

Analysing ICT Micro-Enterprises using Activity Theory: The Case of Mobile Regulation in India

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Abstract— There is an increasing presence of informal micro-enterprises in developing countries which use information and communications technology (ICTs) at the centre of their operations.

Analysis of such enterprises has so far focussed on the local practices of individual entrepreneurs which whilst significant, does not provide a complete understanding of how such enterprises evolve, underplaying wider contextual issues, such as entrepreneur interconnection, institutional environments and supply chain relations.

This paper illustrates an example of using Activity Theory to analyse ICT micro-enterprise. Activity Theory allows a dynamic understanding of evolving technology use, but with consideration to connected and heterogeneous ICT micro-entrepreneurs.

Index Terms—ICT micro-enterprise, entrepreneurship, technology appropriation, developing countries, policy

I. INTRODUCTION

INCREASINGLY in developing countries, micro-enterprises¹ are emerging locally which centre around using ICTs and/or digital products in areas such as mobile provision, internet cafes and video-film [2-4]. Typically, such enterprises contain elements of informality² which challenge conventional ‘business school’ understandings of enterprise and entrepreneurship.

For informal ICT micro-enterprises, the literature is mainly ethnographic, focussing on the ingenuity of ICT micro-entrepreneurs in modifying technologies and their local practices. However, there is little in the way of wider theorization and a weakness in linking between local practice and wider contextual issues, notably entrepreneur interconnection, understanding institutional environments and supply chain relations (e.g [2], [4]).

With the lack of wider understanding of informal ICT micro-enterprise, we have little knowledge of how ICT micro-

enterprises evolve and adapt over time, and how this relates to their uses of ICTs. In wider policy terms, this connects with a lack of guidance or policy understanding of such informal ICT micro-enterprises.

Activity Theory provides a potential framework to fill this gap. It provides a coherent way to analyse the *dynamics* of ICT micro-enterprises, focusing on local technology practices but within a wider social environment. In this paper Activity Theory is outlined and an application of Activity Theory is illustrated by way of worked examples from informal mobile micro-enterprise.

II. ACTIVITY THEORY MODELS

At its core, Activity Theory seeks to examine how wider change is closely connected into daily practice and actions. The main features are outlined below [6]:

- 1) Activity theory places *activity* at the centre of analysis, arguing that humans and tools can only be understood by examining their interaction and change within activity.
- 2) The basic unit of activity is an *action* which can be broken down into a triad of components; A *subject* (an individual) acting upon an *object*, done by way of a *mediating object* (a ‘tool’) (e.g. me (*subj*) using a hammer (*tool*) to hit a nail (*obj*)).
- 3) Actions can be considered from a *socio-historical position* as shown in Figure 1. Forms of tools and established practices are theorized to have emerged from longstanding forms of activity. Equally the present forms of tool and action will in turn shape future activity. Thus, historic action at time ($t-1$) shapes the forms of each of the respective components of the action triad (subject, object, mediating object) at the time (t), and will be further refined at time ($t+1$) through action at time (t).

Engeström’s models of Activity Theory is adopted in this paper, which can be used to understand more complex interactions, where a number of different actions and actors undertake interrelated activities. In this work, the triad of action outlined is increasingly subsumed into a wider *activity system* [7]

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¹ Micro-enterprises can be defined as enterprises with 10 or less employees (the large majority of which are single owner-operator businesses), where products are sold into the market [1]

² Informality refers to elements of micro-enterprise that for reasons of tax, licence, location, products or processes lie outside legal norms and/or how micro-enterprises are “not recognised, regulated, or protected by existing legal or regulatory frameworks” [5]

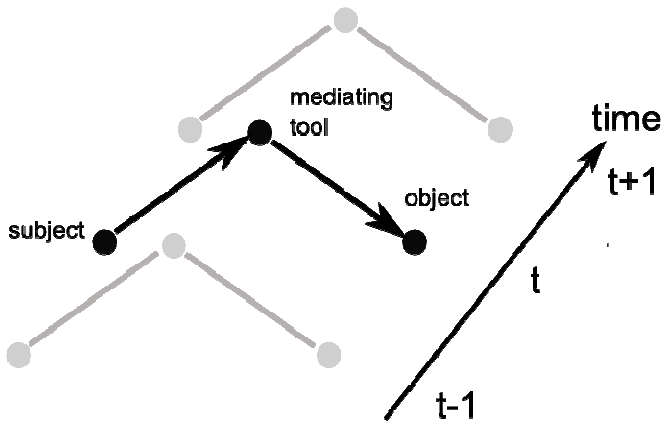


Fig. 1. Socio-historical view of actions. History of actions results in a change to the subject, object, mediating tool

