A travelogue of 100 laptops

Investigating Development, Actor-Network Theory & One Laptop per Child

Lars Bo Andersen
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A warm thank you..

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Preface
Tension and multiplicity

Maybe some of you have been wondering who is this tall white man who has been walking around at the school?

He is uncle Lars and he is here to keep an eye on that you behave and work hard, and he might select the best of you to go to Denmark!

We would like to encourage you to use more of the open-open approach because this is where the learner centred teaching takes place the most.

The child centred approach professor Jørgen and professor Henrik presented to the teachers during training is not new at all because our teacher training in this country is [already] child centred.

I have a question about the new pedagogy. I know that you missionaries don’t like the bulala [a rattan cane], but we here in Africa...

No John, we have left that behind, we are not using that any more!

These students are like donkeys, unless I cane them they don't work, so now they are bringing an even bigger cane, then you will see them work!

Somebody then just come in and stays for a week or so, and tell you that all the things you have learned in the past, you can just keep them, we are bringing in something that the child needs.

When they start reaching the hands of the world's children, these robust and versatile machines will enable kids to become more active in their own learning.

It is just like marketing, that is what I feel, when you show them the pictures with the students working with the laptops they will be very happy and know that the money has worked.

Do you know why you are not allowed to take the laptops home?
Yes, hehe, because this is Nigeria! If they go back with this one they will not bring it again.

When we talk and write and occupy ourselves with education then we are lifting humans towards the path that God, our Father, has created for us.

What do you want to be when you grow up?

A man of God!

We have experienced so many technical problems in terms of the solar system and the subscription.

But now you are still talking about the technical matters. May I suggest something? We are seeing this differently. The technology on one side and the teaching on the other!

Then it has really sunk to a low level this computer, it has gone from being a tool of learning to a mere toy!

If I were to give you computers right now what would you do?

Play games!

These are fragments from the following study of 100 laptops from One Laptop per Child (OLPC) going to a small school in Nigeria. They are taken from interviews, observations and documents, and they give voice to more or less diverging positions and identities.

When reading through them, relating one to another, trying to form order and make sense, a tension arises as there is no neutral or straightforward way of doing so. Sure enough, parts may be aligned with others, but there is no overall coherence to make sense of it all.

As such, tension and multiplicity is the analytical outset.

This means that no theoretical order is made from empirical disorder. The purpose is rather to investigate the implications of allowing disorder to remain disorderly.

The theoretical outset for doing so is Actor-Network Theory (ANT).
The thesis proceeds like this:
The introduction and the first chapter on OLPC provide some themes related to development which are drawn upon in later chapters. These themes are also used to formulate and substantiate research agendas.

Next is a chapter investigating ANT as a vocabulary for development and one doing the same for methodology.

Then follows three chapters investigating the movement of laptops to Nigeria and what became of them once there.

The last chapter reflects on the travelogue in relation to the post-colonial critique of development.

Thank you for reading,

*Lars Bo Andersen, Aarhus, 2013*
n 2005, former UN Secretary General Kofi Annan helped unveil a small device in front of an international audience in Tunis. It was a little green laptop with a bright yellow crank sticking out from the side. This device, Annan (2005) told the audience, held promise of major advances in social and economic development. The delegates had come from all over the world. There were politicians, academics, journalists, lobbyists and businessmen, and they were there to debate the role of information technology in achieving a better and more equal future for humankind (WSIS, 2003). A few years later, Akila, a Nigerian primary 5 student, was made to change schools by his parents, because at the new school, they had acquired 100 small green laptops for their students. Although similar in appearance, these were not the same laptops as those presented by Annan. However popular with the audience in Tunis, the laptops did not travel to Nigeria under their own steam. Riding along with others, making detours, making friends, the laptops ventured into what was really a process of becoming, a transformative movement that did not end upon arrival at Akila's school. In fact, as is known by immigrants, anthropologists, and laptops alike, settling in is an equally strenuous process of becoming.

The laptop presented in Tunis was from the American One Laptop per Child (OLPC) organisation. As the name implies, OLPC aims to equip every child in the world with their own laptop. The purpose of so doing is to create new educational opportunity for children such as Akila and empower them to participate in the information society.

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1 I use OLPC as a collective term for what is, as of writing, the legally distinct entities One Laptop per Child Foundation, One Laptop per Child Association, and to some extend also Sugar Labs – a spin-off from OLPC which develops and maintains the special Sugar operating system running on the laptops.
To OLPC, the challenge we currently face is that while “the pace of change in the world increases dramatically” our “educational systems remain rooted in the past”, which is especially true in the developing world, causing the “gaps in equity in education and subsequent opportunity” to increase (OLPC Website, 2013a). While we rush toward a new existence in the information society, children of impoverished origins are stuck in outdated, colonial school systems, with little chance of competing in the new global order. However, the root cause of this disparity, information technology, also provides the key to the solution:

The root cause of the rapid change (digital technology) also provides the key for the solution. When every child has a connected laptop, they have in their hands the key to full development and participation. Limits are erased as they can learn and work with passionate experts around the world; they can access high-quality, modern materials; they can engage their passions and develop their expertise. (OLPC Website, 2013a)

Thus, laptops to OLPC offer not only each child educational opportunity, they are also a means of global inclusion, a way of bridging the digital divide.

OLPC has focused on large-scale deployments according to a principle of digital saturation. If you deploy thousands, or even millions, of laptops in a given area the children and their parents will form networks of learning, connecting them to each other, to the world and to a brighter future (OLPC Website, 2013c; OLPC Wiki, 2013b). In order to meet the ambition of digital saturation, OLPC has collaborated with major technology companies to design and manufacture a small laptop called the XO, better known as the $100 laptop, which makes use of a range of clever innovations such as mesh-network and dual-mode display. Through economy of scale, low manufacturing costs and low-power components, the XO is appropriate to developing countries with a price-tag intended to become as low as $100. The laptop also features a special operating system called Sugar based on Seymour Papert’s (1993) constructionist pedagogy. The idea is that laptops can stimulate children's natural ability to learn and engage in playful experiments. They are things to think with that enable adept children to learn and explore the world regardless of the condition of their school, the quality of their teachers, or the lack of traditional teaching.
materials. OLPC Chairman Nicholas Negroponte has, for instance, described the XO laptop as a school-in-a-box (OLPC Talks, 2007d).

This thesis is the travelogue of 100 OLPC laptops that reached Akila’s school in Nigeria by way of Danish researchers and a Christian missionary NGO. Or rather, it is the travelogues, in plural, of the criss-cross movements of all sorts of people, technologies, theories and finances that not only got the laptops to Nigeria, but also constituted them as unique socio-technical entities. And yet again, it is also my travelogue as a researcher tracking down these movements in both Denmark and Nigeria, trying to translate them into an academic thesis. Ultimately, my purpose is to highlight how all these intersecting movements constitute a process of becoming for technologies being transferred – technologies which we otherwise deem complete and ready for implementation (q.v. The first debate: do laptops empower, right out of the box?, p. 44).

The insight I wish to convey by assuming the language of movements and travelogues is similar to that of Marc Berg, when he warned his fellow CSCW scholars that the impact of technology could not be foreseen, or controlled, since the logic and ontology of both laptops and workplace software “is not predetermined but emergent, always remaining an empirical matter” (Berg, 1998, p. 475 – italics in original). This, I think, could be a valuable contribution to development practice, where much hope rests on making a positive difference through transferring technology (we return to that in a moment). That technology does not transfer linearly from A to B, that transfer is instead a multilinear tangle and so too are the vehicles being transferred. As will be explored in different ways throughout this thesis, this is very different from conceptualising laptops as ready-made objects introduced into novel social contexts. It means that I consider laptops not as pieces of hardware, but as specific socio-technical achievements that cannot move without becoming different in consequence.

The travelogue involves a quite heterogeneous group of actors. OLPC plays an important part. But the transfer was also facilitated by researchers, businessmen and missionaries from Denmark. The Danes went into partnership with a
Nigerian church, which agreed for the use of laptops at one of their primary schools. A range of consultants also helped to implement the laptops in Nigeria. Among these are an American computer scientist, Danish pedagogical researchers and Nigerian engineers. The project also makes use of a range of supporting technologies such as solar panels and satellites. All these helped to make possible the socio-technical achievements that are the OLPC laptops at Akila’s school, and in order to trace these different actors I conducted multisited, qualitative fieldwork in the period between 2009 and 2013 (q.v. Method & Travelogue, p. 81). I twice carried out fieldwork at Akila’s school, first in 2009 and again in 2011, and in between I conducted interviews and participant observation in Denmark.

The travelogue is based on Actor-Network Theory (ANT) and related positions within the wider field of Science, Technology, Society studies (STS). ANT is a vocabulary that does not differentiate between subject and object, society and nature, or particularly relevant to this text, developer and developing. Laptops, Akila and OLPC are all described under one as actor-networks, which is another way of saying that they are multilinear tangles rather than bounded and self-contained objects, subjects and organisations.

We return to actor-networks in more detail in chapter 2 (p. 59). The purpose of this introduction is to position Akila’s laptop in the wider debate about technology and development, and to this end, there is another interesting trait of ANT: It does not operate with a traditional distinction between theory and framework on one side, and empirical data on the other. As a theory, it does not apply to anything, as Bruno Latour (2005, p. 141) argues. Rather, it facilitates and moderates an encounter between several lines of both theory and practice, it allows informants and researchers alike to “mix up organization, hardware, psychology, and politics in one sentence” (ibid.).

The facilitation, however, is not free of charge. ANT allows for this mixing up of theory and practice only on the premise that the hybrid, that which is impure and of mixed origin, be the foundation for negotiation. In other words, the encounter is set in a special ANT ontology (q.v. An ontology of actor-net-
works, p. 69). Similarly, at the outset, all lines are ignored in their claims of truth or privilege, and treated equally according to a principle of symmetry (Callon, 1986a). The symmetry does not amount to equality among diverse positions, to relativism. It simply means that when lines of diverse theory and practice intersect, as they do in the following chapters, they are not dismissed as true or false from the outset but followed to see what they amount to in practice.

Three groups of lines are followed in this thesis. There are the theory-practices within development in general, and OLPC more specifically. These are outlined in remaining introduction and elaborated in later chapters. There are also the theory-practices of those involved in bringing laptops to Nigeria. These were hinted at in the preface and take up large parts of the chapters later on. And then there are the theory-practices which I myself bring to this study which is ANT and the writing of this thesis.

The introduction now presents the broader fields, the theory-practices, to which the travelogue relates, and uses these to formulate five research agendas. The fields are dispersed across several disciplines but all are concerned with technology and development. We begin with an outline of the history of technology transfers in development in order to position OLPC in relation to long established themes of developmental leapfrogs, empowerment against polarisation, and white elephants. We then turn to the critique of development by post-colonial scholars in order to relay ANT as a theory with much the same outset but also with a few important differences. Finally, the movement of laptops is related to theories of technology transfer and -diffusion. As we go along, research agendas are made explicit (look for the Research agenda: prefix on headings) before being summarised on p. 29.

**A history of technology transfers and development**

As an initiative aimed at doing good through the large-scale distribution of laptops to impoverished children, OLPC is heavily embedded in the history, theories, and debates concerning technology transfer and development.

The history of technology transfer is not only distributed across many dif-
different countries and political agendas, but also spans an array of diverse academic disciplines, including anthropology, economics, political science, sociology, engineering, and so on. Thus, the purpose here is not to provide a grand narrative of technology transfer in development. But instead, to outline first of all that there is a history of technology transfer in development, and that this history has some recurrent themes, such as convergence contra dependency, which resonate into OLPC and all the way to Akila's school (we return to these towards the end of the thesis q.v. Molar lines from the archive, p. 207).

The post-war birth of development

The history of moving technology around to further political or economic interests is as long as human civilisation itself (e.g. McNeill & McNeill, 2003). However, it is widely recognised that the transfer of technology as part of development originates in the socio-political displacements following World War II (Easterly, 2007; Escobar, 1995; Jolly, Emmerij, Ghai, & Lapeyre, 2004; Leys, 1996; Seely, 2003).

There are multiple entry points to this story, but the inaugural speech of Harry Truman's second presidency in 1949 is a favourite. In the speech, Truman effectively demarcates the two modern worlds of the USSR and Europe-USA from all the world's other countries which are grouped under one as the Third World; in other words, those who are developed, and may help to develop, from those in need of being developed.

With two of the “most frightful wars in history” fresh in memory, and diametrically opposed to the “false philosophy” of the Second World—“a regime with contrary aims and a totally different concept of life”—Truman (1949) made the development of the former colonies of Africa, Asia and Latin America the fourth point of his presidency and a central theme for the second half of the 20th century.

Fourth, we must embark on a bold new program for making the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas.

More than half the people of the world are living in conditions approaching misery. Their food is inadequate. They are victims of disease. Their economic life is primitive and stagnant. Their poverty is a handicap and a threat both to
them and to more prosperous areas.

For the first time in history, humanity possesses the knowledge and skill to relieve suffering of these people. (Truman, 1949)

A few years earlier, Truman’s first administration had launched the European Recovery Program, better known as the Marshall Plan, which became “the most massive technology transfer in history” (Seely, 2003, p. 11). At war’s end large parts of Europe lay in ruins; millions had been left homeless, and many regions were on the verge of famine. The severity of the situation, combined with the desire for political stability in Europe, especially in relation to the containment of communism, had prompted Truman to fund the Marshall Plan. The success of the plan created confidence in the ability of technology to induce developmental leapfrogs, as most recipient countries in Europe benefited greatly from the injection of American science and technology (Leys, 1996, p. 8; Seely, 2003, p. 11).

The plan had “brought new hope to all mankind” and Truman (1949) ventured to expand this type of assistance to Third World countries, forming a new type of relation void of the old imperialism, one that would turn the booming reservoir of American science and technology into an agency for development:

I believe that we should make available to peace-loving peoples the benefits of our store of technical knowledge in order to help them realize their aspirations for a better life. And, in cooperation with other nations, we should foster capital investment in areas needing development.

The old imperialism—exploitation for foreign profit—has no place in our plans. What we envisage is a program of development based on the concepts of democratic fair-dealing. (Truman, 1949)

By 1950, Truman had convinced Congress to fund 60% of the new United Nations Expanded Program of Technical Assistance (UNEPTA), the largest UN programme at the time, which, in 1965, merged to become the well known United Nations Development Programme (UNDP) (Moore & Pubantz, 2008, p. 120).

In the following decades, faith that technology could induce development
stood at a highpoint. Looking back, a high-ranking civil servant with Danida\(^2\) describes the contemporary belief that the problems of the Third World would soon be resolved, as had been the case in Europe, through the transfer of science, capital and technology.

It didn’t occur to us in the beginning of the 1960s, that any of us would reach the other side of the Silver Jubilee working with Danish development. We really thought that the development decade [...] would bring so many transfers and spark so many initiatives that growth would follow, and extreme poverty would be eradicated. (Villadsen & Heldgaard, 2012 - my translation)

**Hopes for convergence and modernisation**

One of six formal agendas for the official UN Development Decade of the 1960s was: “A *redirection* of science and technology to attack the problems of developing countries“ (Jolly et al., 2004, p. 89 – emphasis added). An indicative event in this regard was a 1963 conference in Geneva on the *Application of Science and Technology for the Benefit of the Less Developed Areas* (UNCAST). The conference was “marked by great optimism on the part of developing countries [which hoped to] accelerate their progress by applying many of the latest advances in science and technology” (Jolly et al., 2004, p. 96).

The challenge they faced, however, was a “*growing gap* between the amount of research and application in developed and developing countries”, which left the delegates with the challenge of how to bridge that divide (ibid. - emphasis added). Bridging the gap is indeed a good characterisation of the problem as diagnosed. That socio-economic disparity could be turned into socio-economic *convergence* through more equal distribution of science and technology:

The common feature of assistance from foundations, the United Nations, World Bank, the United States, or Soviet governments was the automatic assumption that economic development required the transfer of advanced Western technology—hardware, industrial processes, knowledge, and skills. (Seely, 2003, p. 13)

Looking at the neoclassical growth theory of the 1950s and 1960s, one motivation for considering technology transfer as directly proportional to econom-

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\(^2\) The Danish International Development Agency – the Danish equivalent to USAID and other such national development organisations.
ic growth lies in exactly such a convergence theory stating that economic polarisation will converge and align over time (Gilpin & Gilpin, 2001, pp. 109–111). The dogma within this type of economic theory holds that investment in capital and labour yields diminishing returns over time, making growth dependent on technological progress, or the exploitation of workers, to compensate. With large technological gaps between developing and developed countries, the transfer of technology thus becomes catalyst for developmental leapfrogs. Technological investment in poor countries should produce more rapid growth than equivalent investment in already industrialised countries. Accordingly, through transfer of technology it is possible for developing countries to increase their growth in both absolute and relative terms (ibid.).

One of the most influential scholars and foremost proponents of economic as well as ideological convergence of the 1960s was Walt Whitman Rostow, who created a capitalist model for development along Marxist inspired stages of growth.³ To Rostow and his followers, bridging the great divide between traditional and modern, underdeveloped and developed, is dependable on passing a developmental tipping point called take-off, in which the socio-economic obstacles of traditional society are finally transcended in order to make way for modernisation (Rostow, 1990, p. 58). Rostow’s tipping point is similar in function to the abrupt inversion that Marx with Hegel called the umschlag—the “leap-like inversion or overthrow, in which the previous barrier […] is negated”, and a higher level of development is attained in the dialectics of history (Marx, 1993, p. 486; Marx & Engels, 1998; Nicolaus, 1973, p. 32).

Rostow’s theory of modernisation too holds that such an umschlag, take-off or leapfrog can be achieved through the transfer of modern technology, combined with the rationalisation of traditional culture (which for Rostow meant a pre-Newtonian attitude to nature). As described in his non-communist manifesto for development, Stages of Growth, of 1960:

³ Although a convinced liberal who served on the Kennedy campaign and was appointed National Security Advisor to the Johnson administration, Rostow’s influential developmental theory holds great similarity with Marxism in its theorisation of how traditional societies develops in several defined stages through the continued adaptation of modern industrial technology (Rostow, 1990, p. 145). The difference between the communist and the capitalist version of modernisation lie in what awaits at the end of history, and not in which (productive) force will lead us there. For a contemporary debate on the end-stage of dialectical history see also (Fukuyama, 2006).
...the concept must be spread that man need not regard his physical environment as virtually a factor given by nature and providence, but as an ordered world which, if rationally understood, can be manipulated in ways which yield productive change and, in one dimension at least, progress […] The take-off is defined as an industrial revolution, tied directly to the radical changes in methods of production, having their decisive consequence over a relatively short period of time. (Rostow, 1990, pp. 19 & 57)

Third World countries were described as being in an original state to be left behind in the progression towards higher levels of development, until reaching a kind of utopian endpoint in history. As described by Arturo Escobar in his polemic with these convergence-style technology transfers:

Technology, it was believed, would not only amplify material progress, it would also confer upon it a sense of direction and significance. In the vast literature on the sociology of modernization, technology was theorized as a sort of moral force that would operate by creating an ethics of innovation, yield, and result. Technology thus contributed to the planetary extension of modernist ideals. (Escobar, 1995, p. 36)

Fears of dependency and network imperialism

However influential, modernisation theory was already challenged in the 1960s by dependency theory. The principal argument of dependency theory is that asymmetrical power structures between centres and peripheries are reinforced by science and technology. The dependency theorists do not see technology as self-sustaining objects to be given away out of charity. Rather, technology is inherently enmeshed in already existing socio-political relations. As described by Johan Galtung (1971, p. 98), when an industrialised nation produces tractors for a developing country, it gains technological capacity whereas the developing country gains only a short-lived material object. Thus, the developing country helps uphold the capacity for tractor production in the industrialised country while remaining dependent on this capacity for its agriculture.

For the dependency theorists, technology is a relational construct that remains embedded in the socio-political structures of imperialist centres, even if transferred to some poor country. Galtung (1971), for instance, describes a network imperialism, replacing the dying colonialism, where centre-nations (e.g. Denmark) establish intimate connections with the centre of periphery-nations.
(e.g. Bangladesh)—trading, outsourcing and exchanging technology—causing both the Danish periphery (e.g. unemployed workers) and the Bangladeshi periphery (e.g. textile workers) to come out at the loosing end. Technologies may just as much enable centres to reinforce their position as it may empower those at the periphery to protest. Writing in the 1970s, Galtung (1971, p. 95) foresaw much of the debate over the digital divide in describing a system of imperialism mediated by instant communication, connecting different centres through links that “form and dissolve in rapid succession, changing scope and domain, highly adjustable to external circumstance”.

**A troubled past of white elephants**

Although both dependency and convergence linger in public discourse as well as academia, the post-WWII faith in technology transfer became diluted in the 1970s (Friedmann, 1992, p. 4; Seely, 2003, p. 19). Indeed none of the least developed countries leapfrogged during the 1960s, and the optimistic promise of development through science and technology became subject to increasing criticism (see e.g. Jolly et al., 2004, p. 73).

Often failing miserably, the technology transfers of the modernisation era were dubbed *white elephants* after the sacred animals kept by South-East Asian monarchs (e.g. Salomon & Lebeau, 1993, p. 122). White elephants are of great social and cultural significance, but of no *practical* use as they are sanctioned from physical labour. The same holds in development where white elephants signify some degree of non-use or non-sustainability of an otherwise praised technology. For instance, when the board of Danida was informed that the $33 million Denmark Road in Ghana had started to erode after only 5 years because no one had considered the overload common on Ghanaian lorries, it became a (paradoxically overused) white elephant “confirming all people's prejudices about development” (Katic, 2010 - my translation). Similarly, when the agency's 50-year anniversary magazine reached readers across the developing world, it was lauded for finally making white elephants a main theme:

> Our first reaction from the big world is an Ugandan reader who comments that the notion “white elephant” – failed projects – has now, after 50 years, found its way to the cover of a Danida publication.

