. The presentation is far from exclusive, and is used to illustrate the three research topics.

Lake Katwe Salt Cluster Initiative, Uganda

Salt Lake Katwe was one of the first seven pilot clusters in Uganda, initiated in 2005. The cluster idea was introduced to salt workers around the lake by one of the participants in the first cluster facilitator training course. The cluster formed a local leadership group in the village Katwe, representing salt workers. The local leadership group is in regular contact with the facilitator and with local government on certain issues.

The lake is located in south-western Uganda. The number of permanent residents working with salt extraction throughout the year is estimated to be 1 000–2 000. Salt is extracted through evaporation in shallow ponds along the shore and through cutting of salt rock from the bottom of the central parts of the lake. The salt workers depend on buyers to appear regularly, since there is no storage for salt. The salt is sold for industrial use and animal consumption in Uganda and across the border to Congo Kinshasa.

The main cluster activity until now had been to find ways to refine the salt. Researchers at Mbarara and Makerere Universities have conducted research on how to refine the salt to table salt quality. A major concern among the salt workers, however, is the risk of losing control over the salt to external investors. A constant problem is also working conditions and the negative effects of the salt on the skin and bodily organs. Therefore, major suggestions within the cluster were to develop work conditions and legal and organisational matters besides product quality improvement or increased salt extraction.

Reduction of the green cover around the lake is a concern, since this had led to increased water runoff and the erosion of soil into the lake. Cluster members have suggested that researchers should be invited to give environmental education in the community in order to emphasise and legitimise regulation for grazing and conservation of the green cover. This has to some extent been executed and persuaded people to take action. In November 2012 positive results in increased green cover were reported. This is one example of how clusters involving researchers can take steps towards inclusion and an increased responsibility for local sustainability.

Although the leadership group and the salt workers were interested in finding ways to increase the value of the salt, they raised concern that more commercial extraction and refinement of salt might likely lead to foreign control of the resource. There is a mobilisation within the cluster and linked actors in order to keep control of the lake and thus secure income for all the people since long dependant on the salt lake resource.

Zanzibar Seaweed Cluster Initiative, Tanzania

The history of seaweed cultivation in Zanzibar goes back to the early 1980s. The Institute of Marine Sciences (IMS), a part of the University of Dar es Salaam, was engaged right from the start, contributing with their botanical knowledge. With increasing knowledge of the boundary conditions of the natural resource and the production, IMS could co-develop best practices with the communities, and also train the cultivators in doing ecological monitoring. Today, thousands of people, mainly women, cultivate seaweed on Zanzibar. The main work is to plant, protect, harvest and dry seaweed for sale to export companies.

The seaweeds in Zanzibar are used to extract carrageenan, a chemical stabiliser used in the food and hygiene products industries. The end-user market has been constantly growing, but the women in Zanzibar at the lower end of the value chain found prices to be highly fluctuating.

The seaweed cluster initiative was formed in 2006 with aims both to improve cultivation and increase income through production of seaweed products locally. Meetings between farmers and buyers of dried seaweed for export were arranged, which led to constructive dialogue about pricing and optional market orientations. Cluster activities include research into novel farming techniques and new species. The different groups also work in cooperatives to produce soap and other products with seaweed and other local ingredients to increase their income. These activities have increased with the help of the cluster. For the women, work with soap production has given a higher self-esteem, higher income and higher status in the family and community. These are important steps towards breaking the dependency on international value chains and the degraded positions within them.

The facilitator is a researcher at the Institute of Marine Sciences (IMS) based on Zanzibar, and is the driving force in the seaweed cluster. She is also in contact with other members of the steering group consisting of representatives from the Ministry of Livestock and Fisheries, Agriculture, and Trade, and the private export companies.

The Associate Director of IMS appreciated the cluster initiative and explained that some professors at the Institute had previously been reluctant to interact with stakeholders outside academia. Today, all researchers were eager to communicate and collaborate with various stakeholders. Students were also given tasks involving interaction with other actors in society to learn the

relevance and complexity of development issues even within the natural sciences. The interactions have also led to a learning process among the seaweed farmers on the ecological pre-conditions for cultivation. They have learned how to make inventories of the naturally growing plants in the shallow waters, plants that either compete with or are threatened by the seaweed cultivation. Their measurements are in turn analysed by IMS staff and students and, in co-creation, used to fine-tune the cultivation methods for ecological sustainability.