In an Activity System, multiple *individuals* work to 'achieve shared *objects*'³, where individuals are part of a *community* (see Figure 2(b)). In more established activity systems, rules, divisions of labour and instruments and objects are crucial, and can be said to be mediators (see Figure(b)):

- *Instruments* - The multiple mediating tools, objects and mental processes (internalised tools) which mediate between the individuals and objects of activity
- *Rules* - The way that individuals negotiate their roles within a community
- *Division of labour* - The way that activity in the community is divided to achieve an object

Such mediation is again theorized as emerging to reflect historical modes of activity and interaction.

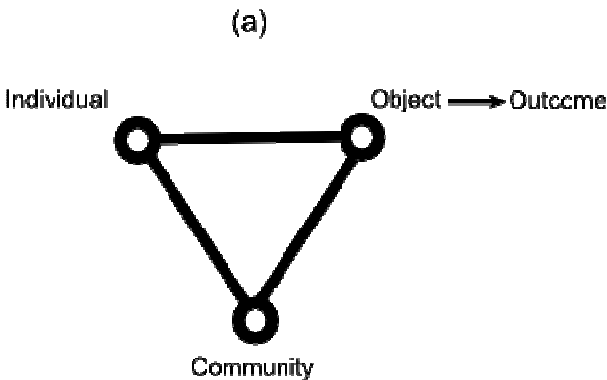


Fig. 2(a). Engeströms[7] model of an activity system. The previous model of actions is increasingly subsumed into a wider activity system model. Individuals are part of communities who work towards achieving 'shared objects'

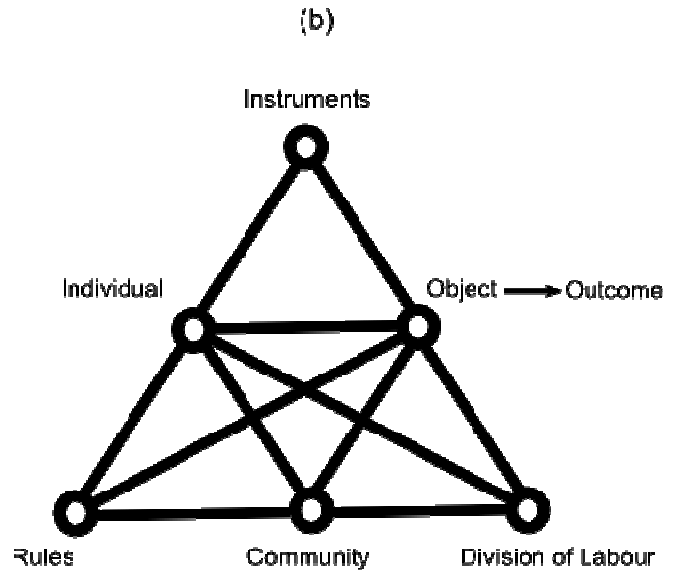


Fig. 2(b). Mediation in Engeströms[7] model; instruments, rules and division of labour act as mediators and are integral to shape the forms of activity within the system

Activity systems are not always stable and aligned. Engeström uses the notion of contradictions - tensions and collisions in an activity system that emerge over time – to understand the role of change. Contradictions emerge in and between components of activity system as shown in Figure 3. Contradictions are the basis for “new qualitative stages and forms of activity [which] emerge as solutions to the contradictions of the preceding stage of form” [7]. Thus, by analysing the emergence of contradictions, it is possible to build a more coherent understand the dynamic characteristics of an activity system and changes over time.