*(Villadsen & Heldgaard, 2012 - my translation)*
In recognition of these difficulties, recent years have seen frequent calls for increased project evaluation and impact measurement. As Judy Baker writes in her World Bank handbook on evaluating development, while the last 50 years have brought insights on what works in general, little is known about how to get actual projects to work:

Despite the billions of dollars spent on development assistance each year, there is still very little known about the actual impact of projects on the poor. There is broad evidence on the benefits of economic growth, investments in human capital, and the provision of safety nets for the poor. But for a specific program or project in a given country, is the intervention producing the intended benefits and what was the overall impact on the population?

(Baker, 2000, p. vi)

**Research agenda: accounting for struggling projects**

We now approach the first research agenda. The recent resurgence of technology transfers (which we turn to below) are also troubled by low success rates and little knowledge of why some projects succeed where others fail (Unwin, 2009, p. 5). Initiatives like OLPC are criticised because they “totally ignores the failed modernization programmes concerning media and education of the past” (Leye, 2007, p. 985). As also stated by Tim Unwin, the UNESCO chair in ICT4D:4

Too few ICT4D activities, especially in Africa, have yet proved to be successful or sustainable. However, we actually know rather little about this because of the paucity of rigorous monitoring and evaluation studies that have yet been undertaken. (Unwin, 2009, p. 5)

The OLPC project at Akila’s school is not going too well either. Starting out strong in 2009, the project has since fallen into a form of impasse. The laptops are still there, and kept in good working order. Likewise, there is still money and support available from Denmark. But the laptops have failed to deliver on their promises and are only used occasionally. The project is in danger of adding another white elephant to the history of technology in development. Accordingly, an important agenda of this thesis is to investigate the agencies that have led to this situation as well as those who may yet revitalise the pro-

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4 Information and Communication Technology for Development (ICT4D) is an academic field which has risen in response to the present wave of developmental ICT projects.
project. This is done in chapter 6 (Falling Into Limbo, p. 167).

Digital divides: the debate resurrected

During the 1970s and 1980s, the focus on technology waned and gave way to structural adjustment programs (SAPs), structural transformation schemes and multilateral theories “less ideological and more economic in nature”, while dependency underpinned a plethora of poverty-oriented basic-needs approaches (Devarajan & Fengler, 2013; Leys, 1996, pp. 112–116; Seely, 2003, pp. 19–22). However, with the advent of the internet and other digital technologies in the 1990s, themes of technologically induced convergence and dependency again became prominent in the development debate. One of the strongest manifestations of the resurgence was the debate over the digital divide.

Although the exact origin of the term digital divide is disputed, at least one version originates in the Clinton-Gore administration of the 1990s (Gunkel, 2003, p. 501). The administration was faced with the problem that real income of the wealthy was on the rise while real income of the poor was in decline (De Miranda, 2008, p. 36). The nation was growing apart and a series of reports from the NTIA\(^5\) exposed a similar disparity in access to, and use of, the new information technologies along the dimensions of income, race\(^6\) and gender (e.g. NTIA, 1999). With information technologies becoming “increasingly critical to economic success and personal advancement”, a link was forged between economic and technological disparity, so as the latter could help bridge the former:

> Information tools, such as the personal computer and the Internet, are increasingly critical to economic success and personal advancement. *Falling Through the Net: Defining the Digital Divide* finds that more Americans than ever have access to telephones, computers, and the Internet. At the same time, however, NTIA has found that there is still a significant "digital divide" separating American information "haves" and "have nots." Indeed, in many instances, the digital divide has *widened* in the last year. (NTIA, 1999, p. xiii)

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5 The National Telecommunications and Information Administration.
6 A more recent example of such coincidence in disparities comes from the roll-out of Google Fiber in Kansas City, Missouri (Wohlsen, 2012). In order for the various neighbourhoods in Kansas City to qualify for super fast internet from Google a certain percentage of households needed to pre-register. And while the “white, affluent neighborhoods” west of Troost Avenue all qualified the “primarily black, lower-income neighborhoods didn’t” (ibid.).
Since the 1990s, the digital divide has grown from a national problem in the US to a global concern for a wide variety of actors. Countries such as China and India have formed policy groups for ICT and development, the UN has created the *Digital Opportunities Task Force* and invited not only all the world’s governments, but also major IT companies, academics and NGOs to the *World Summit on the Information Society* (WSIS) in the early 2000s. And, as of writing, Mark Zuckerberg has launched the internet.org initiative to get the whole world online – taking over from AMD’s now abandoned 50x15 project aimed at doing the same (although for only half the world).

**New fears of disparity**

The debate around the digital divide also contained renewed fears of dependency and exploitive network capitalism. In volume one of *The Information Age*, Manuel Castells (1996, pp. 16–17) argues that we are currently experiencing a shift from an industrial to an informational society – a shift from modes of development based on energy, to modes of development based on information. The shift also brings a reorientation of economic actors from their immediate geographical surroundings, the space of places, to a global network of socio-economic activity; the *space of flow* (ibid., p. 422). In contrast to the industrial zones of the twentieth century, the space of flow is an ahistorical space where elites across the globe interact with no reference to culture, geography or politics (ibid., p 459). The IT company in Bangalore may become less connected to the Indian hinterland than to its business partners in London or São Paulo.

The problem is that the vast majority of people do not live in the space of flow. They live in the space of places, and the growing opposition between the two spatialities is of increasing concern. As Castells (ibid., p. 446) writes: while elites are cosmopolitans, people remain local. Consequently, he urges us to take extraordinary action unless we are to be confronted with a schizophrenic polarisation of our societies giving rise to a Fourth World of disconnected black holes in the global information economy (Castells, 1996, p. 459, 1999).

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7 Modes of development is Castells’ term for what Marx called forces of production: the technological arrangement on which the economic activities of a society is based. To be contrasted with modes of production (relations of production with Marx) which is the socio-economic organisation intertwined with the modes of development.
In a similar vein Yochai Benkler (2006), author of *The Wealth of Networks*, argues that we are currently at a crossroads. Depending on our actions, we face two alternatives: either the potential of information technology will be directed towards democratic inclusion and common good, or digital technologies will agglomerate into an increasingly exclusive system, empowering the few while marginalising the majority (ibid., pp. 1-34). Accordingly, both Benkler and Castells call for massive technological upgrading of unconnected, marginalised areas (Benkler, 2006, p. 354; Castells, 1999, p. 12).

**New hopes for convergence**

If marginalised areas can be upgraded, if the digital divide can be bridged, then digital technologies also bring renewed hope for convergence and developmental leapfrogs. Speaking at the 2000 G77 South Summit in Havana, the then UN General Secretary Kofi Annan was confident that:

> This (information) technology is far less capital-intensive than old industrial technology, and therefore may enable poor countries to *leapfrog some of the long and painful stages of development* that others had to go through.

(Kofi Annan quoted in Pal, 2008 - emphasis added)

Returning to the hopes of convergence, Annan not only assumed that development progresses through certain stages of growth, but that information technology will have the ability to leapfrog countries along these. A similar point was on the agenda at WSIS:

> 8. We recognise [...] The rapid progress of these technologies opens completely new opportunities to attain higher levels of development. The capacity of these technologies to *reduce many traditional obstacles*, especially those of time and distance, for the first time in history makes it possible to use the potential of these technologies for the *benefit of millions of people* in all corners of the world.

(WISIS, 2003 - emphasis added)

WSIS revolved around the familiar hope that technology could leverage the millions living in the world's impoverished regions by reducing or circumventing more traditional obstacles to development. As we discuss later, it was also at WSIS that OLPC launched their initiative (q.v. If the digital divide is to be bridged..., p. 103).

In his essay *Alleviating Poverty Through Technology*, Muhammad Yunus
(1998) makes specific the developmental potential of information technologies in relation to Bangladeshi villagers. Yunus envisions how technology can empower villagers in a range of ways. They can get better access to current market prices of agricultural products; they can educate themselves with access to the knowledge of the internet; and it gives them an alternative to migrating to urban slums for employment because they can work for a London company while in their villages. The promise of information technology is again that it may circumvent the obstacles otherwise holding back development, that villagers can learn despite not being in school, that they can sell their grain at reasonable prices despite greedy middlemen, and that they can remain in their village despite urbanisation (Yunus, 1998).

OLPC describes a similar situation. That information technology has caused the “pace of change in the world” to increase dramatically, which in turn makes “the urgency to prepare all children to be full citizens of the emerging world” all the more pressing (OLPC Website, 2013a). However, with little access to knowledge and education, the children of the Fourth World are in danger of becoming increasingly marginalised. The digital divide must be bridged with laptops and other technologies, so that the “nations of the emerging world can leapfrog decades of development” despite the range of obstacles otherwise holding them back (OLPC Wiki, 2013d - emphasis added). As we later investigate in more detail, the vision is for children to be less bounded by geographical and historical limitations and become valuable on the global labour market (q.v. Children are the future, p. 42).

**Criticism of technological determinism**

The various attempts to bridge the digital divide have been termed both dependency 2.0 and modernisation 2.0, in that technology is regarded as both a source of disparity and a neutral and beneficial means of empowerment and leapfrogging (e.g. Leye, 2007). In fact, the unaltered faith in the ability of technology to induce social change has been heavily criticised (a substantive example is Barbrook, 2007).

One critic, Alvaro de Miranda (2008), opens his polemic on the digital divide with an anecdote about how a student of his felt when she became em-
ployed at a housing project for refugees in East London.

Her work involved creating an IT room in a run-down housing estate used largely to house refugees. The estate was rat infested and the flats had water running down the walls. There was money to install the latest computers but no money to get rid of the rats or of the humidity in the flats.

(De Miranda, 2008, p. 23)

As Miranda (2008, p. 23) writes, the student “wondered if this made any sense”. The necessity of investing in computers was not related to any other necessities, such as doing something about humidity or rats. And nobody related the situation to distant wars or unscrupulous landlords. The focus was computers. This is the principal criticism of many initiatives using technology for development, that they are reductionist, based on deterministic understandings, and ignore the fact that their thinking has problematic heritage from earlier attempts at development through technology.

In an article entitled Let Them Eat Laptops, Brian Winston (2007, p. 171) calls OLPC an “extreme example of technicist hyperbole”, and accuses Negroponte of thinking that laptops themselves will overcome poverty, war, hunger, ignorance and so forth. The problem for Winston is not so much that this line of thought is false or reductionist; the real problem is that people, especially politicians, incorporate it into their actions no questions asked. In this way, OLPC actually ends up being a disempowering waste of resources.

[Negroponte] remains a true a believer although thus far all his highmindedness has achieved is to spot a new Western market. The children of the South no more have his computer than they have adequate shelter, clean water, health care or peace. But in the First World the possibilities of a really cheap laptop are now being actively explored. (Winston, 2007, p. 175)

In fact, the argument has been made that these development initiatives are politically attractive because they display decisive action without threatening the established order (Robinson & Torvik, 2005).

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8 Historical accounts are a good source of examples of technological reductionism and determinism: “The automobile created suburbia”, “the pill produced a sexual revolution” or perhaps the most famous of all provided by Karl Marx: “The hand-mill gives you society with the feudal lord; the steam-mill, society with the industrial capitalist” (Bimber, 1994; Heilbroner, 1994; M. L. Smith, 1994, p. xi).
In a similar vein, Lynne Markus and Robert Benjamin (1997) have famously claimed that the unfortunate consequence of technological determinism is that it stops people from doing their part. They describe how change is considered analogous to creating technology because people then expect the technology to do the work:

These people describe IT as a magic bullet – and believe that they have built the gun [...] After all, magic bullets always hit the right targets. So the gun builders can focus on the performance characteristics and aesthetics of their craft...

(Markus & Benjamin, 1997, pp. 56–57)

Such a feat is also recognisable in OLPC. Although famous and highly respected for their technical innovations they are at the same time strongly criticised for their lack of an implementation strategy (q.v. The first debate: do laptops empower, right out of the box?, p. 44).

**Research agenda: OLPC as theory and practice**

When de Miranda (2008, p. 34) writes that information societies and digital divides “hide human agency and particular political interests in promoting a specific direction of social change” I agree that this can be the case (see also Barbrook, 2007; Leye, 2007). At the same time, however, I hold no witness of truth saying that it is always so, that it can be made a theoretical rule.

My engagement with these themes and theories of development and digital divides is more like that of “reading with the text” suggested by Casper Bruun Jensen and Peter Lauritsen (2005), who oppose two ways of reading a text or, in this case, working with theories of technology and social change: 1) *Reading against the text*, being critical, looking for something to address, and 2) *reading with the text*, seeing where it goes, what it does and who it engages (ibid., p. 353). Jensen and Lauritsen use a report from 1999 called *Digital Denmark – Conversion to the Network Society* as example. The report presents various technological understandings which could be disproved, dismissed and criticised (ibid., p. 358). However, reading with the text made it possible for the authors to observe how the report actually served as a relay between administrative practices and local initiatives. For instance, the authors were able to explain how the report relayed the acquisition of 50 laptops by a rural school (ibid., p. 364).
A similar approach of reading with the text is taken with OLPC which too is criticised for their take on technology. After all, there is no reason to consider the causality between theory and practice as more certain than the one between technology and social change, especially since it has always been OLPC’s ambition to ally themselves with external partners to produce and deploy laptops (q.v. Organisation and principles, p. 34). In practice, OLPC deployments “vary in almost every respect, including how they are set up, funded, managed, implemented, and supported” (ACER report quoted in Bender, Kane, Cornish, & Donahue, 2012, p. 121).

As stated in the preface of a recent book on OLPC written by Walter Bender and Charles Kane (two senior members of the organisation) along with Jody Cornish and Neal Donahue (two independent commentators), the initiative may provide plenty of fodder for criticism, but also an interesting story of how the developmental hopes associated with technology helped the organisation attract support from major companies and governments.

If you’re looking for a chance to pick apart a theory for how to reform and revolutionize education, there is much fodder here for criticism and debate […] rather than approach it with an eye critical of the particulars of their program, one might approach it with a specific intent to learn not what OLPC has done, but how it’s gone about it. (Bender et al., 2012, p. xvi)

There are thus two research agendas associated with OLPC: The first is to properly investigate the initiative and its theoretical underpinnings. This is done in chapter 1 (One Laptop per Child, p. 33). The second is to investigate what this has amounted to in practice at Akila’s school. This is done throughout the thesis, although most explicitly in chapter 4 (Rendering Laptops Mobile, p. 97) and chapter 7 (Lines of the Apparatus, p. 199).

**Post-colonial critique of development**

The debate over technology in development tends to focus more on those to be developed—to analyse their situation, how they can be leveraged and so forth —than on what type of phenomenon development is itself. Countering this asymmetry is the principal contribution of post-colonial thinking, which considers development not as a thing to possess, a theory with which to explain, but as a specific Western way of relating that succeeded colonialism at about
the same time Truman launched his program of technical assistance. As stated by Gustavo Esteva, on the day of Truman’s speech two billion people stopped being what they were and became instead underdeveloped:

Underdevelopment began, then, on January 20, 1949. *On that day, two billion people became underdeveloped.* In a real sense, from that time on, they ceased being what they were, in all their diversity, and were transmogrified into an inverted mirror of other’s reality: a mirror that belittles them and sends them off to the end of the queue, a mirror that defines their identity...

(ESTEVA, 1992, p. 7 - emphasis added)

As indicated by the label post-colonialism, development is not regarded a neutral means to a rational end, the progression of society through linear history. Rather, development is seen as a form of objectified neo-colonialism, what Michel Foucault (1980, p. 194) has designated an *apparatus* (or *dispositif*), an exercise of power by a heterogeneous ensemble spanning philosophy, law, language, and a range of institutions from USAID to the UN (see e.g. Escobar, 1992, p. 23). And what the development apparatus does, Esteva (1992, pp. 11–12) argues, is to define the identities of Third-World'ers in the images created for them by those in the First- or Second World.

Another notable post-colonial scholar, Arturo Escobar (1995, pp. 11–12), has suggested that the problem with development is not so much development itself, but rather the overall project of modernity in which it is embedded. Escobar (ibid.) suggests an anthropology of modernity capable of *rendering exotic* the products of development, or, in other words, to treat World Bank economists as equally tribal in their language and practice as witch doctors in Africa. The lesson from half a century of development, Escobar argues, is that the programme of modernity (development included) is not going to homogenise the world into the same historical trajectory, and thinking so has only yielded disruptive, inappropriate and oppressive interventions.

**Research agenda: ANT and development**

It is important to investigate the history and ideas of development, that the benevolent endeavour can also be an oppressive apparatus. However, as with determinism, we only know this of development in a few well-studied cases. If we go to Colombia and study attempts at modernisation like Escobar (1995),
we will certainly be confirmed that development is disruptive and oppressive. But if we go to Lesotho, as James Ferguson did, we also discover that development can be rather weak, like a “bread crumb thrown into an ants' nest. Pushed and pulled in all directions” (Ferguson, 1994, p. 225).

In keeping with Shmuel Eisenstadt (2000), we could consider modernity and development to be *multiple* programmes of action with very different compositions, operating to achieve very different ends. Escobar also offers this insight, although he insists that the variations are all accompanied by regimes of violence:

*The development discourse, as this book has shown, has been the central and most ubiquitous operator of the politics of representation and identity in much of Asia, Africa, and Latin America in the post-World War II period. Asia, Africa and Latin America have witnessed a succession of regimes of representation—originating in colonialism and European modernity but often appropriated as national projects in postindependence Latin American and post-colonial Africa and Asia—each with its accompanying regime of violence.* (Escobar, 1995, p. 214)

This is not a post-colonial study, although there is a range of similarities in the approach taken. Most prominent is the common denominator of the rendering exotic suggested by post-colonialism and the rendering exotic on which ANT is based (q.v. From savage minds to tribal science, p. 63). It is agreed that theories are not what describe the world from a distance in an increasingly precise and objective manner. Rather, theory is an engagement, an apparatus, with empirical agency beyond that which it describes.

But there are also important differences. As noted, ANT is agnostic in allowing for several lines of theory and practise to mix up in the same situation. Such agnosticism is not neutral. It strips everyone and everything of a priori privilege. From the outset, no-one is allowed to explain the nature of the others and this includes post-colonial critique as much as theories from inside development. Accordingly, a major agenda of this thesis is to investigate the implications of ANT's agnosticism with regards to participants in development encounters. This is done in chapter 2 (Development Encounters, p. 59) and again in chapter 7 (Lines of the Apparatus, p. 199).
The transfer process

As we have seen, technology transfer has a history, it has its practitioners, its intended purposes and so forth. But it is also a process of moving technology across a range of borders and barriers into some novel setting. Bruce Seely offers a good summary definition of transfer as:

...the processes and consequences of moving technological ideas, skills, processes, hardware, and systems across a variety of boundaries – national, geographic, social and cultural, or organizational and institutional...

(Seely, 2003, p. 8)

A central figure in theorising the process of technology transfer is Everett Rogers who too emerged in the 1960s with the first edition of his book *Diffusion of Innovations* (Rogers, 2003).

Rogers’ work with technology transfer and diffusion has many points in common with what is presented here with ANT (q.v. Rendering Laptops Mobile, p. 97). Perhaps most prominent is the argument that technology does not diffuse spontaneously, out of necessity or superiority, and those believing so can only ever think of users, recipients and other non-inventors as holding back the process (Rogers, 2002, p. 323). Rogers suggests that we should instead consider transfer as a communicative process where transceivers—which include inventors, users, resellers and all others—are hard at work in establishing a shared meaning of the vehicle being transferred:

The technology transfer process is more adequately viewed as a transaction process in which questions, answers, clarifications, and other information flow in both directions. One should think of “transceivers” or “participants” in the technology transfer process rather than only “sources” and “receivers.”

(Rogers, 2002, p. 327)

The argument being that transfers are difficult and technology requires a substantial amount of articulation work to function properly in novel settings.

**Research agenda: transfer through actor-networks**

Concerns similar to the foregoing are prominent in the transfer of laptops to Akila’s school in Nigeria. The laptops did not travel from their factory in Taiwan to the school in Nigeria under their own steam. A multitude of different
participants, or transceivers, participated in the process, each with their own way of articulating the laptops.

However, ANT radicalises this insight by tearing down the boundaries between participants and technology. Both are considered hybrid actor-networks of the same type, and when these carry each other along, they become entangled in ways that transform the entire situation. Thus, Roger's communicative focus is replaced with a constructivist one – shifting the function of transceivers from articulating a shared meaning to building the actual technology. Following the transfer of Akila's laptop as an actor-network through the negotiations of other actor-networks is on the agenda in chapter 4 (Rendering Laptops Mobile, p. 97) and chapter 5 (Laptop Multiplicity, p. 131).

**Transfer involves re-invention**

One consequence of having transceivers rather than inventors and users is that these have the power to negotiate the character of the vehicle under transfer. Such occurrences are called re-inventions in transfer theory (Rogers, 2002, pp. 328–331). A famous example of re-invention in development is that of mosquito nets transferred to Africa to help fight malaria (see e.g. Easterly, 2007, p. 13).

During the first decade of the new millennium, vast quantities of chemically impregnated mosquito nets were distributed in Sub-Saharan Africa in order to reduce the 240 million cases of malaria each year. Many of these nets were produced in Denmark and then shipped to Africa. However, something happened during transport. Although most nets undoubtedly ended up helping Africans protect themselves from malaria, accounts of nets being used as all sorts of other things soon started to make headlines. It seemed that what shipped as instruments for malaria protection had somehow arrived in Africa as fishing nets and wedding gowns (Villadsen, 2010).

Like white elephants, re-inventions are a concern because they contrast what technology is supposed to do with what it actually ends up doing. Although there is evidence that re-invention strengthens sustainability (Rogers, 2002, p. 331), it also creates the risk of undermining the intended purpose of the transfer in the first place - what is the developmental value of chemically
impregnated mosquito nets when used for wedding gowns?

**Research agenda: divergence and multiplicity**

With unintended re-inventions, a principle concern for technology transfers has become how to ensure good communication among dissimilar participants across legal, cultural or political boundaries (Rogers, 2002, p. 325). As was discovered in the 1960s, having all the right answers is not enough if transfer participants cannot be convinced that this is the case, if the transfer process cannot be controlled:

> We were amazed to find that even though “we knew all of the answers,” very few of them worked. Initially we were simply insensitive to the (1) cultural differences, (2) indigenous motivating forces, and (3) different value systems.  