Basketry Cluster, Luwero, Uganda

The basketry cluster in Uganda was initiated in October 2005 in Bombo and Wobulenzi, Luwero District, and had the following rationale as expressed in the business plan of the basketry cluster, December 2005. Handicrafts in Uganda tell a story of strength of a region's cultural heritage. The modes of production of most handicrafts require the use of natural raw materials utilising basic indigenous production methods and to some extent the application of appropriate technology. Traditionally in Uganda, basketry is mainly done by women and it is a key catching activity for the disabled, HIV/AIDS victims and youth who are directly affected by the unemployment waves. Basketry is a key activity within the handicraft sector that is environmentally friendly, and has great market potential that needs to be exploited to supplement the incomes from urban and rural agriculture.

The key stakeholders were initially Private Sector Foundation Uganda (PSFU), Uganda Export Promotion Board (UEPB), National Association of Women Organisations in Uganda (NAWOU) and Uganda Bureau of Statistics (UBOS).

Many of the cluster members were positioned in the informal sector. Activities within the cluster included training, pattern sharing and establishment of a venue for joint activities. These activities increased interaction between cluster members as well as other stakeholders, which fostered the trust building approach. One impact is that the relevance of participating in a registered cluster initiative increased. This change from an informal to a formal status opened up the possibility for support from bodies like PSFU, which showed explicit interest in the basketry sector.

Katwe Metal Cluster, Kampala, Uganda

The Katwe Metal Cluster initiative is based on a geographical agglomeration of blacksmiths and metalworkers in Kampala, along the road to Entebbe. The area is 4 km², the cluster firms employ more than 3 000 people and the product range is wide, from repairs of heavy lorries to security gates and restoration of used refrigerators. It is a very vital township with lots of activities. Occupational health is one of the most apparent issues as you see welders protecting themselves from the welding machines' UV-rays with ordinary sun-glasses,

and children playing in the showers of sparks from grinding machines.

Much of the activities have been informal, but the cluster initiative made many of the firms realise the benefits of registration. Becoming members of the Private Sector Foundation meant that they could count on services and get assistance on how to address the local government on issues such as power supply, water and sanitation. As a result of these contacts and of the formalisation of the businesses, the cluster has now achieved a possibility to expand the area to rebuild and relocate some of the activities.

Discussion

In this article we set out to respond to the following research questions:

- What is the relevance of current theoretical frameworks for emerging innovation systems, innovations for inclusive development and the role of universities as intermediaries and co-creators of knowledge in cluster development?
- How have clusters developed through co-creation of knowledge?
- How can the continued elaboration of the theoretical frameworks and the cluster practice mutually benefit from such co-creation)?

When bringing the theoretical approaches and previous research finding together with the cluster findings we found that there are three issues that deserve more discussion. They are:

- Policy and experience
- Clusters and the inclusive approach
- Universities as intermediaries.

Policy need to be better based in experience

From our experiences of assisting and studying the cluster programmes in Eastern Africa, we have some difficulties with the theoretical approaches to innovation policy. The cluster programmes came into existence when innovation had not yet become a buzzword in Tanzania and Uganda. No specific innovation policies could be found, even though policies and national strategies for science and technology and education had been updated several times. Both countries had started an expansion of the system for higher education, but were still far behind as regards governmental funding of research. It was only at the end of the first decade of the new millennium that the goal of reaching 1% of GDP to S&T reappeared in governmental talks. Vocational training was also severely underfunded. Policies for private sector development had been in place since the mid 1990s, but with little bearing on learning and innovation.

Our observation from the cluster programme is that the national committees learn through experiences from the cluster development programme. In the committees, governmental representatives are partners who learn and

act together with the other partners. There are both formal and informal contacts that have led to minor, but significant, changes in approach from the government, albeit not to changes of policy and legislation. The national committees could most probably learn from successes and failures to build up more conscious strategies and tactics for advocacy, lobbying and co-development of the emerging innovation system.

We subscribe to the intentions behind the experimental approach to innovation policy from Chaminade et al. (2009) and the evidence based approach from Jacobsson and Bergek (2007). Although Chaminade et al. (2009) underline the need to build trust between the actors, we find it difficult to understand the definition of roles and responsibilities between policy makers, authorities, firms and universities in innovation policy making. In Jacobsson's and Bergek's (2007) perspective, the policy makers are clearly defined as recipients of information from analysts (innovation system researchers). Using this information the policy makers are supposed to address (political) bottlenecks. The assumption that policy makers are combined spectators and super-influential actors leaves a number of questions unanswered.