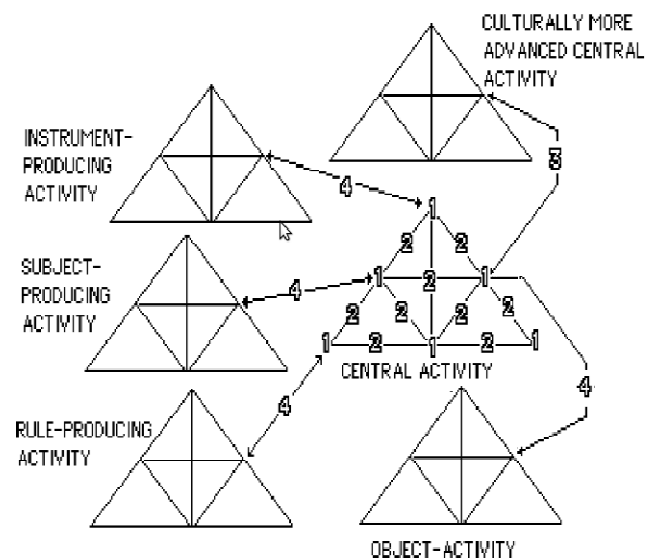


Fig. 3. Contradictions can be seen in multiple senses[7]:
 1) Within single elements of activity (i.e. competing objects of activities)
 2) Between elements of activity; (i.e. between rules and individuals)
 3) As activity systems evolve, between more advanced and older activities
 4) Between 'neighbouring' activity systems; (i.e. activity systems elsewhere which create instruments which are then transferred)

³ Which can be either physical items or mental states

III. USING ACTIVITY THEORY TO ANALYSE MOBILE MICRO-ENTERPRISE

A. Understanding Informal Mobile Micro-enterprise Forms

Activity Theory is used to outline typical dynamics of informal mobile micro-enterprises in developing countries, connected to serving base-of-the-pyramid (BoP) customers - lower income citizens, who mobile has reached as consumers [8].

In all sectors, BoP customers are commonly served through informal micro-enterprises. Figure 4(a) shows the makeup of a typical micro-enterprise which focuses towards BoP customers, using the components of an Activity system that were laid out previously. Micro-entrepreneurs through their close social connection to customers are able to understand local BoP needs, and informal micro-enterprises survive in all sectors by providing niche products for locals (such as by breaking products down to fit with small incomes etc.) [8]. Beyond this informal strategic approach, informal micro-enterprises are often aligned by the relational interconnections, between micro-enterprises, and the consequent informal norms created by interconnected and networked micro-enterprises [9].

As shown in Figure 4(b), there is a disconnect between these general norms of BoP provision, and models of formal mobile 'vendors'. By comparing the parallel components of these two

activity systems, we can see that there are a number of contradictions between them. There are contradictions in the *object* of activity - formal outlets do not necessarily succeed in providing appropriated mobile products for BoP customer needs. However, it is unlikely that a typical informal micro-entrepreneur, who better understand BoP needs, could integrate into formal mobile structures and contracts. This is connected to the contradictions between *rules* and the local informal networks of trust in the markets, bazaars and streets where trading occurs, against the more formal requirements of being a formal mobile vendor [10].

These contradictions between the two systems can be seen to be resolved through a hybrid - informal mobile micro-enterprises which are found in many developing countries. As outlined in Figure 4(c) such micro-enterprises should not be seen as passive 'vendors', but in line with BoP entrepreneurs in other fields, informal mobile micro-entrepreneurs actively create inventive niches which differentiates them from the wider market for BoP customers [11]. Such niches are achieved through socio-technical appropriations, small adaptations of technology or connected arrangements [4]. In terms of the relational aspects, evidence suggests that mobile micro-enterprises are often closely interconnected, becoming part of 'ecosystems', where micro-enterprises feed into one another and enterprises gain through clustering [12].

In sum, the Activity Theory model of mobile micro-enterprise in Figure 4(c) provides a clear model of mobile