(Development official quoted in Seely, 2003, p. 13)

OLPC, too, has been criticised for having all the right answers, but being inefficient in communicating these to the actual context in which their laptop is to function (Kraemer, Dedrick, & Sharma, 2009). Taking into account the perspectives, values and culture of participants has thus become a central concern for sustainability. For instance, Christian Madu (1990) suggests that coordinators of technology transfers in development should build cognitive maps of all participants involved.

Although knowledge and appreciation of diverging expectations and values are indeed commendable, this also displaces explanatory categories from the technological and towards *culture* and *context*. In the literature, failures are often attributed to some form of cultural incompatibility rather than, say, over-valued technology (Jolly et al., 2004, p. 308). For instance, Kreamer et al. suggest that although OLPC has designed a well functioning laptop the whole endeavour is undermined by “misunderstanding the social and cultural environment” (Kraemer et al., 2009).

What I have observed about the laptops going to Nigeria is likewise that they have not been received as OLPC or anyone else expected. The arguments in chapter 4 (Rendering Laptops Mobile, p. 97) and chapter 5 (Laptop Multiplicity, p. 131) are that the laptops have ended up becoming a multitude of different things beyond those intended. As illustrated in the preface, an important
purpose of this thesis is to investigate the implications of such divergence and multiplicity. The investigation, however, does not attribute alterations to context or culture. Rather, the different laptops are investigated as being just that, different laptops. The explanatory mode of singular objects embedded in different social contexts is replaced with one of multiplicity in both context and laptop.

**Agendas and structure**

The overall agenda for the thesis is thus to investigate themes of technology and development through ANT and the study of 100 OLPC laptops going to Akila's school in Nigeria. On the above backdrop of development history, post-colonial critique and technology transfer five more specific agendas were outlined, here presented in the chronology in which they will appear through the chapters.

1. To investigate the theories and practices of OLPC.
2. To present ANT as metaphysics and vocabulary for development encounters.
3. To study the transfer of Akila's laptop as an actor-network being negotiated by other actor-networks.
4. To investigate divergence and multiplicity in and around laptops.
5. To investigate the agencies making the project struggle not to become a white elephant of development.

The thesis is thematically structured with one or more agendas investigated in each chapter. However, it should be noted that there is no 1:1 relationship between chapters and agendas. For instance, while the entire thesis is basically an investigation of ANT and development there are only two chapters explicitly devoted to struggling projects (chapters 6 and 7).

It can also guide the reader to think of the thesis as structured into two halves. The first half consists of chapters 1-3 and deals with OLPC, ANT and methodology. The second half focus more on the project in Nigeria and begins with chapter 4.
Chapter 1: One Laptop per Child
We begin with an in-depth account of OLPC and the theories on which the initiative is based – most notably the constructionist pedagogy of Seymour Papert and the digital society described by Nicholas Negroponte. As one of the most ambitious and advertised development initiatives of our time, OLPC is rich with debate over whether digital technology can truly empower the poor and marginalised and in which ways. The chapter introduces these debates and positions the thesis in relation to them.

Chapter 2: Development Encounters
The second chapter describes how ANT grew from the trenches of the science wars as a way to anthropologise the world across any such dichotomies as subject||object, modern||traditional, objective||subjective, developer||developing, etc. As already mentioned in relation to post-colonialism, ANT is presented as a symmetrical vocabulary to describe development encounters. The chapter also outlines principal ANT concepts such as actor-network and translation which are then further substantiated in later chapters.

Chapter 3: Method & Travelogue
The method chapter accounts for how I came to know the laptops in Nigeria, who and how I interviewed, where I did observations, and so forth. But it is also a travelogue. It contains the story of how I first became interested in OLPC through the media, how I was so lucky as to get a scholarship, how I went around Denmark, South America and Nigeria searching for things to observe and people to speak with, and how many of my learnings were mediated by internet, email and telephone.

Chapter 4: Rendering Laptops Mobile
Starting from this chapter the thesis turns more exclusively to the project in Nigeria. The chapter investigates the process which landed laptops at Akila’s school. Building on the notion of translation, it describes how the laptops started life as bridgers of the digital divide before being translated by a group of Danes as a means to introduce more appreciative methods of teaching in Nigeria – before being translated again by a Nigerian school as a means to offer computer training to their students. The argument being that technology does
not travel by itself, propelled by superiority or developmental necessity, it needs someone to pass it along, and being passed along is a transformative process.

**Chapter 5: Laptop Multiplicity**

Whereas the focus in chapter 4 was on forging relations to render the laptops mobile, the preoccupation in this chapter is what kind of laptop emerged in the end. Through the notion of enactment it is argued that rather than a single coherent laptop, the transfer actually resulted in many different ones. For instance, in Nigeria, teachers are enacting the laptop as an upholder of authority while missionaries in Denmark are enacting it as a development device doing the opposite. The argument of the chapter is that multiplicity belongs to the laptops rather than their context.

**Chapter 6: Falling Into Limbo**

While the laptops were rendered mobile and incorporated into diverse practices in both Denmark and Nigeria, they are currently caught in a kind of impasse. This chapter describes how ANT has a well developed vocabulary to describe all sorts of existences, such as black boxes, fluids, and bush fires, but lacks a mode of existence which is neither stable, stabilising nor non-existing. Accordingly, a notion of limbo is suggested to describe the laptops as caught in a halfway state where initial configurations have been suspended without being replaced by alternatives.

**Chapter 7: Lines of the Apparatus**

Rounding off the thesis is a chapter relating the situation at Akila's school to the post-colonial critique of development and the Foucauldian concept of apparatus. Through a reading of the apparatus based on Gilles Deleuze, the chapter sets out to trace the lines running through the project in Nigeria. It investigates their different nature, the parts they play and how they have contributed to a problematic project.
Chapter 1

One Laptop per Child
On the agency of laptops for learning

One Laptop per Child (OLPC) is one of the most famous and ambitious development initiatives of our time. The organisation aims at massive distribution of laptops to the world's impoverished children in order to leverage these along two dimensions. The first is inclusion in an increasingly globalised world mediated by digital technologies. The second is educational empowerment through constructionist pedagogy. However, OLPC has been strongly criticised along the same two dimensions, that they underestimate how difficult it is to get laptops to work in impoverished contexts and ensure that they are used for education. This chapter sets out to investigate these two themes of inclusion and education along with their associated debates. The purpose is to equip the reader with background knowledge of OLPC and to draw out the underlying debate over technological agency. The chapter opens with an outline of the OLPC organisation and an introduction to the XO laptop. It then proceeds to the first theme of global inclusion which is presented through the work of OLPC chairman Nicholas Negroponte. The second theme of education then follows and outlines the pedagogy of Paulo Freire, a principal figure of educational empowerment, as well as that of Seymour Papert – a MIT professor affiliated with OLPC and who's work on learning with computers runs through the design of the XO.

As the name implies, OLPC wants to empower the world's poorest children by equipping each one of them with an internet connected laptop: bridging divides by giving them a “window out to the world” and providing educational opportunity in a “tool with which to think” (OLPC Website, 2013b). To this end OLPC has designed their own laptop famously known as the $100 laptop, al-
though its official name is the XO. In collaboration with national governments and commercial partners, the initiative hopes to distribute laptops in the millions – keeping prices low and impact high. Launched in 2005, OLPC is one among many spinoffs from the famous MIT Media Lab.

**Organisation and principles**

OLPC is quite a heterogeneous gathering. Like all other projects from the MIT Media Lab it consists not only of researchers like Negroponte and Papert but also of an industrial consortium with 11 members including AMD, Google, News Corp, Red Hat and Quanta (OLPC Website, 2013h). These provide OLPC with capital and knowledge to develop and implement their vision. There are also a variety of other collaborators such as the United Nations Development Programme, Fuse Project, Pentagram, JCDecaux, Amazon and Citibank (ibid.). Like the founding members, these too help OLPC develop both laptop and organisation. And finally, there are a range of national governments and NGOs which are the clients, those who purchase and distribute the laptops to children. Originally Brazil, Argentina, Nigeria, Libya and Thailand were key clients, but have since been replaced by Peru, Uruguay and Rwanda. This diversity of partners makes the different OLPC projects around the world look very different from each other in concept and character (compare e.g. Derndorfer, 2010a, 2010b).

That development organisations partner with private companies is not unusual insofar as the latter donate money in return for publicity. But OLPC takes their partnerships a bit further in presenting themselves as a major business opportunity for private partners and contractors. In practice, this means that commercial partners earns a profit from each laptop sold, a share of the intellectual property and a strengthened foothold in new markets at the bottom of the pyramid (see e.g. EnJie, 2007; Prahalad, 2005). OLPC, which itself is a non-profit, is organised this way to enrol the capitalistic machinery in the design and manufacture of vast quantities of cheap and rugged laptops appropriate for children’s learning in impoverished regions:

> And there’s a lot of profit there. And so we thought, well let’s use the capitalistic machinery to get this to happen. But what became very obvious is that
we can get a lot more work done as a non-profit. Our goal was never to max-
imize gross margin, it was trying to get laptops to kids to improve education.
(Mary Lou Jepsen quoted in MachMullin & Jepsen, 2007)

Accordingly, when launched in 2005, the challenge for OLPC was to make
ends meet between commercial partners expecting large, profitable orders and
developing countries expecting low prices and high impacts (this is further in-
vestigated in chapter 4, Rendering Laptops Mobile, p. 97).

Presenting OLPC at the World Economic Forum in 2005, Negroponte made
the bold prediction that 7-10 million laptops would sell the first year, saturat-
ing partner countries with laptops, insuring continued support from commer-
cial partners and pushing the unit price down to an unprecedented $100:

We're a nonprofit organization [...] Immediately, 50 to 60 percent of the cost
of a normal laptop is gone because we really don't have distribution, sales,
marketing and profit. It's really done by a single sale to a ministry of educa-
tion in the first year in quantities of a million, so you launch seven to ten mil-
lion in the first year, which, by the way, will start roughly a year from now.
That brings down the price so far down, the combination of those two events,
not having sales, marketing, distribution, and having very large numbers, that
smaller companies, smaller countries, smaller school systems can then parti-
cipate.  

(Negroponte quoted in OLPC Talks, 2006a)

However, early negotiations did not amount to any confirmed orders in that
magnitude and OLPC faced substantial challenges staying afloat until saved by
a program directed at Western consumers called Give One Get One (G1G1) in
2007 and, a little later, by substantive sales to Peru and Uruguay (Bender et al.,
2012, pp. 80–95).

While the ambitious quantities first envisioned have not materialised, there
are nonetheless quite a few laptops out there. According to OLPC's own statist-
ics, 2.4 million laptops have been sold – the majority of these to South Amer-
ica with 860,000 to Una Laptop Por Niño in Peru and 510,000 to Plan Ceibal
in Uruguay (OLPC Website, 2013g). In Africa, Rwanda is the main adopter
with a purchase of 110,000 laptops (ibid.). The actual laptop cost varies from
order to order, but average around $185 rather than the envisioned $100.
Five principles everyone agrees to, in principle

OLPC has five principles to guide their operation and communicate their philosophy to partners (OLPC Wiki, 2013b). The principles are meant to advocate norms and values for the use of laptops in partner countries and organisations. As stated by the OLPC mission video: “wherever the XOs go there are five core principles everyone agrees to” (OLPC Website, 2013c). Ideally, the principles are meant to ensure that partners don't use the laptops to any odd purpose, but put them to use as envisioned by OLPC.

The first principle is that each child must have ownership of his or her own laptop. In fact, ownership of the XO is a “basic right” (OLPC, 2012). To OLPC, computers are not just computers. They are more like mobile schools through which the child learns whenever and wherever. Being in school, at home, or somewhere else, it is important that the child can always engage in learning. The second principle places school age children at centre of OLPC. Much more than adult farmers or civil servants, children hold the future in their hands because of their innate potential to learn and take on new technologies. The third and fourth principles of digital saturation and connectivity advocate maintaining the one-laptop-one-child scale across entire communities or countries. Being connected to each other and the internet will enable children to form powerful learning networks, and whole areas will experience a shared lift in development. The fifth and final principle promotes open source software to foster unrestricted adaptation, localisation and development of learning software.

The XO laptop(s)

OLPC has created several laptops. The most famous is the original XO presented in 2005, the one also known as $100 laptop. The name XO is a pictogram, the X is a child's body and the O is the head. It plays on the principle of 1:1 child ownership: one XO = one child. Besides from technical updates called XO-1.5 and XO-1.75, OLPC has made two subsequent concept models called the XO-2 and XO-3. The XO-2 (or XOXO) was a foldable book with screens on both pages. A clever design, the XO-2 could be used as a traditional laptop with one screen being the keyboard, it could be used as a traditional book with a page on each screen and it could be used like an iPad if laid down flat. Then
in 2009, OLPC abandoned further realisation of the XO-2 in advantage of a XO-3 tablet. As with the original XO, the target price for the tablet was set at an unprecedented low $75. The device was envisioned to become so power efficient, that it could be charged with small solar panels embedded in its cover (Barber, 2010).

However, as of writing, OLPC seems to have cancelled the XO-3 as well and focus instead on using already existing technology from their partners (Shah, 2012). The XO-1 was needed to create something that was not there in 2005: low cost, low power, rugged computers. But with the abundance of well functioning and cheap tablets on the market today, that no longer seems necessary (ibid.).

...no matter how much we love the XO laptop, our edge in hardware is lessening over time […] The future of OLPC may well be solution agnostic: we have already unbundled our IP and process knowledge of hardware, software, and deployments in order to embrace any solution that achieves measurable and sustainable impact—at any scale.

(Bender et al., 2012, pp. 54 & 57)

The laptops in Nigeria are of the original XO-1 type. The award winning green and white casing was done by industrial designer Yves Behar and the colours pay tribute to Nigeria as one of the first countries to enter into negotiations with OLPC (OLPC Talks, 2007a). While the laptop indeed is low cost, the idea was to create a design that is “anything but cheap” with unique features such as rabbit ear wireless antennas, suitcase style handlebar and the use of 400 different colour combinations in the XO logo making each one stand apart (fuseproject website, n.d.). And as an extra quality feature, The Edge from U2 donated the ding-dong-ding tune played at startup.

The XO runs a Linux based operating system called Sugar made especially for children's learning. Sugar does not use the otherwise all prevailing desktop metaphor. Instead it is organised around learning activities which fill up the entire screen when running. These are all named with verbs such as Draw, Record or Browse to emphasise that to OLPC, learning is an active process of doing (OLPC Website, 2013d). Sugar also supports multiple learners collaborating on activities using each their own XO (the principle of 1-1 ownership) and
all work is automatically saved in personal journals (the user interface for the file system).

To the left: The original XO laptop in neighbourhood view, all the small “XO men” are other children with laptops collaborating on the activity around which they are circling. To the right: the Home screen of Sugar, the child is in the middle, below is the journal and around are learning activities (creative commons: wiki.laptop.org).

Sugar also has the advantage that it demands very little of hardware, which enabled the XO-1 to be designed with cheap and low power components: 256MB memory, 1 GB flash drive, and a 433 MHz AMD Geode processor – limiting the total power consumption to an average of 4-6 watts (OLPC Wiki, 2013c). Another power saving innovation often emphasised, is the dual mode display developed by Mary Lou Jepsen, which can be used either indoors in full colour or outdoors in monochrome – the latter being especially important for children living in areas with limited indoor facilities. The XO also featured a mesh networking technology capable of routing internet from a central access point and out to classrooms and the dispersed homes of students. The mesh technology, however, never worked well in practice and has since been abandoned (OLPC News, 2007, 2010). Because power consumption is low, it was envisioned that the XO could be recharged by handcranks, pullcords or treadmills. Combined with a dust, shock and water proof casing, the XO thus presented itself as an autonomous traveller demanding only very little of its environment (q.v. The missing masses of laptops, p. 123).
OLPC's combination of cheap hardware, resource efficient software and economy of scale aimed at a hitherto underdeveloped market was quite innovative. And as the anecdote goes, Intel, Asus and Microsoft, who are not OLPC partners, felt threatened that the XO might help their competitors gain first mover advantage into new markets. Intel and Microsoft decided to launch the World Ahead program featuring the \textit{Classmate} computer as direct competitor to the XO (OLPC Talks, 2007d). And Asus, principal competitor to Quanta, the manufacturer of the XO, launched their popular \textit{eee} series netbook. Accordingly, OLPC is often credited with having challenged an entire industry to create a market for small and cheap devices, such as netbooks and tablets (see e.g. Thompson, 2009).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{intel_classmate.jpg}
\caption{The Intel Classmate computer at a public school in Akila’s neighbourhood. Due to problems with electricity, the hundred or so classmates at the school sat idle in the boxes (in the background to the right).}
\end{figure}

\section*{Being digital and social inclusion}

OLPC should be understood in continuation of research conducted at the MIT Media Lab. The “long march from radical theory to reality” at the history section of the OLPC website is full of events associated with MIT and the Media Lab; from the introduction of the Logo programming language in 1964 to the publication of Negroponte's principal book \textit{Being Digital} in 1995 (OLPC Website, 2013f).
The Media Lab was established in 1985 by Negroponte and former MIT president Jerome Wiesner as a counter culture to mainstream computer science. In the Media Lab, computers were considered something that should touch on every aspect of living (Negroponte, 1996, p. 225). The first decades of research at the lab was centred around how computers can enable being digital—an existence enmeshed in ubiquitous digital technology. The approach taken was that of active development of specific technologies under a demo or die motto: “Forget technical papers and to a lesser extent theories. Let’s prove by doing” Negroponte argued (Negroponte quoted in Lunenfeld, 2001, p. 13).

Honouring this principle, the lab is organised around commercial partnerships where companies sponsor research in return for royalty-free use of derived innovations. As such, “much of the technology that enabled the digital revolution of the late 1980s and early 1990s” stems from Media Lab spinoffs including such noteworthy examples as E Ink, Lego Mindstorms, MPEG-4, Guitar Hero and, of course, the XO laptop (Bender, n.d.).

**Being digital, being empowered**

Being digital augments being physical. It means that bits will merge with atoms as the principle base of human activity: “In being digital I am me, not a statistical subset” Negroponte (1996, p. 164) states. The pervasive proliferation of digital technologies will empower us to express ourselves much more forcefully than we ever could in the industrial age. Being digital renegotiates and transforms the world around us: “If instead of going to work by driving my atoms into town, I log into my office and do my work electronically exactly where is my workplace?” Negroponte (1996, p. 165) asks.

Likewise, being digital also carry political consequences. The nation state will perish and a new global solidarity will rise because of the transformed digital geography:

> While the politicians struggle with the baggage of history, a new generation is emerging from the digital landscape free of many of the old prejudices. These kids are released from the limitation of geographic proximity as the sole basis of friendship, collaboration, play, and neighborhood.

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Convinced that digital technology is a force to be reckoned with, Negroponte predicts that while the information society may be mostly hype today it will come to exist “beyond people's wildest predictions” tomorrow (Negroponte, 1996, pp. 229 & 231). What is projected is a society of self-employed worker/learners engaged with each other on a global scale: “By the year 2020, the largest employer in the developed world will be “self.” Is this good? You bet” (Negroponte, 1996, p. 240).10

Digital technologies are so intimately bound to our present age that they are on par with electricity, writing and other such fundamental technologies of civilisation:

I'd like you to imagine that I told you "I have a technology that is going to change the quality of life." Then I tell you "Really the right thing to do is to set up a pilot project to test my technology. Then the second thing to do is once the pilot has been running for some period of time is to go and measure very carefully the benefits of that technology."

Then I am to tell you that we are going to is very scientifically evaluate this technology, with control groups - giving it to some, giving it to others. This all is very reasonable until I tell you the technology is electricity, and you say "Wait, you don't have to do that." (Negroponte quoted in OLPC Talks, 2009)

In this famous quote Negroponte argues that even the idea that anyone would question the impact of computers is “unbelievably amazing” (OLPC Talks, 2009). Digital technology, like water and electricity, is simply a basic condition for civilisation (ibid.).

Insofar as laptops can enable being digital for impoverished children, they are not only key to “full development and participation” but also capable of circumventing more traditional obstacles tied to being physical in some urban slum or African village: “Limits are erased as they [the children] can learn to work with others around the world, to access high-quality, modern materials, to engage their passions and develop their expertise” the OLPC website states (OLPC Website, 2013c).

10 It is perhaps of little surprise that OLPC, like many other ICT4D initiatives, has been criticised for being neoliberal politics by other means (De Miranda, 2008; Leye, 2007; Pal, 2008).
Negroponte often exemplifies the circumventing potential of laptops with a project he did in Cambodia in 2002. In this predecessor to OLPC, laptops were given to remote villages where the average income was a mere $47 a year, they didn't have electricity or telephones, there were no roads or infrastructure, but with laptops they were learning English and using Skype:

They've never seen a telephone or a handset, but they use Skype everyday. The first English word of every child in that picture is Google. They access all the books, they brought up Khmer sites, they learned how to type and read English to a certain degree in two or three months.

(Negroponte quoted in OLPC Talks, 2007c)

While these villages lack all necessary infrastructure for participation in an industrial society, they are already fully engaged in the informational. And this was achieved simply by equipping them with the right means of inclusion: connected laptops.

Children are the future

The Media Lab advertise itself as a place of vital importance for empowerment of people “of all ages, from all walks of life, in all societies” by inventing new possibilities for them through digital technology (MIT Media Lab, 2012). What is, however, special for digital empowerment is that it will enforce itself most forcefully with children because of their innate ability to take on new technology as natural as they take on their native tongue – a stance also reflected in terming the children of the 1990s as digital natives (e.g. Prensky, 2001).

Consequently, the debate over digital divides takes a different form with Negroponte and OLPC. It is not so much the divide between geopolitical segments as it is a generational divide between natives and immigrants.