The challenge, for us who do the research on innovation systems, is to get a better understanding of how the experiences of the innovation actors could influence and have influenced policies relevant to the innovation system. The theories we have explored in this article contain many promising elements. They tend to overestimate the top-down approach from policy makers and underestimate the role of the other actors and their bottom-up approach. The co-evolution and reflexive governance proposed by Rip (2006) appears as an intermediary, but the philosophy has yet to be operationalised in empirical studies. Other aspects that we miss in these theoretical approaches are power and control, partly addressed by Cozzens and Kaplinsky (2009). Co-evolution of innovation policy would immediately bring out the controversies between potential winners and losers. In an emerging innovation system, it is likely that innovation policies may be as disruptive as innovations themselves. The politics of balancing winners and losers must also be an object for studies of emerging innovation systems.

Clusters promote an inclusive approach

Since innovation for improvements in the value chain is linked to competitiveness, it often brings about organisational changes that may be detrimental to certain population strata. Those most vulnerable due to endowments and entitlements (including skill profiles) may not fit into the new organisational set up. Hence, there are no automatics in effects on income levels and income distribution from improving value chain positions. Instead there is an additional and tough challenge for designing the specifications for innovation – not only looking for competitiveness but also for social justice. The Salt Cluster in

Uganda is a highly relevant example of this dilemma, since salt extraction and refining can potentially be done in highly mechanised ways compared to the current manual work.

Cluster based learning could improve the position of firms and farmers in value chains of different reach (local, national, continental or global), which, if consciously done, could address income gaps and reduce the number of people living in absolute poverty. One challenge is to address needs of the poor and at the same time trying to comply with national or international standards regarding for example food products. Quality requirements certainly differ for products that are sold and consumed locally on a day to day basis compared to over-seas transportation and a required shelf life of more than a week. Issues of quality standards have been addressed in several clusters, including those working with food products.

Our major argument for the PACF cluster development is that they secure the inclusive approach highlighted by Cozzens and Sutz (2012). Clusters provide a forum for learning between firms and farmers and may act as an intermediary between the firms/farms and possible partners in academic institutions, government bodies and, sometimes, foreign firms. The Cluster is also a possible intermediary that could articulate the needs of the poor, directly from these or through the collaboration with NGO's or bodies responsible for implementation of social policies. Through internal and assisted learning, the clusters can translate the needs of the poor into improved processes, products and services. Thus, clusters address several of the issues raised by Alzuguray et al. (2011) and Jiang (2011) concerning the specific problems related to fragile social structures and poverty. The seaweed cluster facilitator has suggested value addition and invited instructors to training sessions in soap production and appropriate boat construction, for example. The cluster has also led to more formal negotiations between (female) seaweed farmers and fishermen concerning conflicts over access to the shallow waters, thus addressing gender inequality in particular.

The PACF Clusters aim to increase competitiveness without leaving some behind. The concept of co-opetition aims to reduce the negative aspects while stimulating the positive aspects of supporting private firms within the same branch. It was evident in our case studies that the cluster initiatives had brought buyers and producers in the local community into collaboration, and that this had been beneficial for both. In the Basketry Cluster, it is evident that the cluster initiative targeted vulnerable groups in an inclusive way and used methods appropriate to this specific group. Similar systems were used in Zanzibar Seaweed Cluster groups, where the income from cooperative soap sales was distributed in the group, while individual harvests were sold independently by each member.

With reference to Fu et al. (2011), the role of PACF seems to be highly relevant and important for the development and spread of local and appropriate knowledge production. The establishment of cluster initiatives with local actors including universities in the vicinity of the small scale business firms and local government officials leads to innovation taking place at a pace fitting the local stakeholders and in areas crucial for further development and competitiveness of the business. For example, in Lake Katwe, where salt has been extracted by manual labor for over 100 years, improvements in quality and work conditions can only be achieved with continuous experiments and dialogue on site with salt workers together with local scientists.

Learning is required within the clusters to build up their technical and managerial skills, and, most of all to build up the trust needed for future mutual knowledge sharing and learning. The latter is needed to go beyond the position of working only on designs and demand from external partners, and become competitive designers and producers in dynamic and changing markets. The skills acquired should facilitate the mobilisation of a wider range of specialised partners to the network, appropriate to the tasks to be accomplished. As we argued earlier, the concept of situated knowledge (Haraway 1988) put emphasis on prioritising local perspectives in the processes just described. In the cluster development programme, the cluster facilitators were trained to take on such a role and to coach the cluster members to organise learning platforms that could serve the functions of 'entrepreneurial experimentation' as well as 'legitimation' and in the 'development of external economies'.

In the cluster experiences, there are examples of how informal firms have realised the benefits of formal registering and compliance in exchange for governmental support that they would not access otherwise. This has been particularly clear in the Katwe Metal Cluster Initiative, where access to strategically located land, reliable power supply and other infrastructure has motivated joining firms.