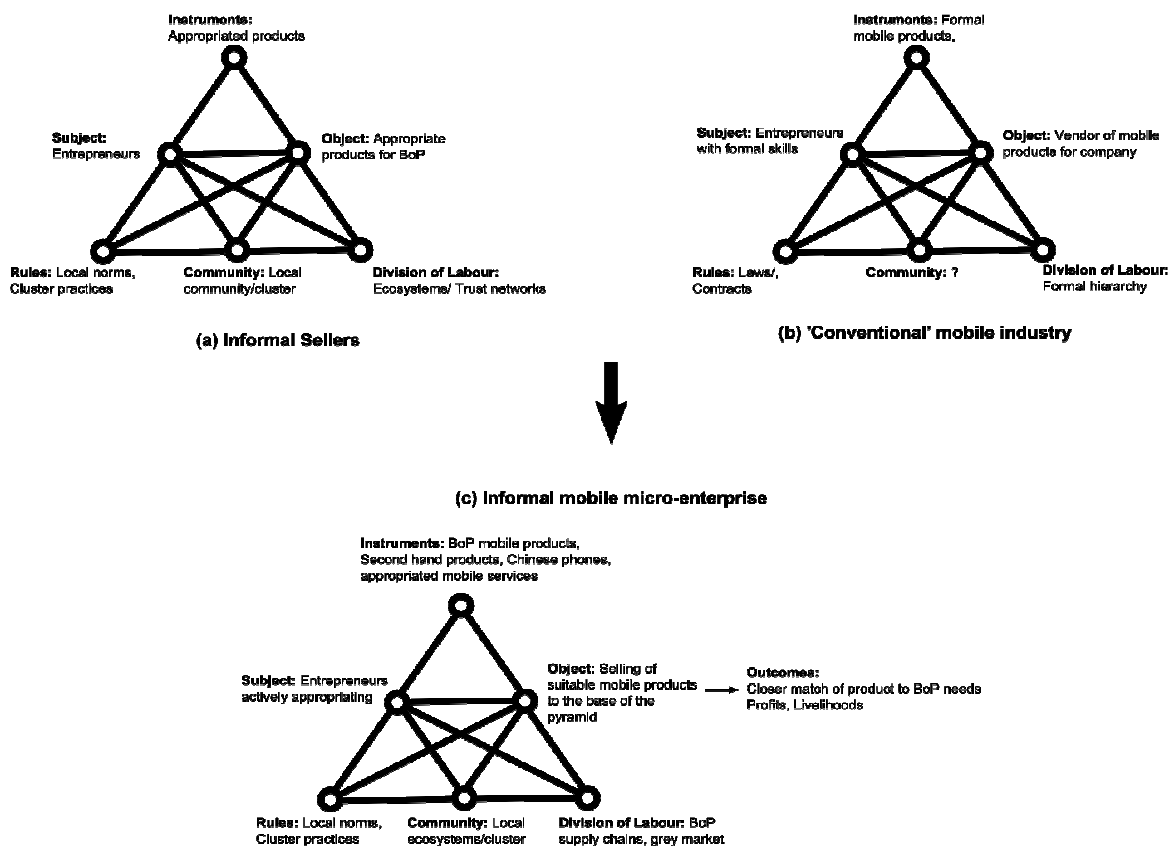


Fig 4: Understanding forms of informal mobile micro-enterprise using an Activity system model. Informal mobile micro-enterprises are considered as a hybrid emerging from the contradictions between two previous activity systems

micro-enterprises and its wider context. Such micro-entrepreneurs are not solely a contractor in the formal mobile supply chain. They are more autonomous and interconnected with their own rules and norms, adaptively pulling together multiple networks and technologies whether this is the supply chains of BoP products, or more informal chains of ‘unbranded’ Chinese phones and second hand items.

B. Sudden Contradictions: Mobile Handset Regulation in India

1) The Case

On 1st December 2009, mobile operators in India began enforcing a new regulation. Operators were required to operate an Equipment Identity Register (EIR), which would reject network access to mobiles which did not have an International Mobile Equipment Identity (IMEI) number⁴ [13], [14]. This seemingly minor regulation, turned out to be a massively disruptive moment both for mobile micro-entrepreneurs in India and BoP customers.

There are no definitive statistics on the extent of disruption, but there are reports of anywhere up to 30 million BoP phone users in India experienced problems, unable to use their mobiles on any network [15-17]. The disruption was focussed on the cheaper generic brand phones, typically imported through grey markets from China⁵ and distributed through informal mobile micro-enterprises. Such phones often avoid registration fees and regulation by not assigning a unique IMEI code to phones, and this was the cause of the December 1st disruption.

The regulation in India can be seen as specifically targeting imported Chinese phones. Such regulation was first suggested in 2004, within wider security consultation⁶ [20]. Operators slowed the impetus of regulation, fearful of potential disruption, “low end and marginal subscribers, could well have grey market handsets with duplicate IMEIs and would be adversely affected by stringent action” [21].

It was only after terrorist incidents in India⁷ that changes again started to move forwards⁸. To placate the operators, the

4 All GSM mobile phones have this unique IMEI number, which is transmitted during calls. The EIR is operator equipment which can accept or reject calls, based upon a white or blacklist of IMEIs.

5 Discussion on such Chinese phones is fraught with ambiguities, on one hand seen as a legitimate competitor to Western BoP firms in developing markets [18]. On the other hand, they are accused of cutting corners and infringing on intellectual property [19].