Some people worry about the social divide between the information-rich and the information-poor, the have and the have-nots, the First and the Third Worlds. But the real cultural divide is going to be generational. When I meet an adult who tells me he has discovered CD-ROM, I can guess that he has a child between five and ten years old. (Negroponte, 1996, p. 6)

Here, then, we find one explanation why it is one laptop per child and not one laptop per farmer or civil servant. In their spontaneous embrace of digital technology children give us “new hope and dignity in places where very little exis-
And so we look at the children as the *agents of change*. We look at the children as able to do a lot of self-learning, a lot of peer to peer learning, a lot more than currently is, you know, permitted by the system.

(OLPC Talks, 2006a - emphasis added)

Contrary to adults, children will experiment, play and learn with anything you throw at them, which is why children are the ones to teach others about being digital rather than the ones having to be taught:

When somebody tells me “Who's going to teach the teachers to teach the children how to use the laptops?” I wonder what planet they're from. It's unbelievable. Because everybody - and I'll speak for myself - asks their children, or their grandchildren, how to use technology.

(Negroponte quoted in OLPC Talks, 2009)

As early as 1982, Negroponte and Seymour Papert experimented with the use of computers for children's education in developing countries. In collaboration with the French government they sat up a learning lab using Apple II computers with Logo learning software in Senegal. On the OLPC website, the event is listed as confirming the central assumption that “children in remote, rural, and poor regions of the world take to computers as easily and naturally as children anywhere” (OLPC Website, 2013f). However, while children with computers were a success, the world around proved much more troublesome and the lab was only short-lived:

By the end of the Center's first year, Papert had quit, so had American experts Nicholas Negroponte and Bob Lawler. It had become a battlefield, scarred by clashes of management style, personality, and political conviction. It never really recovered. The new French government has done the Center a favor in closing it down.

(Dray and Memosky quoted in Camfield, 2007)

In a recent “hole in the wall” type study, OLPC thus went into two Ethiopian villages and simply dropped off Motorola Xoom tablets for the children to

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11 In a famous study, Sugata Mitra (2000) placed a computer in a hole in a wall and left it there for the poor children of the neighbourhood to play with. Filming everything, Mitra became famous for proving that even impoverished children with little or no schooling can learn how to use computers and, to some extend, learn to read and write in the process.

12 Remember, OLPC may be given up on developing their own hardware (q.v. The XO laptop(s), p. 36).
use (Talbot, 2012). No instructions, no formalities, no explanations. Once a week a technician then went to the village and tracked how the children had been using the tablets – if they had been using them at all. As it turned out, they had been using them quite a lot.

I thought the kids would play with the boxes. Within four minutes, one kid not only opened the box, found the on-off switch … powered it up. Within five days, they were using 47 apps per child, per day. Within two weeks, they were singing ABC songs in the village, and within five months, they had hacked Android. (Negroponte quoted in Talbot, 2012)

While the article quoted describes the Ethiopian study as surprising and novel, the experiment can also be seen as a contribution to a long established debate around OLPC: how much more than laptops do you need to create educational empowerment?

**The first debate: do laptops empower, right out of the box?**

The experiments in Senegal, Cambodia and Ethiopia have suggested that getting technology into the hands of children is empowering *in itself*. However, claiming that empowerment is to “take a Nintendo gameboy in its box and drop it in the center of Africa“, as Negroponte has done, lands some trouble with long established notions of context, sustainability, capacity building, cultural appropriation, and so forth (OLPC Talks, 2006b). There is a tension between conceptualising laptops as tools, which will work no matter the context, or as socio-technical achievements, which only works according to context.

As often stated in various ways, Negroponte's stand on the matter is clear: laptops can fend for themselves as long as they reach the hands of children, even if dropped from helicopters:

Can you, either literally or metaphorically, drop out of a helicopter, which is exactly what we plan to do, with tablets into village, where there is no school, but there's kids, at least eight to ten kids? And then go back a year later - are they reading? And if the answer is yes, that would be transformational. Then people might pay more attention.

(Negroponte quoted in Vota, 2011)

Isolated in remote villages, Ethiopian children receive no formal education, but
given the right tools—in this case tablets with literacy training software—they will learn to read and write themselves.

In a Boston Review debate entitled *Can Technology End Poverty*, Kentaro Toyama (2010) argued that: “Computers, guns, factories, and democracy are powerful tools, but the forces that determine how they’re used ultimately are human.” Basically a social constructivist claim that laptops are only as powerful as their social context allows them to be. As such, the tablets in Ethiopia will never empower beyond the social context of their village.

In Negroponte’s response to Toyama, we see that their disagreement is not so much if laptops are tools for human potential, but whereas Toyoma focus on existing context Negroponte insist that computers will make a new context to replace, or circumvent, the old one, providing rich learning environments wherever they go. Laptops can bring all of Paris to rural children for them to learn French, is the argument:

[Computers] are innately a constructionist medium; you can program them to have behaviors, multiple behaviors. You don’t simply consume or use them for a special purpose [...] Imagine I take a five-year-old from the most rural part of India and drop her in Paris for a year. She will speak French by the end of that year. Did Paris magnify her knowledge of French? No. It created it from her potential to learn language. Likewise the computer. It can enable learning from the potential to learn. (Negroponte, 2010)

While some commentators of OLPC agree that computers are good mediums for learning, there has been heavy criticism of what has been called a “naïve and technologically determinist” approach to technology (Kraemer et al., 2009; Vota, 2008a; Warschauer & Ames, 2010, p. 37). Morgan Ames and Mark Warschauer (2010) summarise much of this critique in their article *Can One Laptop Per Child Save the World’s Poor?* Their basic claim is that where computers have served as part of overall educational reform—on equal terms with curriculum development, community involvement and so forth—there has been a positive effect. But where the model of simply handing out laptops is followed, there has only been failure. In the US city of Birmingham, for instance, the mayor announced an OLPC programme following the parole that “If we give them these XOs and get out of their way, they’ll be teaching us
about the world” (Warschauer & Ames, 2010, p. 40). But with little support from school districts, limited training of teachers and lacking infrastructure, the program ended up a failure.

The OLPC deployments that simply tried to hand out laptops, such as Birmingham, have failed because they ignored local contexts and discounted the importance of curriculum and ongoing social, as well as technical, support and training. (Warschauer & Ames, 2010, p. 40)

Another commentator, the founder of OLPCNews.com Wayan Vota (2008a), has famously stated that OLPC’s approach to deployment is relying on implementation miracles.13 Child plus laptop gives a child with a laptop for some time. But it takes child plus laptop plus miracle to empower children to the degree envisioned. Referencing the movie The Gods Must be Crazy, where a coke bottle thrown from a plane disrupts the social stability of an isolated Kala-hari tribe, Vota (2011) polemically stated that Negroponte must be crazy in pursing such helicopter deployments and implementation miracles.

These commentators share the argument, that work has to be done outside the child-laptop constellation for change to occur. As Ames and Warschauer (2010, p. 37) argue, children with laptops take the form of socio-technical networks rather than subjects with tools. As we shall see, this thesis too is an investigation into this latter conceptualisation.

Educational empowerment

Negroponte and other OLPC persona frequently emphasise that while digital technology indeed is central to participation in our future society, the initiative

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13 The miracle termage in fact originates with Andrew Zucker whom Vota watched present on hype, hope and miracles in technology initiatives like OLPC (Vota, 2008a).
is not about computers. At heart, it’s about education for all those children for whom other learning opportunities are unavailable or of low standard:

Children are consigned to poverty and isolation—just like their parents—never knowing what the light of learning could mean in their lives. At the same time, their governments struggle to compete in a rapidly evolving, global information economy, hobbled by a vast and increasingly urban underclass that cannot support itself, much less contribute to the commonwealth, because it lacks the tools to do so […] Our answer to that challenge is the XO laptop, a children’s machine designed for “learning learning.”

(OLPC Website, 2013e)

A tenet of OLPC is that simply doing “more of the same” will not solve the world’s educational problems (OLPC Website, 2013f). Building schools, hiring teachers or buying books is not only too expensive, it is also an “insufficient response to the problem of bringing true learning possibilities” (ibid.).

Besides from the fact that textbooks and teachers won’t bridge the digital divide, there is something more fundamental at stake in this reluctance towards building schools and hiring teachers. The pedagogical philosophy of OLPC, which to a large extent is based on the work of Papert, considers most educational systems as not only lacking in resources, but also fundamentally flawed in their understanding of learning. As such, they are incapable of making any real difference in the lives of their students.

**Empowerment by learning to learn**

The scepticism towards traditional school systems is best exemplified by Brazilian educator Paolo Freire and his pedagogy of the oppressed. Although Freire disagreed with Papert on the importance of computers (we return to that), he is nonetheless one of the official theoretical resources of OLPC (Bender et al., 2012, p. 17; OLPC Website, 2013d; Papert, 1993, pp. 10–14).

To Freire, the oppressed are those who live their lives submerged in the reality of others; those who see the world as static and given; those who cannot

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14 As stated by their website: “Given the resources that developing countries can reasonably allocate to education—sometimes less than $20 per year per pupil, compared to the approximately $7500 per pupil spent annually in the U.S.—even a doubled or redoubled national commitment to traditional education, augmented by external and private funding, would not get the job done” (OLPC Website, 2013e).
become fully human because they do not know themselves, they are only known by others. They are not subjects of their own history. Extraneous agitators such as communist vanguards or liberal reformers cannot revolt the system of oppression because they only seek to replace one system of external knowing with another. Real change must come from within, from the oppressed having come to know themselves in the system of oppression, because then, and only then, will the oppressed not simply become oppressors themselves: “Their ideal is to be men; but for them, to be men is to be oppressors” Freire (2000, p. 60) writes.

It is a rare peasant who, once “promoted” to overseer, does not become more of a tyrant towards his former comrades than the owner himself.

(Freire, 2000, p. 46)

This is the pivotal challenge for pedagogy, to facilitate internal reflection and make subjects active in knowing themselves and the world around them (Freire, 2000, p. 54).

Freire’s work is central to much literature on empowerment and participatory development (Castells et al., 1999; Nyirenda, 1996).

Until the buzz-word ‘participatory’ stepped into the spot-light, it was common usage to describe any ‘bottom-up’ or ‘grassroots’ approach as ‘Freirean’

(Blackburn, 2000, p. 3)

It’s basically a vote of confidence that reflection amongst the oppressed is preferable to external intervention. That interventions should aim to invoke “the capacity for creative thinking and, hence, potentially at least, the capacity to transform rather than merely adapt to reality” (Blackburn, 2000, p. 5).

The problem with schools

In this way, schools and other places of learning are central arenas for social change. But the schools known to Freire, and the schools with which OLPC feels ambivalence, are ill equipped to such pedagogy because they impose on children that the world is already fixed and only for them to know through pre-

15 Against Marx’s (1998, p. 62) promise of bourgeois ideologists to help save the proletariat, Freire (2000, p. 60) warns that “they almost always bring with them the marks of their origin: their prejudices and their deformations, which include a lack of confidence in the people’s ability to think, to want, and to know”.
defined knowledge. This is what Freire calls the banking approach to education. The primary concern is the safe deposit of predefined tokens of knowledge inside the intellectual vaults of children (Freire, 2000, pp. 75–76). The teacher-with-knowledge or textbook-with-knowledge parse tokens to students-with-no-knowledge through rote learning, repetition and strictly controlled curricula: “students records, memorizes, and repeats these phrases without perceiving what four times four actually means” (Freire, 2000, p. 71). Not only didactically inefficient, the real problem with such an approach is that the oppressed are never encouraged to see and learn for themselves and, in effect, to reflect on their own position in the status quo.

In opposition to the banking concept, Freire places what he calls problem-posing education. In problem-posing education, teachers and students alike are investigating the way they exist and the world in which they exist through processes of contextualised problem oriented learning. As the students are challenged by these problems, and are allowed to go at them from different angles, they become better at learning, they discover how they learn and they become increasingly confident in their ability to take on new problems. This is the famous mantra of learning to learn central to many ICT4E initiatives (see e.g. Selinger, 2009). In this type of education, students and teachers alike see the world not as a static reality but as a process in transformation, as a “world which impresses and challenges both parties, giving rise to views or opinions about it” (Freire, 2000, p. 93).

**Children’s machines**

While Freire was practising his alternative to school by organising literacy programs amongst the Brazilian poor, Papert and OLPC are counting on computers to erode away the foundation of the banking approach. The continued proliferation of science and technology is bringing with it what Papert calls megacheck: a fundamental transformation of almost every human endeavour (Papert, 1993, pp. 1–21). The only area of society so far unaffected by this megacheck are schools, which have become reverse salients in the advance of society (Papert quoted in TES, 1998).

16 Information and Communication Technologies for Education: A generic term for initiatives using technology for educational development. A similar term also used in this thesis is Information and Communication Technologies for Development (ICT4D).
In an 1980s\textsuperscript{17} interview with Freire, Papert emphasised that human reformers of school are being overtaken by a much more powerful force in digital technologies:

> I don't think that we are the force that will change school [...] I'm saying that it is inconceivable that school as we've known it will continue. Inconceivable. And the reason why it's inconceivable is that little glimmer with my grandson [...] who are using VHS and Computers to learn about road-making machines [...] These children will not sit quietly in school and listen to a teacher give them predigested knowledge. I think that they will revolt.

(Papert & Freire, 1985)

Hope for the future lie with learning facilitated by machines rather than humans. In his book *The Children's Machine*, Papert outlines such a machine made especially for children. He had the “Robin Hood-like idea of stealing technology from the lords of the laboratories and giving it to the children of the world” (Papert, 1993, p. 33). Granting children “the power to know what others know” would make a powerful symbiosis with their inherent ability to learn – an ability that might otherwise be left to suffer what Freire called “cognitive death by school” (Papert & Freire, 1985). Substituting the teacher-with-knowledge for a computer-with-knowledge does not presuppose that you “stop learning” in order to “accept being taught” (ibid.).

In *The Children's Machine* there is a full chapter devoted to case studies of how knowledge is created, or constructed, in interaction with the world rather than instructed by books or teachers (Papert, 1993, pp. 137–157). In one of these, Papert is in the kitchen with a friend and they need to do fractals to customise a recipe. They need two thirds of one and a half cup of flour (2/3 of 1.5 cup) which, if calculated through the method of school, translates into 2/3 times 3/2, and then into a multiplication of numerators (2x3 = 6) divided by a multiplication of denominators (3x2 = 6) which equals (6/6 = 1). But Papert's friend calculated the problem differently. She pours one and a half cup of flour on the table, divides it into three portions and then pours one back. According to Papert, what this teaches us is that:

\textsuperscript{17} I have been unable to identify the exact year of the debate, but I know it was in the 1980s and have thus dated it 1985 in the references.
Not only does School use faulty methods of teaching, what it teaches is not what people use when they have to deal with a real problem [...] The central epistemological moral is that we all used concrete forms of reasoning. The central mathetic moral is that in doing this we demonstrated we had learned to do something mathematical without instruction...

(Papert, 1993, pp. 114–115)

Our intuitively best way of dividing flour when cooking is bottom-up rather than top-down. Children learn the best when engaged in activities that require them to form knowledge while engaged in such intuitive and meaningful activities.

On this backdrop, Papert wish to shift the debate away from pedagogics of teaching—because a child being taught is a passive object—and towards what he calls mathetics of learning (Papert, 1993, p. 84). What pedagogy is to teachers, mathetics is to learners. Let us take a mathetic example from Papert's mentor Jean Piaget. What follows is a dialogue where Piaget asks Julia at age 5 “What makes the wind?”

Julia (age 5): The trees.
Piaget: How do you know?
Julia: I saw them waving their arms.
Piaget: How does that make the wind?
Julia: Like this (waving her hand in front of Piaget's face). Only they are bigger. And there are lots of trees.
Piaget: What makes the wind on the ocean?
Julia: It blows there from the land. No, it's the waves.

(Piaget in Papert, 1999)

While tempting for an instructor, be it parent or teacher, to correct Julia and tell her “nice try, but this is how it really is” that would be counter productive mathetically speaking (Papert, 1999). What is at stake for Julia is practising the laborious art of making theories – of learning to learn how the world works. In this way, cognitive death by school occurs when you stop creating your own theories and start relying on answers from others.

One concrete example of the XO supporting mathetic learning is the Logo
programming environment behind much of the software (full list at OLPC Wiki, 2013a). Logo is designed to allow students learn about mathematics, language and science in interaction with computers (Logo Foundation, 2013). Like learning a spoken language, you program in Logo by adding new words to an existing vocabulary until a sufficient level of conversation is achieved. A good example is the popular Logo turtle. The turtle is a little creature on the screen, which you move around by passing it statements like \texttt{forward 50} and \texttt{right 45}. As the turtle moves it leaves behind a line in its trail. In this way you can draw a simple house by passing it a long series of statements. But if you tell it to \texttt{repeat 360} the statements of \texttt{forward 1; right 1} it will draw you a circle using only three statements. And if you group these statements under a function called circle, you will not only have made circles, but also defined what that means mathematically. In this way Logo offers "low threshold and no ceiling" for learning mathematics in playful construction of new worlds (ibid.).

The second debate: do laptops stimulate good learning?
OLPC see in computers not only a bridge over digital divides, but a children's machine to circumvent and substitute rote learning with interactive mathetic learning environments. With ownership of each their own laptop, children can programme using Logo, surf the internet, communicate with people outside their village or country and use the range of other activities which ships with the XO.

Our goal was to enable a global paradigm shift in the way in which we help children learn. It was about giving children tools that would empower them by teaching them to think, explore, innovate, and create [...] In our emerging global reality, giving children the tools of innovation and critical thinking is vital in enabling them to address the legacy of complex and seemingly intractable problems past generations have created for them.

(Bender et al., 2012, p. viii)

The function and necessity of a place called school with people called teachers are thus an important debate around OLPC. Suffering from insufficient funding, badly educated teachers and the described banking-pedagogy, OLPC has promoted their XO as a viable alternative to the schools of the world's impov-
erished regions (e.g. OLPC Talks, 2007d). The "worst, most dangerous limitation" of computers in education, Papert argues, is the assumption that “computers will just help us do things better” (Bennehum & Papert, 1996). We need to rethink how we facilitate learning rather than make what we already do more efficient. There will be no room for schools as we know them in the future (ibid.).

In early program presentations, you find frequent references to the laptops as trojan horses (see e.g. Vota, 2007). Like the wooden horse used to flatter the Trojans, the laptops appeal to governments because they make good textbook economy: “it will come with a 100 books, a 1000 books [...] It's not disruptive, kids use it, they don't have text books” (Negroponte quoted in OLPC Talks, 2007a). Non-disruptive textbooks at a good price will get governments to open their doors and deploy laptops in their school systems. But the real deal happens after school, when children can play and learn with the laptops on their own:

The soldiers inside the horse are the kids with laptops, and that’s where the change is going to happen [...] Our project’s a learning project. We want to give kids opportunity for learning. And one way that learning’s going to happen is through schools. But that’s only one way. And in fact, a lot of the time, kids aren’t in school. Kids are in school a couple hours a day, and that time is already pretty well programmed. (Bender quoted in OLPC Talks, 2007e)

This is the disruptive inside of the horse: children with laptops learning wild and uncontrolled by teachers, curricula and state authority. As such, OLPC has been more about leveraging children than training teachers or developing curriculum:

Or some of the teachers won't show up, or the teachers will have a 6th-Grade education at best. So, if you look at that and you say to yourself: "How do I fix that? How do I deal with that?" It is not by training teachers, it is not by building schools. In all due respect, it's not about curriculum or content.

It’s about leveraging the children themselves. Children are extraordinary - we don’t give children enough credit for what they can do.

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18 The conceptual disagreements notwithstanding, OLPC is actively partnering with schools of the present in order to get their laptops deployed, and have upgraded their commitment to teacher training and capacity building (Bender, Kane, Cornish, & Donahue, 2012, p. 112).
As discussed, OLPC considers children with laptops as self-sufficient learners because, to them, computers are ideal learning environments. What is made available to the child is the equivalent of having a million knowledgeable adults in close proximity (Bennehum & Papert, 1996).

Others, however, have contested that relying solely on the computer-child constellation for transformative learning is reductionist, and a total disregard of the multitude of other aspects influencing education. Toyama, for instance, argued that computers alone can not fix broken education.

Computers can benefit good schools, but they can’t make up for poorly run schools and absent teachers. On this point, I disagree fundamentally with Nicholas Negroponte. No one prescribes innovative software for the employees of a failing business. So, why laptops for broken schools, or mobile phones for badly run rural health care? (Toyama, 2010)

Freire too did not support Papert in his claim that computers can substitute for facilitated and collective learning (Kahn & Kellner, 2007; Papert & Freire, 1985). While clearly of historic importance, Freire could not see that computers would compel students to engage in social, political and historical tasks beyond the individual. And neither will they make students understand the reason of being of themselves or the computer. In their mutual debate, Freire made his point to Papert:

What matters to me is the determined space and time where determined tasks are accomplished. Social historical and political tasks, not only individual ones. […] the technological modification definitely accelerates the apprehension of knowledge, but not necessarily the reason of being of the knowledge […] Because it's not just by looking at and operating a computer that I understand the reason for the computer. (Papert & Freire, 1985)

While computers may indeed accelerate apprehension, they are no guarantee against shallow or propagandistic understandings which further entrenches the system of oppression.

In Freire's problem-posing education, an active human facilitator is central
– although it is pivotal that s/he does not take the role of instructor. Ideally, this facilitator should live together with students, learn from them the nature of their world and use this knowledge to pose questions on subjects such as water availability, health, work and wages (Blackburn, 2000, p. 9). In this process participants not only learn something in the direct sense—like when Brazilian sugar cane farmers become literate by literately spelling out their problems—they also come to consider themselves active subjects capable of questioning the world from multiple angles. This is the process of conscientization in which students, or participants, learn how to learn in Freire’s understanding. While enthusiastic about using electronic media for education, Freire did not agree with Papert that these could fulfil the important role of facilitator (Kahn & Kellner, 2007, p. 437).