Our examples show that the drive from informal to formal status of the cluster firms has several components. We argue that before procedures for linking the informal and formal sector regarding issues such as intellectual property rights, as presented by Chaminade et al. (2009), the relevance for the firms in the informal sector must be explicit. The relevance is built upon trust, knowledge development and sharing, and basic infrastructure. In all our examples, it has been evident that creating meeting places and joint activities are crucial and a first step towards a perception of relevance.

Universities are good intermediaries in innovation and cluster development

The ISCP Cluster Initiative came about as an off-spring to ongoing research cooperation with the aim to strengthen

research capacity at universities in developing countries. Training of academic staff remains the main item in that cooperation, simultaneously producing teachers and researchers. The universities were involved in the ISCP Cluster Initiative first as organisers of the Cluster training programmes and in the selection of viable clusters. Some of the selected clusters were created through the application of research results, for instance seaweed and mushroom cultivation and quality guaranteed seeds for horticulture. Most of the cluster facilitators are university staff, and those who are not have university degrees. Some of the junior facilitators have been stimulated to take up PhD studies on cluster development and Innovations Systems, and through this they have earned a closer linkage to or more central tasks at the national agencies responsible for science, technology, innovation and industry.

Most of the findings by Brundenius et al. (2009) are applicable to the context of the ISCP Cluster initiative and would be even more so in an upscaling of the initiative. The cluster story contains examples of applied research results and direct use of academic expertise, which fulfill an intermediary role. A shift of university to focus more on locally relevant research projects would involve lots of experimentation and gathering of experience, a role well performed by the cluster initiative. A testimony of this is the recognition given from the governments of Uganda and Tanzania who, after being presented to cluster results have increased funding for innovation at the universities. This was also evident in discussions at for example IMS who hosts the seaweed cluster in Zanzibar. The cluster has had spin-off effects on other research projects as well as on teaching and student projects.

The clusters involved differ in their needs. For some it would be appropriate to follow the proposition from Brundenius et al. (ibid.), and hire academically qualified staff. For others, hiring academic staff is not an option, as the needs for academic inputs are occasional. In such situations, the facilitators become brokers who find appropriate experts from the university. Involving Masters Students in solving problems for the cluster and being exposed to practicalities to which they apply their theoretical knowledge is another option that could be more systematically applied.

Just as the theory on universities' role as intermediaries can contribute with ideas for up scaling of cluster initiatives in developing countries, cluster initiatives have much to contribute to theory on how universities can act in emerging innovation systems. Cluster initiatives create an initial platform for interaction and mutual learning between universities, firms and farmers and governmental bodies. The model allows for evolution. The universities' role of awareness raising and experimentation with the fundamentals of innovation systems should not be underestimated.

Concluding remarks

We propose that cluster initiatives for / of firms and farmers is a useful model to start filling the gaps in emerging innovation systems. We base this suggestion on examples from Uganda and Tanzania. Cluster initiatives have been introduced in a similar way in e.g. Mozambique, Ghana, Nigeria and Bolivia. We found university researchers engaged in intermediary functions related to administrative tasks as well as collaborative research to develop business among socially vulnerable groups. The national umbrella function of PACF was also a facilitating aspect when it comes to knowledge sharing and inspiration, as well as legal and technical problem solving. We noted that the national committees also have important functions in co-evolutionary policy making with potentials for inducing reflexive governance of innovation systems.

Innovation policies are in the becoming in many developing countries. However, the theories of innovation policy need to be adjusted by empirical studies on the actual processes. Many of the described theoretical elements and approaches are useful, but there must be more openness to bottom-up perspectives and the perception of policies as confirming rather than prescribing issues in the innovation system.

The perspectives from Cozzens and Sutz (2012) as well as Arocena and Sutz (2012a) regarding inclusive innovation strategies are important contributions. Their approaches resemble the empirical findings in the cluster programme. Cluster initiatives are found to have effects for national as well as individual economic progress and security. We see that inclusive innovation currently taking place in clusters could be linked to development programmes aiming towards poverty eradication. For the ISCP cluster initiatives there is a growing determination of meeting demands from different social sectors. However, the opportunities to align cluster efforts to the national sector development programmes are still unexplored. To persuade governments and donors, there is a need for a stronger empirical and theoretical argument.

We also find a strong resemblance between the participation of universities in cluster programmes and the approach of 'developmental universities' suggested by Brundenius et al. (2009). Systematic study of cluster activities could enhance the empirical base for further elaboration of that approach.

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