6 In the 2004 proposal, operators would implement EIR with blacklisting of all stolen phones in their network, each EIR would share blacklists through a national (and likely international) Central Equipment Identity Register (CEIR), allowing trans-operator and trans-national synchronisation of blacklists

7 For example, one of the main sources of evidence that the Mumbai bombers were Pakistani, was alleged to be connected to the IMEI of their mobiles (which embeds details of the country of distribution) [22]

8 Whereas wider consultations in 2004 had been around blocking all stolen phones and non-unique IMEIs, the newer approach was specifically targeted at Chinese phones [23], ignoring international security standards of CEIR/EIR blacklists [24], which makes the genuine effectiveness of the scheme debatable.

government worked in hand with MSAI (Mobile Standards Association of India) to open 1600, ‘Genuine IMEI Implant Program’ (GII) outlets in India [25], whose role was to fix Chinese phones “for the benefit of genuine innocent mobile customers who have unwittingly bought such handsets” [26].

However, as suggested by the scale and chaos of the fallout, it is debatable whether such a scheme made more than small dent in the problems. For example, there is suggestion of a lack of provision in GII centres [15], [17]; in the cost, which was likely prohibitive for the poorest (R199 (~\$4.25)); and stated doubts of mobile micro-entrepreneurs as to the long-term viability of such IMEI ‘implanting’ (see discussions at [27]).

In sum, a seemingly small policy change had significant effects, in this case potentially jeopardizing the key products and reputations of many informal mobile phone entrepreneurs, who many argue have been central to enabling mobile to reach BoP customers in developing countries [28]. In addition the way the policy changes have occurred has put a significant number of marginal livelihoods at risk.

2) Using Activity Theory to Analyse Change

An activity theory model theorizes a wider significance of technology, beyond simply being an object. In this Indian case, Chinese phones are not simply a technology, they are deeply entwined into the connected micro-entrepreneurs, and their form influences the practices of the mobile micro-enterprise activity system. With their sudden removal, contradictions emerge within activity systems which point to increasing instability of mobile micro-enterprise due to these regulatory changes.

As shown in Figure 5, in terms of contradiction in *instruments*, many technology products will no longer be viable for micro-entrepreneurs, and this will have knock on effects in terms of supplying niche products to BoP customers. In addition, from an activity theory view such changes threaten long established forms of appropriation and repair amongst mobile micro-entrepreneurs. Examining the contradictions related to the *division of labour*, mobile supply chains have been documented as a source of knowledge, learning, credit and social capital [4], thus sudden disruption of supply chain could have spillover effects on the viability of the complete activity system. Other contradictions are also brought into focus by the regulation change, the local *rules* and norms of entrepreneurs are being questioned with the enforcement of law, and this might affect the way that micro-entrepreneurs articulate themselves in the long term. Equally BoP customers are likely less willing to interact with micro-entrepreneurs.

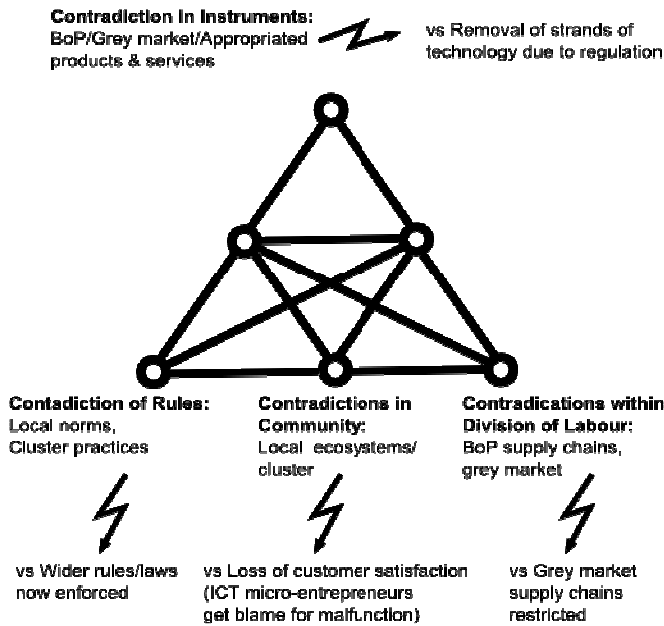


Fig 5: Sudden change in mobile regulations leads to widespread contradictions and instability in the informal micro-entrepreneurs' activity system