Discussion: OLPC and the agency of laptops

OLPC has gained massive media exposure and are widely known by laymen and professionals alike. Even today, eight years after they first went public, most people still remember the $100 laptop with antenna-ears and a hand crank (the crank, however, never made it into production, q.v. Substituting for a hand crank, p. 124). OLPC has been amongst the most outspoken and ambitious proponents of using digital technology for development – ideally aiming at distributing one laptop per (poor) child in the world. This has made the initiative a favourite case for debating what can actually be achieved with technology in development.20

Because our goals started in such a lofty place, and because our launch was covered by media the world over, we have been closely scrutinized by education, technology, and development circles. (Bender et al., 2012, p. 5)

I too use OLPC as a vehicle to conceptualise the agency of not only laptops at Akila’s school, but also of technology in development more generally.

Empowerment for OLPC is centred around access to mathetic learning en-

19 That facilitators are able to be just that, facilitators, without assuming the role of instructor and relay to the poor why they are poor, and how they can escape their situation, is also a potential pitfall with Freire (Blackburn, 2000, pp. 10–12).

20 OLPC underpins various evaluations and reports (e.g. Cristía, Cueto, Ibarrarán, Santiago, & Severin, 2012); a range of academic articles (e.g. Luyt, 2008; Warschauer & Ames, 2010; Winston, 2007); and countless newspaper articles, blogposts and debate sites.
environments and inclusion in the global information society. Their means to achieve this has been the XO laptop which, to OLPC, can substitute for a Freirean facilitator and circumvent the limitations of an impoverished context. However, this setup has also been the principle point of criticism. As emphasised by Toyama, initiatives like OLPC have been “deconstructed” by academic observers as being insensitive to what goes on beyond the child-laptop configuration:

ICT4D enthusiasts don’t design context-appropriate technology, adhere to socio-cultural norms, account for poor electrical supply, build relationships with local governments, invite the participation of the community, provide services that meet local needs, consider bad transportation infrastructure, think through a viable financial model, provide incentives for all stakeholders, and so on. (Toyama, 2010 - emphasis added)

However, this thesis is not on the bandwagon of deconstruction.

OLPC is indeed based on problematic assumptions, which help me angle some of the following chapters. Initially, OLPC assumed that getting laptops to remote locations—and getting them to work there—would be somewhat trivial. Likewise, they assumed that laptops and children could fend for themselves in stimulating critical and creative thinking. However, as recalled in a recent reflective book entitled Learning to Change the World written by key OLPC persona,21 they learnt otherwise:

It is one thing to deliver laptops to a warehouse in Lima and another to get the laptops into the hands of children in the Andes. In-country logistics—getting the laptops into hands of the children—would become one of the biggest challenges [...] As it turned out, more challenging than distributing laptops to children in remote villages was ensuring that once the children had the laptops, they were used for learning. (Bender et al., 2012, pp. 98 & 102)

Similar lessons on the influence of context also figure in the book, that the biography of each child helps decide how much empowerment a laptop can hope to do:

Youth from low-income households presumably have fewer family members

21 The authors are Walter Bender (cofounder of OLPC and director of Sugar), Charles Kane (former Chief Operating Officer and currently a board member), Jody Conish and Neal Donahue (independent commentators on OLPC). The book, however, does not present itself as officially speaking on behalf of OLPC.
who are familiar with and use technology as well as guardians who work longer hours; they tend toward more basic uses of the computer such as chatting [...]—the context in which each child is situated impacts the benefit derived from the XO. (Bender et al., 2012, pp. 133 & 150)

The authors should be applauded for openly sharing these insights. But the good question here is what difference do the theories of OLPC really make for the success of laptops in Peru, Uruguay or at Akila’s school?

A first observation could be that had OLPC in 2005 been convinced and outspoken that laptops would be difficult to deploy, and even more difficult to get to work for education, they would most likely not have attracted much support or attention. What the direct coupling of laptops with social change did for OLPC, was to bring in support which theories like ANT, for instance, might never have:

But these lofty goals when publicly stated led to more media coverage than most organizations would ever dream of and, as a result, brought money, partner organizations, and individuals to the table to support our cause. Would these partners have joined us if our mission had been less bold? Quite likely not. (Bender et al., 2012, p. 27)

A second observation could be that since OLPC is a quite heterogeneous gathering of private companies, national governments, researchers, school teachers and children, how much influence do the theories and assumptions of Negroponte and Papert really have? As also revealed in the same book, keeping the vast network of collaborators aligned has been a substantial challenge (Bender et al., 2012, p. 53). In the case of Akila’s school, for instance, most of the OLPC ideas were abandoned from the outset and replaced with a more holistic approach which, in the end, could not get the laptops to work well either (q.v. Laptops detour, deviate and betray, p. 120 and Falling Into Limbo, p. 167).

I am not trying to acquit OLPC of all charges by making them powerless because indeed they are not. I am arguing that OLPC alone do not decide what their laptops end up becoming – no matter how many principles they put down (q.v. Five principles everyone agrees to, in principle, p. 36). Marc Berg (1998, p. 457) has outlined the predicament of technological agency in relation to design interventions. If our ambition is bringing into being “more desirable or
justly ordered social collectives” and we know that technology “participate in
the ordering of social collectives” we naturally seek to ally ourself with such
agency only to be dumbfounded time and again that “the specific impact of
technology appears to be the outcome of negotiations” beyond our control.
This is also captured by Casper Bruun Jensen (2008) in his article on develop-
ing/development cyborgs—that is, subjects such as Akila meant to be em-
powered through technological extension—which often ends up as “rather sur-
prising creatures, with bodies and minds set on goals rather different from
what development agencies had hoped for” (Jensen, 2008, p. 378). It is to fur-
ther elaborate on such elusive agency that I now turn to ANT.
Development Encounters
ANT as ontology and vocabulary for development

Development as concept and practice grew from Western modernity and the idea that science and technology can help nations develop along a Western trajectory. Actor-Network Theory (ANT) grew from a polemic with Western modernity and from offering science and technology a different representation of themselves. However obvious, ANT has rarely been used to investigate development. This chapter sets out to investigate the relationship between ANT and development on a conceptual level, providing the foundation for other and more specific investigations in later chapters. After briefly introducing some themes related to development, and what is meant by a development encounter, the chapter proceeds to position ANT within a war over reality between not only science and sociology, but also, by implication, the development official and those to be developed. Here we have the first argument: the stakes of development extend to ontology. ANT takes this premise to its full extend in positioning development in a symmetrical and irreducible metaphysics of actor-networks. The chapter then proceeds to investigate the notion of translation as that which binds heterogeneous elements together in a drift of construction and composition. This is the second argument, that development encounters bring into being novel compositions rather than introducing already established ones. The chapter is concluded with a discussion of the critical potential of ANT's symmetrical vocabulary.

22 While not a major theme within ANT there are some development related works. There are a number of empirical studies of technology in a developmental context (e.g. de Laet & Mol, 2000; Rhodes, 2009; Stanforth, 2006). There are also a range of more conceptual works (e.g. Jensen, 2008; Latour, 2002; Marques, 2005, 2012; Rubinoff, 2008) and recently a series of working papers were published from the University of Manchester with the explicit theme of understanding development with ANT – see the full list here: http://www.cdi.manchester.ac.uk/resources/ant4d/.
Development did not exist prior to World War II (q.v. A history of technology transfers and development, p. 9). Before then there were colonies and colonisers, but no developing countries and foreign aid as we presently know them. This changed following the war when the United States led the way into a new way of relating between socio-economic powers such as itself, Europe and USSR, and the newly independent countries of Africa and Asia—as well as the older colonies of Latin America.

Post-war development had two major themes of interest for our current purpose of relating ANT to development. First is the idea that development signifies universal progression through ever more rational stages of history and, secondly, the idea that transfer of science and technology can help induce movement along such developmental trajectory. With an outset in Marx (1993, pp. 470–500), the first theme has been formulated by writers such as Rostow (1990) and Francis Fukuyama (2006) who may disagree on the destination but share the same premise: that nations indeed do progress through certain stages, that some are further along than others and, as such, in more intimate connection with universal truth (q.v. Hopes for convergence and modernisation, p. 12). The development official inscribed in this setup resembles the missionary in speaking not simply from another perspective, but from one more intimately connected with truth.

This premise extends into the second theme. That if the science and technology of those further progressed can induce development amongst the poor, it is because they are objects-as-facts and not cultural fetishes. The Integrated Rural Development Program (DRI) described by Escobar (1995, p. 137), for instance, was not simply another way of doing agriculture, a fetish of North America, but a modern and rational method meant to develop traditional and backward peasants through technology, training and infrastructure. If the thought of universal progress can be made Marxist, the idea that modern science and technology are independent of context and culture is Cartesian in that it forcefully separates res cogitans from res extensa, subject from object and society from nature (Descartes, 1641). The objects transferred during development apply equally well in Africa, as they do in Europe, since their nature is transcendental and their logic already established elsewhere (this is further in-
vestigated in chapter 5: Laptop Multiplicity, p. 131).

Both themes make for asymmetrical development encounters in a range of ways. If one part is further progressed than the other, if the assistance and objects offered are ready-made for universal appliance, there is only little room for negotiation and limited tolerance of variations. Mosquito nets are mosquito nets, they are not wedding-gowns or fishing nets (q.v. Transfer involves re-invention p. 27). And if mosquito nets fail to fight malaria the fault is necessarily displaced to an irrational culture—or insufficient deployment strategies for this culture—since the nets have objectively been fixed as mosquito nets rather than fishing nets or pieces of cloth (q.v. Innovations: Imported or Invented?, p. 98).

On a conceptual level, these are the themes ANT tries to reformulate by replacing Marxist notions of progress and Cartesian dualism with symmetrical ways of following relations between heterogeneous elements in specific development encounters. However, ANT is not a theory meant to deconstruct development in order to prove it false or oppressive (Latour, 2005, p. 11). The overall project of ANT is rather to reformulate the metaphysics and analytical vocabulary in which we place these encounters.

When the Western (or used to be Soviet, or presently Chinese) development official meets the impoverished African, it is not an encounter between an actor further progressed, with a rational mind backed by universal science, and another who is less progressed and enmeshed in a charming but irrational culture. And neither is it one of a powerful apparatus confronting its powerless victims. The principal insistence of ANT is that there is no a priory difference to the being of Western consultant, African poor, technological object or any other actor involved, there is no transcendental resource who may decide at the outset who is right or wrong. However, the equality is a priori and analytical, it does not extend into a posteriori conditions. When ANT investigators take to the field they do so to investigate how a given order is achieved in the end from such symmetrical outset:

..the more actors are seen to be equal, in principle, the more the practical differences between them become apparent in the means available to them to
With ANT, development is simply an encounter between heterogeneous elements wherein agencies are working to bring about some change of situation in both social and material terms. There is no guarantee that these agencies are working towards the same ends, or that the situation will change as any of them expect, if at all. And the only means we have for validating such encounters is immanent to the situation rather than transcendental like Cartesian objectivity or Marxist progress.

To understand how ANT may offer a symmetrical description of development, one not proceeding along Cartesian or Marxist dimensions, we now proceed to explore how ANT grew from the ambition to do the same for science.

From science to development
Studies of science have traditionally adhered to a Cartesian distinction between conditions of the social—those conditions that science shares with everything else—and conditions of objective reality—those conditions that are exclusive to the scientific method, those which guarantee scientific propositions to be in accordance with transcendental nature, with res extensa (Collins, 2009; Latour & Woolgar, 1986, p. 23; Olesen, 2007). Implicit in this distinction is the view that objective knowledge is contained by nature and discovered by scientists, whereas all other aspects of science is contained by society and explained by human relations. That while Isaac Newton was a man of God just as much as he was one of science, we should keep his theology distinct from his laws of motion – even if he himself did not do so (Jacob & Jacob, 1980).

The purification of Newton, and the world in general, into either nature or society is arguably a trait in all programs of modernity, development included, but takes strongest form in science (e.g. Latour, 1993c). The argument of ANT is that this purification is not there from the outset, that scientific facts come into being through a painstaking, hybrid genesis which can be described in the same anthropological terms as those normally reserved for exotic cultures, such as those found in development countries.
From savage minds to tribal science

An important study of scientific work is *Laboratory Life* by Bruno Latour and Steve Woolgar (1986). The study was motivated by Latour having been commissioned for another study a few years earlier. The two studies are of the same anthropological type, but whereas the former is set in a laboratory, the stronghold of scientific rationality, the latter was carried out in the Ivory Coast, a former French colony turned development country.

In the Ivory Coast, Latour had served out his military service investigating such questions as “why it was so difficult for black executives to adapt to modern industrial life” (Latour & Woolgar, 1986, p. 273). Doing so, he was confronted with a literature full of cognitive explanations of the African mind, most of them distinguishing between modern rational reasoning and traditional irrational reasoning (ibid., p. 274). Latour became frustrated with these theories as they preferred sophisticated cognitive explanations over mundane material circumstances. French teachers in technical schools, for instance, accused their Ivorian students of being unable to see in three dimensions, and thus incapable of reading blueprints of engines (a cognitive deficiency). Upon closer scrutiny, however, it turned out that students had never actually seen an engine, and since school taught theory prior to practice, the blueprint abstractions did not tie into any known material reality. He later termed these experiences the shock of Africa:

> Not for a moment have I forgotten the shock of Africa, of neocolonialism, of the advance of the modernizing frontier. How can one practice a truly symmetrical anthropology?  

(Latour, 2013c, p. 17)

It was not the erratic behaviour of an exotic culture which was shocking, but the asymmetric encounter between Ivorians and French expatriates (Latour, 2013c, p. 4). Whereas the latter had rationalities the former were left with deficiencies.

There was, however, no alternative schema available when those under study were behind in development, unprogressed in history:

> ...we did not know how to describe in ethnographic terms the meanings of “rational,” “effective,” “competent,” “profitable” - all qualities, I was told with the scornful assurance of expatriates, that seemed to be lacking in the
In cooperation with Nobel laureate in medicine Roger Guillemin, Latour and Woolgar thus went into the laboratory at the Salk Institute in California searching for anthropological understandings of rationality, objectivity and scientific facts:

We envisaged a research procedure analogous with that of an intrepid explorer of the Ivory Coast, who, having studied the belief system or material production of "savage minds" by living with tribesmen, sharing their hardships and almost becoming one of them, eventually returns with a body of observations which he can present as a preliminary research report.

(Latour & Woolgar, 1986, p. 28)

Through their fieldwork, Latour and Woolgar were able to gain insights on how scientific facts are produced through hard work requiring expensive machinery, test animals, scientific publications, controversies and large quantities of transcripts and inscriptions. The scientists did not simply discover facts-in-nature. Rather they tinkered along in a complex and hybrid setup which yielded only small increases or decreases in the truth-value of their various propositions:

By the end of the day, mail has been dispatched together with manuscripts, preprints, and samples of rare and expensive substances packed in dry ice [...] One thousand dollars has been spent today. A few slides, like Chinese idiograms, have been added to the stockpile; one character has been deciphered, a miniscule, invisible increment. Minute hints have dawned. One or two statements have seen their credibility increase (or decrease) a few points, rather like the daily Dow Jones Industrial Average.

(Latour & Woolgar, 1986, p. 17)

The facts were not simply there to be seen. Rather, what was achieved by a multitude of diverse actors was one or more proposed orders made from a pool of disorder:

...the practising scientist is likely to be as much involved with the task of producing ordered and plausible accounts out of a mass of disordered observations as is the outside observer [...] Despite participants' well-ordered reconstructions and rationalisations, actual scientific practice entails the confrontation and negotiation of utter confusion. (Latour & Woolgar, 1986, p. 36)
The anthropological understanding of science, which became formative for ANT, is thus one of many heterogeneous participants tying into each other in a slow and painstaking process the outcome of which is not nature stripped naked, but *hybrid constructions* which is carefully scrutinised by the scientific community for their build quality.

**The social equivalence postulate**

*Laboratory Life* was a move to render anthropology symmetrical across scientific laboratories in California and technical schools in the Ivory Coast. As such, it operated on the *equivalence postulate* (also known as the *principle of symmetry*) formulated by David Bloor and Barry Barnes (1982; Latour & Woolgar, 1986, pp. 23–24). The postulate argues that in order to be symmetrical, both true and false propositions must be accounted for in the same way:

Our equivalence postulate is that all beliefs are on a par with one another with respect to the causes of their credibility. It is not that all beliefs are equally true or equally false, but that regardless of truth and falsity the fact of their credibility is to be seen as equally problematic.

(Barnes & Bloor, 1982, p. 23)

The provocative implication being that all propositions are considered equally constructed at the outset, regardless of their subsequent credibility in the scientific community.

Barnes and Bloor (1982) give the example of the two eighteenth-century chemists Joseph Priestley and Antoine Laurent Lavoisier. The controversy between Priestley and Lavoisier consisted in their divergent theories over the gasses associated with combustion. Priestly had identified a gas called plogiston, the existence of which Lavoisier denied in favour of another gas called oxygen, which Priestly in turn had also discovered by means of his plogiston theory. Priestley and Lavoisier shared the same physical reality, they both experimented with lead oxide and mercuric oxide, and they both gave sound theoretical explanations for what they observed.

To explain why oxygen ended up true and plogiston false, Barnes and Bloor suggest that we need to replace nature with *social* categories (ibid., p. 34). The equivalence postulate was thus a move to render the social the basis for sym-
metrical investigations. If facts are out there to be discovered, unmediated in existence by cognitive and social factors, why, then, these controversies some of which, like cold fusion, persist even today?

Within studies of technology the postulate helped establish a similar move in that some technologies, like those of Escobar’s DRI program, could no longer be deemed superior to their alternative by reference to necessity, rationality or historical progress. A theory of the Social Construction of Technology (SCOT) was developed holding that technologies have a multi-directional character enabling them to develop in several directions until finally one variant is stabilised as dominant (Bijker & Pinch, 1989, p. 28).

According to this theory, what moved agricultural technology to Columbia and laptops to Nigeria, and made them either successes or failures once there, are social forces. In a famous SCOT study it is, for instance, illustrated how our current layout of bicycles with chain drive and two equally sized wheels only came to replace the Penny-Farthing when woman and elderly wanted something safe and manageable (Bijker, 1997). As it happened, the Penny-Farthing was actually deemed technically superior by “young men of means and nerve” which valued the speed, thrill and steady ride on cobblestones offered by the big wheeled layout (ibid., p. 41). In this view, the DRI program was a North American fetish after all.

Hybrid equivalence and irreduction
There is, however, a problem with the equivalence postulate. While it challenged the privilege of science to determine the real, it also maintained this privileged in a different form by making the social foundational for “all the vastly different cognitive responses that men produce” to the world (Barnes & Bloor, 1982, p. 34). Social explanations had failed to incorporate the materiality of engines in the Ivory Coast and dissatisfied with the term, Latour and Woolgar famously removed it from the subtitle of Laboratory Life. It had been “a term of antagonism, one part of a binary opposition“ but ended up a coloniser of all relations:

But how useful is it once we accept that all interactions are social? What does the term "social" convey when it refers equally to a pen’s inscription on graph
As argued by Michel Callon (1986a, p. 198), social constructivism was never a real alternative to scientific realism because it makes the social so strong, that it alone has to carry all the world upon its shoulders. The stance which developed with ANT is that society and the social are just as much constructed and performed as nature and science, and in ways equally hybrid and troublesome (Latour, 2005; Strum & Latour, 1987).

The scientific fact is not a social construct and neither is it alone in nature, it is a hybrid ensemble irreducible to any non-hybrid origin. Accordingly, the metaphysical and methodological basis for ANT is irreduction:

...nothing can be reduced to anything else, nothing can be deduced from anything else, everything may be allied to everything else.

(Latour, 1993b, p. 163)

While simple enough, such an outset carry deep implications. No theoretical framework, no order, no social class, no nature, no society, no social groups, no atoms – nothing but utter mess which has to be cleared up and ordered in concrete processes like those at the Salk Institute. This is the point of ANT: to follow these processes through which the world comes into being, to follow how actors construct their worlds and with what components.

Callon (1986a) has laid out three concrete principles, or methodologies, for doing so. Void of any transcendental foundation, the analytical outset must first of all be agnostic towards divergence and heterogeneity: “no point of view is privileged and no interpretation is censored” (1986a, p. 200). The second principle extends the equivalence postulate in making all convictions equally hybrid, irreducible to either side of the Cartesian divide (this is also called generalised symmetry). The third principle of free association follows the others in allowing for any analytical coupling traced in the practice of actors. These principles not only guide the researcher, but describe the metaphysics of an irreducible world, of actor-networks. We return to those shortly.

**In development as in science, the stakes extend to ontology**

The origin in science studies makes ANT particularly attentive to metaphysical
implications. What was at surface a minor expansion of sociological interest into scientific work carried deep ramifications. It forced out a strong debate over which intellectual realm could, or should, make claims to nothing less than reality itself: the science wars of the 1990s (Collins, 2009).

What is the real real and who stands on firmest ground to determine how it works: physics or sociology, development official or Ivorian? Alan Sokal (1996b) famously had a fake article accepted in the journal Social Text after which he declared that anyone not believing in the superiority of science in this question should prove him wrong by jumping from the 21st floor.

Fair enough: anyone who believes that the laws of physics are mere social conventions is invited to try transgressing those conventions from the windows of my apartment. (I live on the twenty-first floor.) [...] There is a real world; its properties are not merely social constructions; facts and evidence do matter. What sane person would contend otherwise?

(Sokal, 1996a, pp. 2–4)

If we take development, the stakes too extend to ontology. From where do such phenomena as democracy, capitalist markets, agricultural equipment, Western education and laptops derive their being and validity? From an universal bedrock as certain as gravity or from social norms as evanescent as fashion? With what authority do the development official approach those to be developed?

In the book Modes of Existence, Latour (2013a) quotes a meeting on global warming between a group of French industrialist and a distinguished professor of climatology. The professor presents his facts but is evaded by the industrialists: “But why should we believe you, any more than the others?” referring to the so called climate sceptics (Latour, 2013a, p. 2 - emphasis in original). The professor makes a long sigh before responding “If people don’t trust the institution of science, we’re in serious trouble” (ibid., p. 3).

The climate debate too has polarised into either sides of the Cartesian divide. Either the relation between climate change and emission of carbon dioxide is entirely observable in nature, a truth-in-itself, or alternatively, it is a social construct where my truth is as good as yours. The problem for the professor is that the hybridity of his facts are there for everyone to see. It is clear to all
that he needs advanced computer simulations, abstract statistics, conferences and peer reviewed articles to make his propositions. A serious source of weakness when confronted with industrialists who share Sokal’s premise that facts of nature must appear alone, unmediated and unquestionable, like Newtonian gravity when jumping out the window.

From its foundation of irreduction, ANT tries to overcome this divide by offering science and development alike “a different representation of themselves” and with regards to the climatologist, “one that would make it possible to regain trust at last in a profoundly redefined scientific institution” (Latour, 2013a, p. 11). When ANT claims that actors construct their world this is to be taken literally. These are not social worlds sitting on a single shared reality to which some—physicists, clerics, agitators, development officials, etc.—have privileged access while others are excluded. The practice of development is like that of the laboratory: engaged in bringing into being specific hybrid compositions. With ANT, an encounter is not set in a context as much as it produces the context, it does not introduce objects as much as it produces them, it does not involve an array of social or cognitive perspectives but “forms of difference that cannot be reduced to a disparity of ‘worldviews’” (Woolgar & Lezaun, 2013, p. 322). The consequence of raising the stakes to ontology are further explored in chapter 5 (Laptop Multiplicity, p. 131).

An ontology of actor-networks

ANT is a “metalanguage that has no goal but to keep ontologic pluralism from being crushed by the subject/object schema” of the Cartesian divide (Latour, 2013c, p. 16). It takes the full consequence of this in the notion of actor-network. An actor is someone or something that is part of an action or movement. The network is that which compose the actor and allows it to act. Actor-networks are irreductions (Latour, 1993b, pp. 153–236). They contain both the material and the social without being reducible to either, they are different from each other but share the same hybrid genesis.

The actor network is reducible neither to an actor alone nor to a network [...] An actor network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of. (Callon, 1987, p. 93)
Actor-networks are like (play-)actors on stage who might appear alone and isolated, but are actually *achievements* by make-up artists, costumes, settings, ropes, winches, writers, directors, acting schools and the audience (Latour, 2005, p. 46). All of these are actors and all participate in some substantial way to sustain our lone Romeo, who is able to act only by virtue of this concatenation of mediators. The actor-network is a *multiple monism*. It is a singular being by virtue of also being a multiple being.

One famous example related to development is the *Zimbabwe Bush Pump* (ZBP) described by Marianne de Laet and Annemarie Mol (2000). Of course, the ZBP is the ZBP, a colourful object for pumping water in African villages. However, upon closer scrutiny, such singularity explodes in multiplicity. Above ground the ZBP consists of pump head, pump stand and lever; below ground there are hydraulics, pistons, boreholes and water reservoirs; around it are communities who drill the boreholes with Vonder Rigs, do the maintenance and have themselves arisen through this process; running through the pump is water with low E.coli numbers; protecting the water are concrete headworks and water diviners (*ngangas*); polluting the water are human latrines, in Harare is a modest inventor who refuse to take out patents and a government sponsoring new installations as part of nation building. While the ZBP is indeed the ZBP, a single familiar thing, it is also a vast network of other things, which makes complex not only what it is but also what it can do. Does it build a nation, form a community, provide health or pump water, or all of these at once?

Thus, the Bush Pump's various boundaries define a limited set of configurations. They each, one might say, *enact* a different Bush Pump. But these different Bush Pumps have in common that they are indeed a pump – and not a diviner, a rain cloud or a water infrastructure chart.

(De Laet & Mol, 2000, pp. 237–38)

**Implications for time, space and other such scales**

Actor-networks are “nodes that have as many dimensions as they have connections” (Latour, 1990, p. 3 - emphasis in original). This not only carries implica-

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23 While the ZBP study shares many ANT characteristics, it comes with its own vocabulary of the fluid. It actually argues against some classic ANT points – for instance by contrasting the modest ZBP inventor to the Pasteur described by Latour (1993b). The study nonetheless affiliate itself with ANT and ties into the movement known as post-ANT (Mol, 2010, p. 256).
tions for agency and composition but also for spatiality and temporality – other qualities usually determined along Cartesian or Marxist lines. Manifestations of scale and temporality are important to development projects, which are seeking immediate impact as well as long term sustainability, integration of micro with macro and local with global. As Faik et al. (2013, p. 1) suggest, reconfiguration of these scales is a cornerstone of bringing ANT into development.

Insofar as development is considered Marxist progression, it enacts the course of time “as an irreversible arrow, as capitalization, as progress” (Latour, 1993c, p. 69). In contrast, ANT describes a world equally irreducible to temporal trajectories as to social or natural categories. Temporal order is that which results from drawing lines between elements rather than that which belongs to elements themselves. For instance, while we are born at a specific point in time, our temporality does not reduce to a straight line from then on to our eventual death. A multitude of temporalities run through our being: “Some of my genes are 500 million years old, others 3 million, others 100,000 years, and my habits range in age from a few days to several thousand years” as Latour (1993c, p. 74) writes.

In every actor-network there is a myriad of possible temporalities to be laid down (Latour, 1993c, p. 68). Temporalities are performative, they help make order and they help bring into being (a point we return to in The black school ensures co-existence, p. 143). Faik et al. (2013, p. 10), for instance, describe how the otherwise sensible concern over sustainability is also performing a special form of development excluding that which is short-term – which may actually be appropriate in a number of cases.

Similarly, actor-networks do not expand in any conventional way. While I sit at my desk and write on my computer, the words on my screen are saved to the cloud, which is as global and intangible as it gets. However, I could nonetheless follow unbroken links of optical fiber cables all the way from my desk to a data center of steel and concrete somewhere across the Atlantic (Blum, 2012). With ANT, there is no global beyond the local and, vice versa, no place self-contained enough to be local (Latour, 2005, p. 204). As such, actor-net-
works do not fluctuate between micro, meso or macro. They extend through relations which intensify at some points while thin out at others (q.v. The object of study and its field, p. 85).

**Saving fynbos is building communities**
Let us take a short example. In Cape Town the ingenious vegetation of fynbos plants is in danger of becoming extinct. The problem is not only one of biodiversity, it also concerns the future supply of fresh water since scientists have established that fynbos are better at sustaining freshwater flows than their invasive rivals from Europe. Accordingly, the former have become a target for protection and the latter one for weeding (Ernston, 2013, pp. 13–15).

The dominant approach to endangered species is to create controlled reserves where nature can be kept separated and protected from society. But in the case described by Henrik Ernston (2013), the planting of fynbos vegetation helped turn a neglected area into an open and attractive residential neighbourhood. The area in question had been whites-only during Apartheid and the coloured and blacks now moving there had strong memories of oppression tied to the land. On this backdrop, the new residents planned to be different in how they lived on the land (ibid., p. 10).

The residents ended up connecting their properties, refrained from building security walls and created open community spaces instead. Since the soil is perfect for fynbos, the community space came to double as conservation space for fynbos by the intervention of nature conservation managers. The City of Cape Town provided thousands of fynbo seedlings, tons of soil was moved around, environmental organisations became involved and in the midst of it all residents were throwing braai barbecue parties.

The example of a small neighbourhood planting fynbos transgresses a range of scales. The community space was established in relation to memories of oppression during Apartheid. The same space also points to the future in protecting fynbos vegetation and fresh water flow while providing neighbourhood children with an ideal for their future society. Although the space measures 2000m\(^2\) it also transgress this boundary: seedlings are cultivated in the Kirstenbosch National Botanical Garden, workers come from outside to weed
invasive plants, which are then transported away on trucks, and neighbouring communities have started building their own spaces following the same model. As formulated by Ernston: “in attempting to account for the stabilizations of a ‘small-scale’ or ‘local’ project, we are almost immediately propelled out in space and time” (2013, p. 13).

**Genesis is translation**

Actor-networks are not static entities organised around fixed connections. Like the community building turned fynbos conservation in Cape Town, actor-networks are dynamic constellations undergoing shifts in character as new relations are forged and old ones wear out. As noted, following this process of world-building is the principle activity of ANT:

> This, then, is the core of the actor-network approach: a concern with how actors and organisations mobilise, juxtapose and hold together the bits and pieces out of which they are composed; (Law, 1992, p. 6)

The process is most commonly described through the notion of *translation* borrowed from Michel Serres. In Serres, translation designate the “process of making connections, of forging a passage between two domains, or simply as establishing communication” (Brown, 2002, p. 5). Likewise, actor-network theorists have adopted the notion to describe the interrelation of heterogeneous elements in a process that not only binds them to each other, but also brings new constructs into being.

Translation means drift, ambiguity and transformation, it means that what is inequivalent has been brought into relation through some form of translation of the situation. For instance, when Leo Szilard first approached the American High Command with his idea of an atomic bomb they dismissed him. The goal of the high command was to win a conventional war of tanks and guns, and Szilard's bomb did not fit this ambition. Then Szilard placed a wedge: “What if the Germans got the atom bomb first?” (Latour, 1987, p. 114). Faced with such a threat the character of the goal changed. It was still to win the war, but the war was now potentially an atomic one. Rather than improving traditional weapons, scientists were now best at use building nuclear bombs in the desert of New Mexico. As such, translating goals is to offer new versions of these:
“‘Take your revenge’ is made to mean ‘write a letter’; ‘build a new car’ is made to really mean ‘study one pore of an electrode’” and so forth (ibid., p. 117).

Translation does more than align diverging interest in a common program of action. It compose and stabilise new actors in the process. As exemplified by tragic shootings in the US, anti gun campaigners rally under the slogan “Guns kill people” to which the National Rifle Association (NRA) responds “People kill people; not guns” (Latour, 1994, p. 30). Of course, such claims are contradictory but nonetheless manage to co-exist as they displace the centre of explanation to the either side of the Cartesian divide: the killings of gunmen is explained as either a social phenomenon (NRA) or a consequence of too many guns (anti gun campaigners).

Although we hardly need ANT to tell us that a man with a gun in his hand is different than one without, the situation nevertheless serves as a good illustration that new and different actors emerge from translations. Lets say that person A has a score to settle with person B—he might have a program of action to take revenge—but if person B is physically stronger, then person A might take a detour and enlist another actor C – which is a gun (ibid., p. 32). A new composite actor, a gunman, emerges with a new, translated program of action: “You had wanted only to hurt but, with a gun in your hand, you want to kill” (ibid.). Our person with a grudge has become different with the gun in hand, he is no longer the same actor. And it is not only the human that has changed, the gun too has become different: “The gun is no longer the gun-in-the-armory or the gun-in-the-drawer, but the gun-in-your-hand, aimed at someone who is screaming” (ibid., p. 33).

Although it is easy to imagine the gunman as gun + man, other compositions have been so tightly constructed that what emerge from translation are black boxes. A term borrowed from cybernetics and technical diagrams, a black box is a singular entity sitting on top of a complex system, but a system the complexity of which we need not worry about. Latour has many examples of black boxes. One is the projector used to display slide shows at conferences or during classes (Latour, 1994, pp. 36–37). The projector just sits there, it is

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24 A program of action is a symmetric term to describe both human intention and non-human function under one (Latour, 1994, pp. 33–34).
taken for granted, and as an actor it seems to be without network. But if the projector fails to work, if no slides make it to the screen, then repairmen, spare parts, frustrated presenters and computer experts all gather round it. Perhaps the light bulb from Taiwan needs to be replaced or perhaps a microchip from Texas has broken down. The actor-network running through black boxes—sustaining them in existence—most often reveal themselves when things break down (Latour, 2011, p. 797).

**Development as drift and becoming**

There are numerous interesting consequences for development if the medium for action is translation. First of all, there is the observation that bringing an idea, concept or technology into novel settings carry consequences for the composition of this vehicle. As explored in chapter 4, the implementation or introduction of what we otherwise consider as complete and ready-made is actually a process of continued invention and construction (q.v. Rendering Laptops Mobile, p. 97). If invention is a process that extends far beyond the laboratory or the R&D department, we may have to rethink a range of both practical concerns such as transfer management alongside more fundamental ones of agency and purpose.

An added complexity explored in chapters 5, 6 and 7 is the ontological multiplicity which may arise in continuation of translations (q.v. Laptop Multiplicity, p. 131; Falling Into Limbo, p. 167 & Lines of the Apparatus, p. 199). The Zimbabwe Bush Pump takes a range of forms depending on who or what we include in its composition: at one and the same time it is a hydraulic system, a sanitation device, a community builder, a national water infrastructure and so forth (de Laet & Mol, 2000). In cases such as the bush pump, these variations lend strength to the composition. In other cases, such as the laptops explored here, the disparity may prove more problematic (q.v. Opposing points of rigidity, p. 211). But in all cases, the multiplicity is ontological, it is grounded in actor-networks, in the material as much as the social (q.v. Discussion: heterogeneous ontology, p. 163).

**Cui bono?**

Translations are also about power, politics and morality. This final aspect of
translation involves disciplinary mechanisms and forceful alignments. Latour (1987, p. 129) illustrates this disciplinary aspect using Dutch windmills. Early versions of Dutch windmills were fixed in one direction. If the wind did not blow from that direction, the miller did not mill. The peasants thus used the pestle and other alternative means of getting their grain milled. But then the millers started building mills with revolving tops which could almost always catch the wind and sustain production. With revolving mills, the miller—that is the actor-network of vanes, wheels and journeymen—was able to enrol the decisive actor of the wind and thus grew stronger and more efficient than the pestle. If the peasants wanted their grain to be milled, the miller had become an obligatory passage point.

Here, then, with obligatory passage point enters the old critical question of *cui bono* and with it the more fundamental problem that the order of translations—in the form described above—tends to have no other, no plane of latent alternatives (Lee & Brown, 1994). No matter what the peasants want, or how good they are at handling the pestle, they now live under the fact of rotating mills. Translations and obligatory passage points do not bring to light those who silently suffer under such order and neither do they see any latent alternatives:

The tools of conventional sociology and psychology, and even of ANT, are confronted with actants reduced to silence and with the silent masses, because they concentrate on monitoring the obligatory passage points of networks; they are obsessed with territorialized space. For them, nothing else counts. (Lee & Brown, 1994, p. 787)

ANT has been criticised for bias towards the network builder, the strong actor who manage to enrol everyone and everything in his (it is most often a he) scheme of things (Lee & Brown, 1994; Star, 1991; Wajcman, 2000). The argument being that we should sensitise ourselves to what goes on outside the calm order of passage points. Here we would find, as Susan Leigh Star argues, that stabilisation and standardisation for some is chaos and suffering for others:

We know how to discuss the process of translation from the point of view of the scientists, but much less from that of the laboratory technician, still less from that of the lab’s janitor, much as we agree in principle that all points of
view are important. (Star, 1991, p. 33)

The problem is twofold. Not only are the worlds of janitors and technicians invisible from the point of view of scientists, but their conflicted positions are also “among the most powerful analytically” (Star, 1991, p. 30). The subjugated have the most “decent chance to be on to the god trick” of those seeing through privilege and claiming this to be neutral, as argued by Haraway (1988, p. 583).

Within development this translates into an enhanced understanding that the facts of the developers are not neutral truths, but versions of reality (or ontologies) which may overrun or colonise the reality of developing countries in ways difficult to counter (De Albuquerque, Cukierman, Marques, & Feitosa, 2013; Marques, 2012).

**New and critical insights of ANT**

Considering early ANT writings it is not hard to see the basis for such criticism. Here, for instance, an excerpt from the final paragraph of Latour and Shirley Strum's article on baboon society:

> In our definition of resources, genes, power, language, capital and technology, for instance, are all seen as strategic means of enhancing one's influence over others in increasingly more durable ways […] a social link that becomes increasingly harder and harder to break.

(Strum & Latour, 1987, p. 797)

But if we take ANT as translatable *practice* rather than fixed theory, we may find both ANT as a theory of the strong man—for instance in managers' how to (e.g. Sidle & Warzynski, 2003)—but also ANT as a theory in defence of those at the margin, those who are colonised by the reality of others (e.g. Marques, 2005, 2012).

Being attentive to multiple versions of reality, and to those sitting uncomfortably in any one of these, definitely have handles in ANT (e.g. Law, 1992, p. 390). However, that the subjugated should be the principle outset for analysis also conflicts with one of the founding principles of ANT: to avoid a priori typecasting of the empirical and being agnostic towards actors followed (q.v. Hybrid equivalence and irreduction, p. 66). As argued by Christopher Gad and
Casper Bruun Jensen, ANT does not seek to replace one abstract framework with another, but rather to minimise the role of ordering frameworks all together.

However, just as surely, ANT challenges the assumption that this [preference for the subjugated] must always be the case. Because ANT is not a comprehensive theory, its potential political problems cannot be solved by enforcing another general perspective, even one from the margin.

(Gad & Bruun Jensen, 2009, p. 59)

The challenge to those seeking to be political with ANT is thus to keep to the symmetrical outset, to insist on the a priori agnosticism, and allow the critique to be guided by what results a posteriori – even if the subjugated, if there at all, turns out a rather surprising creature.

ANT has nonetheless accommodated much of the criticism in the movement known as post-ANT, and a major theme is currently the exploration of multiple realities and latent alternatives beyond what Steve Brown and Nick Lee (1994) call with Gilles Deleuze the striated, territorialized space of black boxes and obligatory passage points (we return to this point in How limbo riddles the ANT genesis with exodus and lines of flight, p. 177 & chapter 7: Lines of the Apparatus, p. 199). ANT is an act of bringing all sorts of heterogeneous resources together; some of which lie latent with the narrator while others are brought into the account by those under study (q.v. Method & Travelogue, p. 81). It is (most often) to the former that ANT belongs together with the analytical sense to ask cui bono and to see that lines of flight may riddle the otherwise firmly established order, leading to alternative, although not necessarily superior, territories.

Discussion: ANT and development encounters

The lines laid down following World War II has proven rather resistant to change. Even today we have “great difficulty thinking about Third World situations and people in terms other than those provided by the [post-war] development discourse” (Escobar, 1995, p. 12). This, however, does not mean that development is one thing. Usually, we need adjectives to narrow it down: economic development, human development, community development, alternative
development and so forth. All these developments are different in scale, practice and theoretical underpinning. And while some versions retain Marxist or Cartesian characteristics, others define themselves in contrast (e.g. Friedmann, 1992) and yet others have made claims on modernity and development from surprising positions (Eisenstadt, 2000). The move of positioning ANT in relation to Marxist progression and Cartesian dualism has served to substantiate ANT, to explain how it may offer different representations, rather than to diagnose development.

Latour has had his clinch with programs of modernity (Latour, 1993c, 2002, 2013c). But while ANT grew from the shock of a modernising front in Africa, it is not a strong theory meant to deconstruct development:

ANT has been confused with a postmodern emphasis on the critique of the ‘Great narratives’ and ‘Eurocentric’ or ‘hegemonic’ standpoint. This is, however, a very misleading view. Dispersion, destruction, and deconstruction are not the goals to be achieved but what needs to be overcome.

(Latour, 2005, p. 11)

To Latour, ensuring the possibility of symmetrical encounters required first to overcome the flagrant asymmetry he encountered in the Ivory Coast where the French were anthropolising Black ontology with no admission to an anthropolisation of their own Nature-building (Latour, 2013c, p. 4). Thus the science studies and attached theoretical work of overcoming the Cartesian divide. This is the only dimension along which ANT should be seen as deconstruction. In trying to replace the ontology of one-Nature-many-cultures with a multiple monism offering finally “a realistic description of the modern adventure” (Latour, 2013b, p. 15).

When failures occur, when development initiatives are surprised that their ambitions are not met, the responsibility can no longer be delegated to social context, pre-modern culture or the cognition of African minds. Likewise, if technologies do become successful, if they do carry out the hoped for changes, it is not because they are necessities-in-themselves, products of a rational mind, or representing the next necessary step in the linear history of a modernising front. In the most general sense, what ANT has to offer development is to literally mix up things across a range of scales so as to study the complex
metamorphoses which arise upon specific encounters (Jensen, 2008, p. 384). In such a metaphysics, the validity of an encounter, the source of authority of the official or of that which is introduced, becomes one concerned with quality of construction in each specific case (Latour, 1999b, p. 199, 2002, 2013b, p. 36). Not all facts are good science and not all laptops benefit poor children (q.v. Lines of marginalisation, p. 213).
Method & Travelogue
Performing laptops

It is customary for research to convey how its findings are brought about and to comment on the authority of its arguments. In my reading, doing so requires two things. First the research must be made to rest on a methodology and associated philosophy of science. And secondly, the actual lived history of the knowledge must be accounted for. This is the point of this chapter. The first part outlines a methodology based on ANT and describes the techniques used for interviews, observations and analysis. The second part goes through the actual travelogue behind this text. The overall argument is that this text and myself are actively helping to perform laptops different from those known to Akila or my Danish countrymen. Not that my laptops are closer to reality than those of the others. Through me they have simply become enmeshed in theories and practices particular to my line of academic work. The derived conclusion being that this research is valid only in the sense that it recognise its hybrid genesis and reliable only to the extend that the transformed world which it presents “actually opens new areas of action for those considering it” (Stengers, 1999, p. 47 - my translation).

Donna Haraway (1988, p. 581) has famously criticised much academic literature for the God trick “of seeing everything from nowhere”. Researching laptops was, to the contrary, quite a laborious process of seeing something from somewhere so as to propose arguments to someone. I find it quite telling when Haraway argues that the world is not a passive resource for an objective researcher but rather a trickster full of hoodwinking agency itself, acting back at any of us trying to “strike up noninnocent conversations” with it (ibid., p. 593). This applies equally well for those seeking normative intervention with
laptops as it does for those seeking analytical insight: “the difference between practical intervention and neutral observation is just one more dualism” more present in theory than in practice (Gad & Jensen, 2009, p. 75).

An account of method is thus in a bad position not to include the actual lived history of researched and researcher acting upon each other. The reason for doing so is not only reflective. It goes to the heart of what research is, the objectivity of it, the way it relates to readers and objects alike. As we shall see, the world does not automatically assume academic forms for researchers to simply point at with authority.