In an activity system theorisation, contradictions are likely to be resolved through change in the activity system. There are a number of potential transformation paths, as illustrated in Figure 6. For the original policy makers, the top-most transformation shown is likely the intended outcome - technological change leads to entrepreneurs opting toward other more acceptable handsets. But is this realistic? As the Figure 6 shows, other transformations seem more likely. This is attested to by reports from India, where mobile micro-entrepreneurs have been documented as further appropriating technology, offering informal IMEI implanting and software flashing to work around the law [29], [25]. This is not a surprise, given long standing and stable local practices and relations, such modifications of technology are more viable than deeper changes, to which the regulator aspire.

Nevertheless, considering the importance of loyalty in the relationship between mobile micro-entrepreneurs and BoP customers [11], [2] there will inevitably be some loss of customers (and potentially a loss of confidence in ICTs for BoP customers). There is evidence of this in strategies of Chinese manufacturers now looking to buy stakes in Indian mobile phone production, keenly aware of a loss of reputation of both Chinese mobile products and mobile micro-entrepreneurs [30].

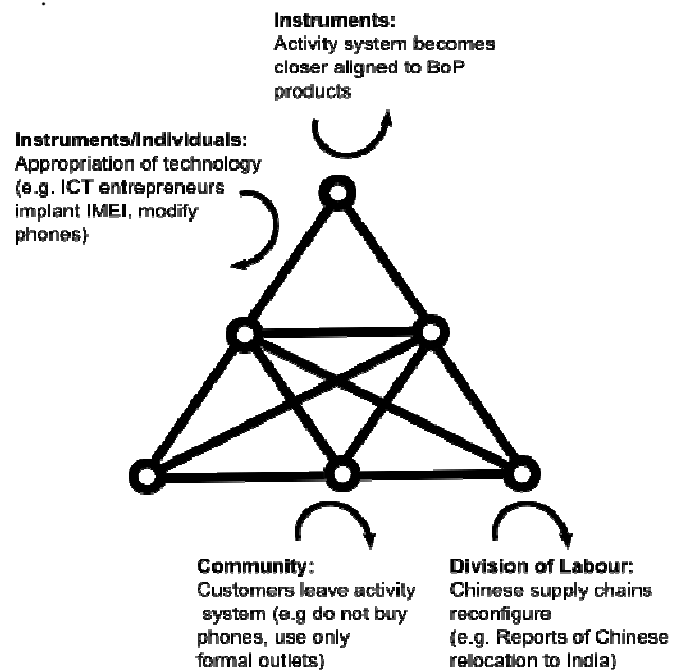


Fig 6: Possible transformations connected to contradictions

In sum, whilst there was some inkling of the impact that regulation would bring, there seems to have been very little analysis of the potential of the knock-on effects on ICT micro-enterprise or amongst BoP customers. As the activity theory models suggest, given appropriate instruments, it is possible that the mode and outcomes of such regulation could have implemented in a more coherent and far less damaging way.

IV. SUMMARY

This paper has deliberately taken a wide sub-sector of ICT micro-enterprise and a strongly disjunctive moment to illustrate the use of activity theory. However, the framework can also be applicable and insightful when trying to understand more subtle links between local practices and technologies [31].

Activity Theory offers a theoretical contribution to studying ICT micro-enterprise in several ways. By analysing practice, within the constraints of wider activity systems, Activity Theory is able to offer a coherent and dynamic analysis of actions, and connecting them into wider flows and structures. The notion of socio-history is crucial in that the focus is on ongoing dynamic change and how this shapes future interactions.

As vividly illustrated in this case, in addition to evolutionary growth of enterprise, there are often sudden disjunctive moments in ICT micro-enterprise. Activity Theory provides room to analyse both the evolutionary paths and sudden

disjunctive moments and how entrepreneurs respond to these changes.

More generally, researchers might also consider Activity Theory as a good fit to analyse complex technologically-led 'grassroots innovation' and 'per-poor interventions' in developing countries that are increasing emerging within the ICTD and ICT4D literature [32], [33], helping to connect between increasingly heterogeneous socio-technical practices and wider contexts.

Activity Theory also critiques the prevailing notion in ICT4D of ICT as simply a tool or of theorisations where ICT is present in name only [34], [35]. In Activity Theory technology objects are theorised in a more expansive way, seen as actively changing, and a meaning maker within technology-led actions.

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