Doing research

If we take methodology as a concern over who and what we query for knowledge and in which ways—and subsequently how that knowledge is interrelated and inscribed into academic arguments—there are generally two approaches on either side of the Cartesian divide. In the res extansa camp there are those concerned with representing their object of study as it really is: “There is a world of empirical reality out there!” Kirk and Miller writes, and that world “does not tolerate all understandings of it equally” (Kirk & Miller quoted in Silverman, 2000, p. 358). As indicated by the word objectivity, such positions desire to overcome the subject position in order to allow the object to appear unmediated and unbiased, like Sokal's gravity (q.v. In development as in science, the stakes extend to ontology, p. 67). The consistency with which you enquire and argument, the methodological reliability, and the accuracy with which you represent phenomena as they really are, the methodological validity, determines whether you are talking fact or fetish. As Silverman (2000, p. 188) writes, unless “your methods were reliable and your conclusions valid […] there is little point in aiming to conclude a research dissertation”.

On the other side, in the res cogitans camp, we have the reflectionists, which argue that the world always comes to us mediated through subject positions. It does not appear quite the same to me as it does to you. Researchers are here understood as mediators of the world, a collective which does not simply represent, but rather “construct understandings of their topics through the questions they ask, the contexts they study, and their personal biographies" (Ross-
man & Rallis, 2003, p. 35). Consequently, the lived history of the research must be scrutinised for fairness in the way its findings are presented (e.g. Rallis & Rossman, 2010).

I share with both camps the reasonable and necessary concern for fair and accountable presentations of the researched. Indeed, the world does not tolerate all understandings of it equally. And indeed, the lived biographies of researchers mediate what they find. However, it is not trivial to decide what it means to make good presentations. Is it to reflect on the subject position, or to validate the exactness of the object position. The answer one could give with ANT is neither. It is neither the case that objects are brought into being by subjects, nor is it that objects have their own being independently from subjects. Rather the relationship between researcher, researched and those to whom the research is directed, is more like that of several actor-networks merging with each other, translating each other and bringing into being each other.

Traditionally, most ANT researchers have made use of qualitative methods derived from anthropology and sociology. So too does fieldwork, open ended interviews, participant observation and document analysis constitute the craftsmanship behind this thesis (more on that below). Gretchen Rossman and Sharon Rallis (2003, p. 8) have argued that one of the defining characteristics of qualitative research is the investigation of "how people make sense of their worlds through multiple methods that are interactive and humanistic: talking, looking, listening, and reading". With ANT this translates into investigations of not only how actors make sense of their world, but also the socio-material practices through which they (and they include the objects) make up their world (q.v. In development as in science, the stakes extend to ontology, p. 67). ANT research is not only interested in social interpretations but also in "with what instruments, what machinery, what material, historical, anthropological conditions" is it possible to produce some part of the world (Latour, 2013b).

This is the point of my travelogue as narrated further below. Not to take sides in being reflective or objective. But to account for the relational coming into being of my research findings.

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25 In fact, as we remember, anthropology played a formative role in formulating ANT (From savage minds to tribal science, p. 63).
The researcher-researched entanglement

As stated by Latour (2005, p. 29), the methodological rule of thumb in ANT is to study how actors deploy their own worlds by following their “own ways and begin our travels by the traces left behind by their activity”. Aided by the principles of agnosticism, general symmetry and free association, the researcher is urged to follow the actors rather than rely on any pre-established criteria for selecting informants, field and place. While littered with principles for investigation, ANT holds no authoritative practical rules for how to do so. There is no conditional logic on who to include or where to go; “neither theory nor methodology will tell how this must be done” (Gad & Jensen, 2009, p. 77). In a similar stance to that of ethnomethodology, these questions remain first and foremost empirical and grounded in the activities of those followed.

It is, however, important to point out that ANT does not provide neutral representations of the actor's own ways. There is a subtle difference between presentation and re-presentation. A presentation is a performance itself whereas a re-presentation more passively depicts or channels what is performing elsewhere. This text is a presentation because it too has some agency in configuring laptops. While I have been following laptops around Denmark, Nigeria, on the internet, in journals and elsewhere, the laptops have also followed me around to conferences and into papers where I argue that they are actor-networks. As such, it could be argued that any number of infralanguages are performing alternating versions of the same phenomena:

Instead of imagining the existence of two metalanguages (“researchers” and “informants”), which are opposed and struggling to get voice in sociological discourse, we suggest that one would do well to see ANT as allowing for the coexistence of several infralanguages, including the researchers’.

(Gad & Jensen, 2009, p. 64)

You are thus reading a set of relations traced and channelled through me during the last five years so as to produce an actor-network laptop presentable in

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26 Besides from the principles of agnosticism, free association and generalised symmetry already mentioned, many other collections of rules and principles exist in the ANT corpus – for instance appendix 1 and 2 of Science in Action (Latour, 1987, pp. 258–9).

27 In fact, Latour (1999a, p. 19) has designated ANT as “simply another way of being faithful to the insights of ethnomethodology”.

84 A travelogue of 100 laptops
The object of study and its field

I am not studying laptops as pieces of electronics. I am studying them as socio-material collectives in the process of becoming socio-material actors. With a word from Michel Serres by way of Latour (2004, p. 236) I am studying quasi-objects. Something in the intermediary phase between a collective and a fully stabilised actor (or object if you will). Another and more common way of saying the same could be that I am studying a project aimed at making laptops work for education at Akila's school. A project of American laptops manufactured in Taiwan, Nigerian children and teachers, Danish missionaries and researchers, Chinese solar panels, pedagogical theories and global concerns over the digital divide. With such a project, my following the actors has been multi-sited, multi-mediated and multi-temporal.

Within ethnography, George Marcus (1995, p. 96) has described how multi-sited strategies to investigate the “circulation of cultural meanings, objects, and identities in diffuse time-space” emerged in the 1980s as alternative to the prolonged single location fieldstudy. The methodology of ANT can be seen in continuation of these “Strategies of following connections, associations, and putative relationships” which not only refute any singularity of field, but also the need for context, structure or world system to lend meaning to observations (Marcus, 1995, p. 97). While I did carry out two important single-location fieldworks in Nigeria—the first for one month in 2009 and the second for three months in 2011—that was not exclusively my field. I also went around Denmark, the internet, Peru and Uruguay. This is not to say that Nigerian culture does not run through the laptop—because it does, and so too does Danish and American cultures—but rather to say that Nigerian culture does not surround the laptops so as to shield them from substantiation from elsewhere.

Adding further to the conflation of fields, Anne Beaulieu (2010) has proposed a shift in strategies from co-location, as in going to Akila's school, to co-presence as in going where a phenomenon takes presence rather than where it is located in any immediate way.

Co-presence decentralizes the notion of space without excluding it. It opens
up the possibility that co-presence might be established through a variety of modes, physical co-location being one among others. (Beaulieu, 2010, p. 454)

Beaulieu's argument, which is also found in ANT, is that the a priori segmentation of phenomena along fixed temporal, spatial and typological dimensions is problematic. For instance, in her work on woman’s studies, the field was an event, not a place, it was only there for certain occasions. It was thus “more important to determine 'when' the field would be available than 'where' it could be found” (Beaulieu, 2010, p. 459).

Likewise, laptop-fields have arisen in Denmark during fund raisers and co-ordination meetings, and even in Nigeria I was presented with Danish fields at hotels and during workshops. My field has also consisted in reports and evaluations being published and subsequently discussed over email, or at meetings, and various talks and discussions with Negroponte and others from OLPC relayed through such websites as olpctalks.com and youtube.com.

All this is not to say that place does not matter. On the contrary, one could argue that much work on information technology tends to forget that phenomena like Facebook are also decisively material in their placeness (e.g. Blum, 2012). The mesh of relations definitely intensifies more in Nigeria than they do in Denmark. And since I am a Dane living in Denmark, I could certainly have benefited from more time at the Nigerian school, more knowledge of local culture, language, and so forth. On the other hand, being a Dane in Denmark privileged me in attending meetings, seminars and other such encounters which would be similarly difficult for a Nigerian researcher living in Nigeria.

**Craftsmanship**

The bulk of my knowledge stems from semi-structured interviews, participant observations, document analysis, email and telephone communication, media articles, academic papers and going through technical installations.

For most interviews I prepared interview-guides beforehand. If it was the first time talking to a person, the interview would commence with me asking something like “I would like it if you would tell me the story of your personal involvement with the project – could you tell the story all the way from the
very early beginnings?”. These questions much resemble what Steiner Kvale (2006, p. 292) calls background questions. I used them to track translations and how different actors interrelates. From background questions, the interviews turned into more or less structured talks about specific subjects such as school discipline, pedagogics or power requirements. Trying to get a grip on things I also asked a lot of non-specific questions such as: “I am trying to figure out how this project with the XO is all about – can you tell me how you understand it and what we should expect from projects like this?”. I did about 51 of these semi-structured interviews, which were all recorded and transcribed (40 in Nigeria and 11 in Denmark).

Being overt in my jottings in both Denmark and Nigeria allowed me to write down many unstructured, everyday conversations as they happened. The Danish project group consists of people who were accustomed to qualitative research and found no problem in me keeping minutes, doing observations and taking notes – in fact I often functioned as meeting secretary since I would be taking notes anyway. Also in Nigeria I tried to write down as much as possible to the amusement and annoyance of teachers and others who were not so accustomed with being researched, so to speak. For a period I also recorded video but quickly gave it up as I found it patronising. Having research agendas you are never just one of the guys, although some fear going native, but I nonetheless felt that the camera made me too much of a tourist even though I was already very much dogo bature – as exemplified by a teacher outlining my position during my first stay in 2009.

People see you [me] as a different person. They see you as somebody that is external because we have different composure, you are white in colour while we are blacks […] There are some people that are very ashamed of you. People didn't come here for some time because of you. Because they say there is somebody, a great man inside because they didn't come inside. I know

28 This question is from my interview guide for teachers from my first visit to Nigeria in 2009.
29 This question featured on most of my interview guides during the first two years of study.
30 See e.g. Uwe Flick's (2002, p. 142) warning that efforts to achieve an internal perspective might lead the researcher to give up his or her's role as "professional stranger". Similarly Cato Wadel (1991, p. 19) has argued that already being native makes it harder to see the strangeness of everyday-obvious activities which is properly true to some extend in my Danish research.
31 Dogo Bature means something like tall European/white man in Hausa and was my humorous alter ego in Nigeria – playing on the obvious facts of me being tall, from Europe and a temporary visitor.
I attended debate seminars where Danish project participants met with others (NGO workers, researchers and activists) to discuss the principal challenges and opportunities in achieving development through laptops. Similarly, I have had the luck and opportunity to attend similar events in other countries – most notably the Sugar Camp Puno in Peru in 2011 where the local government was trying to substantiate for teachers how they could make the most of the Una Laptop por Niño scheme. Through the proxy OLPCtalks.com—where others openly share their transcripts—I also gained insight into what was said when OLPC-as-concept was presented at various occasions.

As for the non-human actors, the principal challenge is getting them to talk at all. In general, one can take the advice of Latour (1992) and look for the missing masses – that which silently mediates and stabilises our doings. For instance, out of sight on the flat roof of the school, solar panels from China are maintaining the laptops in existence every single day since there is no other reliable source of electricity. Another advice is simply to remember that in practice there is no separating human from non-human. Rather than worry about getting machines to talk one should rather worry about getting hybrid constellations to talk. As such my knowledge comes not only from reading diagrams and going through the wires, which I did, but also from talking to technicians and helping with active maintenance at the school. The solar panels must be cleaned, the batteries monitored, the internet subscription paid and countless other tasks handled for the material aggregates to do their part (q.v. The missing masses of laptops, p. 123).

Besides from interviews, observations and technical maintenance I also have a great variety of documents at my disposal. I have media articles, bureaucratic reports and evaluations, financial accounts, project presentations, email conversations and so forth. Some of these I even wrote myself – another point in the inseparability of observer and observed. All in all I have little more
than 200 transcripts in a SQL database which I have processed in an ad hoc combination of condensation, codification and custom SQL searches for specific combinations of words (the coding and condensation is inspired by Kvale, 2006, pp. 87–209).

While coding, condensation, and SQL searches have been productive analytic aids I have also made heavy use of what you with Tsing (2005, p. xi) could call “patchwork and haphazard” methods. I made a great deal of posters with clippings, I have been writing papers and making presentations and I have gone through my journal and looked at pictures a ton of times.

As a final note, all empirical material has been anonymised, the names are false and identities obscured. I see no reason not to give this protection as the consequences of being publicised is hard to foresee – especially when actors dependent on each other are also in friction on various points (see e.g. LCT encounters, p. 146). When referring to empirical data I do so according to the following notation: (#[database id] [name or function of actor], [place or medium], [date]). For instance (#60 James, interview, 2009) or (#138 consultant, secondment report, 2007). However, some empirical references have been kept

32 These include 51 interviews with 59 different people (some of which were group interviews), 36 transcribed documents and 90 field observations. These have been coded with 79 codes. The content of my database do not include transcripts and documents freely available online (such as those at OLPCTalks.com).
entirely anonymous through an #X identifier, e.g. (#X anonymous, interview, 2012). This is either because I want to keep the informant in question from being identified through cross reference or because the given item for various reasons has not been transcribed and inserted into the database.

Laptop-researcher travelogue
Many different trajectories and interests came together when I was granted a scholarship on “IT in Development” in early 2009. Having benefited greatly from having computers in my own life I was (and still am) enthusiastic and supportive of most initiatives aimed at including others in the world of digital technologies. There is a good chance that I too am guilty of the secret technological determinism, or at least technological fascination, that Sally Wyatt (2007, p. 175) provocatively argues is motivational for many STS scholars. After all, to this present day, I still make my living working with, and talking about, IT. The earliest draft of my research proposal thus contained a hoist of inclusive IT projects I wanted to study.

At the same time, however, I was (and still am) critically aware that technologies often come with hopes and fears of future utopias and dystopias, and the belief that with this new technology, the game has changed complete from that of yesterday. I have a few personal experiences in this regard. For instance, en-
tering secondary school in 1999 I became part of an experimental PC-class. We each spent a small fortune buying laptops which we were supposed to integrate into our everyday learning activities so as to prepare us for innovative, project work based on IT. However, what happened was much more conflicted. Without going into details my three years of secondary school were perhaps just as much “wired for distraction” as they were educationally empowering (Matt, 2010). Neither the school nor we students had taken seriously how much a challenge it would be to make computers work for education, so to speak.

At university, I attended a series of historiographical courses. At one of those, for instance, I studied railways in the colonial world—such as the Great Western in England or the Cape to Cairo in Africa—which were as deeply embedded in politics, power structures, globalisation, economics and information infrastructure as any digital divide (Merrington, 2001; Wolmar, 2008). At another of these courses we read Jared Diamond's best-seller Guns, Germs and Steel which posed the most general problem of development by way of a New Guinean called Yali: “Why is it that you white people developed so much cargo and brought it to New Guinea, but we black people had little cargo of our own?” (Diamond, 1999, p. 14). While discussing Yali's question with my peers I read Latour's (1993c) We Have Never Been Modern for another course on STS and discovered an unknown side of ANT. That more than a theory for making case studies, it is also an important attempt at redefining quite fundamentally how we debate development, modernity, rationality and all other such themes we included in our debate of Yali's question.

**Tracing laptops – Writing laptops**

In the fall of 2008 I wrote a research proposal outlining a qualitative study of an OLPC project in Nigeria to be theoretically anchored in ANT with the purpose of offering non-determinist understandings of technology and development. As summarised by the nomination committee:

> The proposed project proceeds from the notion of digital divide and efforts made to further development in third world countries through the transfer of information technology. It is noted that these are often based on deterministic understandings and qualitative, empirical studies of these transfers and their...
implications are wanted. On this backdrop the applicant wishes to develop an alternative perspective on technology transfer through a theoretical and methodological base in STS-studies.

(#X the nomination committee, review document, 2009 – my translation, my emphasis)

I had been interested in OLPC since I first became aware of its existence through the massive media exposure around 2005 and 2007. That I ended up studying it was, however, circumstantial and owing to the fact that my supervisor knew a consultancy which was about to commence a deployment in Nigeria. I thus ventured to the consultancy in late 2008 and secured their support for my proposal.

Having been in preparation for some time the Nigerian OLPC project was to commence simultaneously with my scholarship in early 2009. While I was welcome to come along, the consultancy told me that the project was not theirs. Rather it was organised in a partnership between the consultancy, pedagogical researchers, a Danish missionary NGO and a Christian church in Nigeria. I thus spent the first part of 2009 going around Denmark visiting and interviewing researchers and missionaries, which all welcomed me to follow the project. They kindly included me in email exchanges and invited me to join their meetings. And through the Missionary NGO I also got the blessing of the Nigerian church to come visit the school in Nigeria.

In late 2008 and early 2009 the plan was for an American consultant to travel to Nigeria and work together with local engineers to get an infrastructure up and running. Hereafter the laptops would arrive followed by a Danish team meant to conduct two technical and pedagogical workshops half a year apart. I participated in the latter of these in September 2009. The workshop lasted two weeks where I lived in a hotel with the other Danes. After the workshop had terminated school resumed as normal, the Danes went back home and I stayed behind for another two weeks.

Back in Denmark I continued meeting with the other Danes while also trying to stay in touch with those I had come to know in Nigeria. Reading Don Ihde's (1990) postphenomenology and Annemarie Mol's (2002) empirical philosophy, I decided that the negotiations I had observed between the official
OLPC setup, the Danes and the Nigerians would be most suitably described by notions of multiplicity. Rather than one actor-network, I came to conceive what I was studying as several networks all running through the laptops. This insight was also aided by reading into multi-sited research and the so-called post-ANT movement (see e.g. Gad & Jensen, 2009; Marcus, 1995 respectively). As indicated by the first paper presenting my findings:

I have occupied myself with multistability and perhaps this is why the laptops keep appearing to me as “many in one” [...] There can only be unilateral versions of the project and the laptops if I stop moving around.

(#X me, seminar paper, 2009)

As evident when reading chapter 5 (Laptop Multiplicity, p. 131) I have since kept this argument as it continues to be productive.

An argument which, however, proved less fertile was the role and function of future trajectories intertwined in the enthusiasm I had observed throughout the project. As indicated by a 2010 conference paper, I was very much interested in how temporal translations ran through the project, projecting better opportunities at the job market, and a place in the information society, in front of those children and teachers using the laptops:

...looking at the horizon of a Global Village projected ahead of the XO laptops in Nigeria one will discover that this model of the future actually serves an empirical purpose. It feeds the translation of the XOs as something useful and it makes things happen at the OLPC headquarters in Boston as well as at the school in Nigeria.

(#X me, conference paper, 2010)

Sadly, however, during 2010 and 2011 the project gradually lost momentum and my work on future trajectories became sidestepped by a new concern for projects in limbo (q.v. Falling Into Limbo, p. 167).

Upon returning to Nigeria for three months in the fall of 2011, I realised that the project had become quite crippled. I had planned for this second visit to take place two years after the first so as to allow for the laptops to settle in. I moved in with one of the teachers and started to take part in the day-to-day activities at the school where I soon discovered that the laptops had not succeeded in becoming part of these. As described in chapter 7 and 8 they suffered from various translation-failures which I spent my three months studying –
learning amongst other that while hope is limited, there may still be some es-
cape from limbo.

Before returning to Denmark, I wrote a rather disillusioned evaluation. This
evaluation helped spread the limbo to Denmark, where a long and throughout
debate ensued on what should or could be done. While some participants be-
came dis-motivated others wanted to re-vitalise the project and yet others—
such as the newly elected bishop in Nigeria—dismissed that problems existed
in the way I described.

It is sad to hear about the situation you describe. Yet I also agree with [one of
the others] that we must look at the key learnings and try to incorporate them
as we move ahead. Change doesn't come easy - not in Denmark - not in Ni-
geria. I look forward to a meeting in 2012 where we can also internally eval-
uate this pilot project and discuss next steps…

(#214 project participant, email, 2011)

While concluding my research in late 2012 and early 2013 I have continued to
interview around Denmark and to keep in touch with Nigerian teachers over
phone and email. Maintaining optimism, the last paper I wrote and presented
before handing in the thesis turned on the potentiality, or the lines of flight,
running through the project giving hope of escape to some new territory:

Such a transformation might make the project translatable again for both
Danes and Nigerians, it might provide new students with an opportunity to
learn and play with the laptops [but so far] none of the lines, none of the
translations running through the project, constituting the laptops and their re-
lations have been working to the benefit of students.   (Andersen, 2012b)

**Discussion: performing laptops**

So what kind of research am I conveying here? Certainly not one where ob-
server and observed are kept nicely apart. While the inherent work is indeed an
empirical study—a study of and in the world—I take empirical to include pa-
pers written, conferences attended, works cited and ultimately thesis produced.
Accordingly, I wanted to make explicit the history of my research, the crafts-
manship and the philosophical underpinnings.

This, however, does not mean that I could have presented any laptop I
pleased. As Kirk and Miller argued, the world does not tolerate all understand-
ings of it equally (Silverman, 2000, p. 358). And neither does it mean that the laptop constructed here is particularly authoritative. While a few academics may come to know laptops in Nigeria as multiple and in limbo—the same way they know the *Zimbabwe Bush Pump* as fluid (de Laet & Mol, 2000)—there is no guarantee that this presentation will take precedence over others, such as the $100 laptop (q.v. Constructing an immobile $100 laptop, p. 101). At least, it is doubtful that it will be taken into account by as many actors.

Isabelle Stengers (1999, pp. 83–84) has argued that the boundaries of democracy runs between those with the means to test and make relevant what is proposed, and those with no such means, to whom knowledge addresses itself only in a fixed state of objective authority. According to Stengers, good science is that which seeks to establish bonds and relations to those it concerns (ibid.). Her argument is not a relativist anything goes. It is not that laymen can freely choose whether or not such and such a phenomena really exists. But rather that we should judge the quality and relevance of scientific propositions on their ability to convey the debates over relevance, implication and controversy with which they are associated. As Stengers (1999, p. 69) writes, science would never refer the government official or the industrialist to simply respect objectivity with no further negotiation. To the contrary, science goes to great length to understand and debate with such actors.

A similar basis must apply for assessing the quality of laptops as presented. Rather than pointing to the authority of data what is presented here becomes *valid* only in recognition of its hybrid genesis and the ontological questions it asks, and *reliable* only to the extend that it “actually opens new areas of action for those considering it” (ibid., p. 47). No matter how well the data was collected, it is in the afterlife of such texts as the inherent that this three way meeting between development, ANT and OLPC may hope to become of value.

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33 This is an argument similar to that of Freire (q.v. The problem with schools, p. 48).
Chapter 4

Rendering Laptops Mobile

Transfer by way of translations

Theories of technological diffusion and -transfer are known for a producer bias which attributes movement to technological superiority, and lack of movement to social or cultural resistance (Latour, 1987, pp. 133–136; Rogers, 2002, p. 327). The bias furthermore suggests that invention is kept within a certain perimeter, reducing those outside to the role of recipients or users. This chapter proposes an alternative understanding of technology transfer based on the notion of translation. It investigates how the OLPC laptops moved from the assembly line in Taiwan to the school in Nigeria by way of a multitude of translations between OLPC headquarters, the digital divide, Danish researchers and missionaries, a Nigerian church and their school, Chinese solar panels and orbiting satellites. The argument being that all of these were transferring different laptops, so to speak, and that their mutual translations ended up creating a laptop, which was not only different from the one promoted by OLPC, but also ontologically multiple (the multiplicity is explored in the following chapter). The multilinear transfer constituted a constructional process that not only got the laptops to Nigeria, but made them what they are in the process. The chapter begins by elaborating further on the producer bias and the notion of translation. It then proceeds to investigate how OLPC ensured support for their laptop and, subsequently, how a group of Danes came to consider working with the OLPC laptops as a viable way of pursuing their own agendas. The chronology is then reversed and the investigation begins anew in Nigeria, where a Christian church was out to offer their students training in IT-literacy, but ended up signing on to an OLPC project instead. Finally, it is investigated how internet and electricity were secured by enrolling Chinese solar panels, satellites and engineers in the tangle.
Transfer theorists discovered long ago that innovations are not necessarily invented at one place and then imported into another (e.g. Charters & Pellegrin, 1973). It can also be the other way round, that what is imported must subsequently be invented. This tricky insight is here investigated through the transfer of laptops to Nigeria, which were invented anew en route. However, a certain *producer bias* in common thinking and academic theory makes it difficult to properly appreciate transfers which are also inventions.

**Innovations: Imported or Invented?**

The *producer bias* in diffusion and transfer theory holds that once an innovation is done, it will propel into novel contexts by virtue of its superiority or necessity (Rogers, 2002, p. 327). The movement of technology is likened to the flight of a cannonball: an initial impetus forces the technology through a social medium, which may have different interpretations of the vehicle, but no power to alter what it objectively *is*. Since invention has long been terminated, the impact of the technology can be predicted without too much concern for different contexts.

This is also what Lynne Markus and Robert Benjamin (1997) has called the *magic bullet theory*. Interviewing IT specialists and line managers in business organisations, they found a strong belief that building technology would equate subsequent organisational change:

> When we examined what many people think about who should do what in IT-enabled change, we found that they seem to believe in magic [...] they think IT itself has the power to create organizational change. These people describe IT as a magic bullet – and believe that they have built the gun.

(Markus & Benjamin, 1997, pp. 55–56)

Following the magic bullet theory, or the producer bias, the laptops from OLPC should arrive unchanged to the school in Nigeria where they will help children learn and give them a window to the world (q.v. One Laptop per Child, p. 33).

As already touched upon, a principal problem with this type of theory, however, is that it limits the constructional phase of technology to a short period of time and a few select actors. Beyond this perimeter, the vast amount of
actors involved can never be anything other than users. Only what is added within the invention perimeter is recognised as being, in the ontological sense, the technology. OLPC in Massachusetts has put together a laptop and this is the full and complete laptop. If technology is successfully transferred, then it is attributed to technical superiority, to the technology being beneficial. While on the other hand, if there is failure, the blame goes to those who stood in its way, to social resistance or cultural factors (Latour, 1987, pp. 133–136). This is a well known asymmetry in development debates where “cultural factors and tradition” are often used scapegoats in accounting for problems, but not success, that is the natural impact of a rightly used technology (Jolly et al., 2004, p. 210). This asymmetry is not only unfair for the (literately) poor people whose culture and tradition we blame, it also keeps us in the dark as to how technology moves into new settings and what this movement does to the technology.

**Abolishing the invention perimeter**

While the producer bias remains prominent in popular discourse, more recent strands of transfer/diffusion research makes no sharp differentiations between inventor and adopter. In fact, as early as 1973, an inspiring study by Charters and Pellegrin (1973) asked the question: are innovations imported or invented? Through their study of a new staffing model called Differentiated Staffing (DS) at four American schools, they concluded that some innovations, such as DS, are actually quite dependent on recipients to gain any real substance:

...there was no “it” to select, implement, evaluate, or bring in accordance with, except in an extremely vague, unspecified sense [...] The innovation was to be invented on the inside, not imported from the outside [...] Researchers and others are in danger of being trapped by the language of an analytical model if they apply it to a situation where an innovation is essentially invented within the school. (Charters & Pellegrin, 1973, p. 13)

Charters and Pellegrin warned that researchers with producer oriented theories would fail to recognise that not only are some innovations “invented on the inside” but also the “value conflicts, political struggles, and negotiations” that

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34 I borrowed the title of this section “Innovations: Imported or Invented” from their conclusion.
arise in relation to substantiating such innovations (ibid., p. 14).

In ANT, the insight that multiple inventors are at work negotiating technology at both sides of the invention perimeter is captured by the notion of translation, and often illustrated with an account of the diesel engine (Latour, 1987, pp. 104–107).35 According to conventional wisdom, Rudolf C. K. Diesel was the engineer who invented the engine which bears his name. And indeed Diesel was the author of an innovation. He came up with a concept for a machine running at constant temperature in accordance with Nicolas Carnot's thermodynamic principles. If realised, this engine would have much better fuel efficiency than its contemporary steam-competitors, which only utilised about 10% of energy added. Diesel also had a political purpose for his concept. He hoped that it could be an empowering device for craftsmen fighting to survive the competition from an expanding industry. In an effort to promote and protect the concept, Diesel took out a patent ensuring him the legal rights and published a book describing the principles.

The engine, however, did not emerge in any direct way from Diesel's book and patent. He needed others to help him construct a prototype and thus started collaborating with what later became Maschinenfabrik Augsburg-Nürnberg (MAN). Working with MAN engineers, Diesel saw his concept progress towards realisation as it was made and remade with varying components. In the process, the original concept had to be altered in several aspects. Most significantly, the principle of constant temperature was replaced by a principle of constant pressure. Diesel outlined the improved concept in a new edition of his book, and in 1897 the engine was finally deemed ready and presented to the public. But once out in the factories and workshops of craftsmen, the engine kept breaking down and had to be repaired at an almost daily basis. The faulty engines were returned, people demanded their money back and Diesel went bankrupt.

With Diesel out of the picture, MAN continued to work on the engine and in 1908, when Diesel's patent fell into public domain, they re-introduced a new version of the engine which they allowed licensees to further develop into pur-

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35 As a side note, the producer bias and the magic bullet theory are known in ANT under one as the diffusion model and often contrasted with the translation model.
pose build versions. Of course, Diesel was not pleased that his former collaborators were now making money of his engine. At a 1912 meeting of the *German Society of Naval Architects*, he raised the claim that MAN had *stolen* his engine. His colleagues, however, disagreed and argued that credit for the engine should go to the engineers and mechanics at MAN, as well as the licensees all around the world, who had perfected the engine for so many different purposes.

While Diesel had contributed a concept, a patent, and his own time and energy, it took the contributions of many other engineers, changed thermodynamic principles, a profit chasing company and a lenient legal setup to construct an engine stable enough to become blackboxed for posterity as the diesel engine. Had it not been for all these actors translating the engine, it would never have materialised beyond a book and patent. Diesel might be the *eponym* for the engine, but he was not the cause in any linear way (Latour, 1987, p. 106). The point is thus: When one actor carries another along, it is not one or more subjects carrying in their hands one or more objects which they cannot change. Rather, we must think of it as actor-networks investing themselves in a shared construction, which is continuously renegotiated, or translated, by these investments.

**Constructing an immobile $100 laptop**

Diesel was not the cause of diesel engines, although he played an important part. Likewise, OLPC is not the cause of laptops in Nigeria, although they too played an important part. In a series of events in 2005, OLPC proposed their laptop as a concrete solution to the problems associated with the digital divide, a solution that was appealing to industry, politicians and educationalists alike. However, while politicians, private companies and NGOs rallied behind OLPC, translating their way into the network, the famous $100 laptop remained largely immobile.

**The OLPC problematisation**

In his article about scallops and fishermen, Michel Callon (1986a) identifies what he calls *moments of translation* the first of which, *problematisation*, is helpful in understanding the launch of the $100 laptop. Callon describes how
in the 1970s, a group of French researchers returned from Japan with the idea of cultivating scallops at St Brieuc Bay, which was suffering from overfishing and diminishing stocks. He describes the researcher’s proposal as a problematisation, a claim to the ways in which something is problematic, for whom it is problematic, and in which ways, and how these parties may act to remedy the situation. As such, a positioning of identities in relation to each other. At St Brieuc Bay, the researcher's problematisation positioned scallops, fishermen, and researchers in relation to each other. If the fishermen are interested in long term economic sustainability, if the scallops are interested in survival, if the scientific community is interested in advancing knowledge, then the researchers and their concept of cultivated scallop production is an **obligatory passage point** for all of them (Callon, 1986a, p. 205).

OLPC outlined a similar problematisation when presenting their laptop in relation to the digital divide, new business opportunities and hopes of developmental leapfrogs. What they presented to the world was a vision for a $100 laptop to be produced in large quantities, distributed in equally large quantities, and eventually end up in the hands of millions of children as a cheap and reliable way of empowering them globally, in relation to the digital divide, and locally by creating better learning opportunities:

> By giving children their very own connected XO laptop, we are giving them [1] a window to the outside world, [2] access to vast amounts of information, [3] a way to connect with each other, [4] and a springboard into their future. And we’re also helping these countries develop an essential resource—educated, empowered children.  

(OLPC Website, 2013c)

Like the French researchers, OLPC offered not only a solution to the problems of global divides and local learning. They also offered a special way of arranging these problems as to make their laptop obligatory passage point for solving them.

The problematisation of OLPC has not changed significantly over the years, so let us look at a recent example from OLPC chairman Negroponte:

> How do you eliminate poverty? The answer is simple: education. How do you provide education? The answer is less simple. It requires more than school, especially in countries such as Nigeria and Pakistan, where 50 per-
cent of the kids do not attend. OLPC leverages the children themselves, bringing the learning medium into their lives 24x7, at a total cost of a dollar per week (that includes buying, maintaining, and connecting the laptop). (Negroponte, 2010)

The OLPC problematisation is thus, somewhat simplified, that poverty is the principal problem – the principal solution to poverty is education – education can not be sufficiently dealt with by schools – laptops are a learning media which can circumvent the deficiencies of school – laptops are also a way of bridging the digital divide – OLPC has a way of providing one laptop per child at the cheapest possible price – you must collaborate with OLPC if you want to solve the principal problem of poverty (see also Being digital and social inclusion, p. 39 and Educational empowerment, p. 46).

As Brendan Luyt (2008) has pointed out, this construction was quite appealing to a variety of actors for a variety of reasons. It was appealing to industrial actors, and everyone else in favour of market led development, because not only was the laptop to be produced in large quantities, it also made promises of fortunes at the bottom of the pyramid. It was appealing to constructionists because it incorporated Seymour Papert’s pedagogy and gave children “access to vast amounts of information” (OLPC Website, 2013c). It was appealing to idealists because it was open source and targeted at children. And finally, it was appealing to politicians because it brought new hope to the ever persistent ambition of leapfrogs and big pushes as it promised a whole generation a “springboard into their future” (ibid.).

**If the digital divide is to be bridged...**

Negroponte made several appearances at important events in 2005. He first presented OLPC’s vision of a $100 laptop at the *World Economic Forum* (WEF) in Davos. At the WEF, there was renewed confidence in development and G-8 chairman at the time, Tony Blair, used the occasion to call for a general increase in aid and “a big, big push forward” for Africa (Cowell, 2005). Speaking at the event was also Nigerian president Olusegun Obasanjo, who became the first head of state to commit his administration to the OLPC initiative.
Later in 2005, Negroponte made another appearance. This time co-presenting an early prototype of the laptop with then UN Secretary General Kofi Annan at the World Summit on the Information Society (WSIS) in Tunis. Pictures of Negroponte and Annan presenting the photogenic prototype went through the media like a storm along with praising words from the secretary general:

Some inventions are ahead of their time. Others are perfectly of their time. Still others seem so obvious and natural that once people hear about them, they wonder why it took so long for them to come into being [...] The $100 laptop is inspiring in many respects. It is an impressive technical achievement [...] It holds the promise of major advances in economic and social development. (Annan, 2005)

This is no small recommendation and it aligned perfectly with the WSIS consensus, that the digital divide is a serious threat to global equality, and renewed emphasis should be placed on technology transfer as possible solution (see also Digital divides: the debate resurrected, p. 17):

7. We recognize the existence of the digital divide and the challenges that this poses for many countries [...] 8. We recognize the scale of the problem in bridging the digital divide, which will require adequate and sustainable investments in ICT [...] 9. We call upon the international community to promote the transfer of technology on mutually agreed terms...

(WSIS, 2005 - emphasis in original)

Leaders from the international community had “recognized the existence of the digital divide” and come to Tunis to help “promote the transfer of technology” in order to bridge the gaps of inequality (WSIS, 2005). Negroponte went to WSIS to literally put a solution on the table: a $100 laptop promising “major advances in economic and social development” (Annan, 2005). The impact was significant and the prototype achieved almost instant iconic status:

...when you announce something with Kofi Annan, everybody pays attention. This was the machine we showed in Tunis about eighteen months ago. It's a charming photograph. It actually worked with a lot of wires under the table and it's unrealistic, but everybody remembered the pencil yellow crank. (Negroponte quoted in OLPC Talks, 2007c)

Even today, people otherwise unfamiliar with development and the digital divide instantly remember and recognise the $100 laptop.
What OLPC gained from these activities in 2005 was a strengthening of their problematisation of laptops-as-development, which in 2006 resulted in an official partnership with the United Nations Development Programme (UNDP). Following the agreement, UNDP issued a press statement noting that: “We are delighted to be part of this venture, which has the potential to break through the digital divide between rich countries and poor countries” (UN News Centre, 2006 – my emphasis).

If scales are to be large and companies are to profit...

Being an actor-network, OLPC is not only composed of a few researchers at MIT. The founding members include a wide range of industrial giants such as News Corp, Quanta, Google, AMD and Red Hat contributing 75% of the venture capital (q.v. Organisation and principles, p. 34). That OLPC should choose to collaborate with major industrial actors is no coincidence. In order to achieve the scale needed for digital saturation, as well as a price low enough for developing countries, OLPC planned a model of diffusion through market mechanisms. Enticed by promises of large scale production and access to new markets, hardware manufacturers such as Quanta, Chi Mei and AMD helped OLPC with design and manufacture and so too did Red Hat, Google, Design Continuum, Fuse Project help OLPC on the software side. Other partners such
as News Corp provided advertisement, CitiBank a financial infrastructure and so forth.

These private companies did not only support OLPC out of charity or PR value, they also did so because the initiative presented itself as a major business opportunity:

I went to one company and said: "You know we need a display. It's got to be small, not to bright. It doesn't have to have perfect color, uniformity. You know it can even have a couple of pixels missing. But it's got to be really inexpensive. Like thirty dollars, thirty-five dollars."

The particular company said to me "Well you know, Professor Negroponte, that's not our strategic direction [...]"

And I said " You well that's a shame, because I need a hundred billion units a year". And they said " Well, you know maybe we can actually do something

(Negroponte quoted in OLPC Talks, 2006c)

If corporate actors wanted a profit from bridging the digital divide, OLPC was a passage point, and while Microsoft and Intel launched a counter offensive based on the Classmate computer, a range of the world's biggest manufacturers of IT enrolled behind OLPC.

The participation of each of OLPC's production partners was predicated on an assumption that they would make an upfront investment in support of OLPC as an advance against a promise of reliable (and significant) future profits [...] OLPC was under pressure to deliver on its promise of high volume.  

(Bender et al., 2012, p. 86)

What these manufacturers added to the problematisation was achievability. Not only had the UN sanctioned OLPC as an important initiative for bridging the digital divide, but now some of the world's largest and most important manufacturers of IT had validated that the $100 laptop could actually be produced as envisioned. As recalled by Negroponte when Quanta (the company which assembles the laptops and did much of the design) gave their support:

...when Quanta joined, it was very important because a lot of people initially said "Great project, wonderful, but they can't do it." [...] And that was kind of what the street was thinking. Quanta comes along, raises their head, and says "We will do it." It took the wind of everybody's sails. They said "it's going to
happen." So now the question isn't "will it happen", but kind of "when", "how much" and so on. So Quanta was very important.

(Negroponte quoted in OLPC Talks, 2007a)

...Then millions of OLPC laptops must travel

For their problematisation to be realised, OLPC needed initial orders in the millions (OLPC Talks, 2005). This would not only ensure digital saturation with one laptop per child across large areas, but also provide a sufficiently scaled production to force the unit price down to $100. With the significant economic and organisational burden entailed by such large scale orders, OLPC decided to achieve momentum through some of the world's largest transition economies:

Again, the numbers have to be big [...] We picked very big countries. China is difficult to deal with but on the other hand there are 220 million students in primary and secondary school in China. Over 50% of the kids in primary and secondary school on the whole planet are in China and India.

(Negroponte quoted in OLPC Talks, 2005)

In spite of their economic growth, these countries have plenty of developmental challenges as well as the scales needed. Negotiations were carried out with China, Brazil, Thailand, Argentina, Libya, Nigeria, Egypt and South Africa (Bender et al., 2012, p. 77; OLPC Talks, 2005).
Highly publicised by global media, sanctioned by the UN and backed by private industry, OLPC had become a high-profile brand to politicians:

...being associated with our program was a positive for leaders who wanted to impress upon their constituencies that education was a priority.

(Bender et al., 2012, p. 78)

Negroponte eventually came close to an agreement with three famous—and in varying degrees controversial—statesmen known for their poverty reduction schemes: Thaksin Shinawatra in Thailand, Luiz Inácio da Silva (Lula) in Brazil and Olusegun Obasanjo in Nigeria all declared their intent to procure millions of laptops.

When we started the project, I said we went to Brazil, Nigeria, Thailand. I knew previously Takshin Shrinawatra who was at that time the Prime Minister of Thailand and I knew Lula not well, but I did not know Obasanjo who was the President of Nigeria. So I go to see Obasanjo[...] I had never met the man, he points his finger at me, "Professor Negroponte! I have one word for your project..." It's a cliffhanger, everybody is waiting for the one word and the one word was "enchanting." I said "wow!" I went back on such a high, this was two years ago, I said "enchanting". Yes god damn it, this is enchanting.

(Negroponte quoted in OLPC Talks, 2007a)

In the mid-2000s, OLPC was not only on the agenda of the UN, developmental NGOs and private corporations, but also about to become part of national education schemes on each of the three developing continents (OLPC Talks, 2007a). And, as the story goes, Negroponte paid tribute to Obasanjo by painting the laptop in the green and white national colours of Nigeria (ibid.).

However famous, laptops ended up immobile

Initially OLPC was very successful in enrolling actors behind their problematisation. The $100 laptop became world famous as the self-powered laptop with a hand crank to be distributed in the millions in the most remote corners of the world. Here illustrated by one out of countless contemporary media representations:

» $100 laptop « is the name of a small computer, there could be of importance for millions of poor children around the world. It has a hand crank enabling it to be used in all the remote corners of the world without having any
other power supply.

(Berlingske Tidende, 2005 - my translation, my emphasis)

Like Diesel's concept continues to be part of any diesel engine today, so does the $100 laptop linger in all subsequent manifestations of the XO.

The problematisation, however, never resulted in a mobilised network deploying laptops in the anticipated numbers. Neither Thaksin, Lula nor Obasanjo materialised on their pledges, the laptops didn't travel anywhere and OLPC came under pressure to “hit the numbers” which they eventually did, although in a more modest way, with the first G1G1 program\(^\text{36}\) for Western consumers and later with sales to Peru and Uruguay (Bender et al., 2012, p. 56).

Adding to the problems was the unfortunate failure of the first official OLPC pilot at Galadima outside Abuja in Nigeria (see e.g. Vota, 2008). The highly publicised pilot suffered from a range of unanticipated problems such as stolen laptops, lack of institutional support, insufficient teacher training, problems with sustainable electricity and internet connection (#137 appraisal report, 2008). Consequently, the then Nigerian Minister of Education, Igwe Aja-Nwachukwu, labelled OLPC as a white elephant (Vota, 2008b).

\[\text{Laptops riding piggy-back}\]

What got laptops to Akila's school, then, was neither Negroponte, Obasanjo.

\(^{36}\) The Get One Give One (G1G1) program was launched at Christmas 2007 and directed at US consumers to buy a XO laptop at double the prince and thus sponsor for a second to be send to a poor child. The program sold 90,000 laptops which sponsored another 90,000 (Bender et al., 2012, p. 82).
Rather, it was a Nigerian church (the TNC) and a group of Danes on whom the laptops could ride piggy-back. Riding piggy-back is a translation. It means that you join the campaign of others, ride along the same trajectory, because it can also be made your trajectory (Latour, 1987, p. 110). In this case, 100 laptops rode piggy-back on Danes and Nigerians because it would get them away from the table in Tunis, and Danes and Nigerians rode piggy-back on OLPC because it translated into working with technologies of learning, Christian fellowship and IT-literacy.

Among the Danes were pedagogical researchers. One is Henrik, a biologist working with science culture, and another is Jørgen, a sociologist working with teacher training. Besides from their respective day jobs, Henrik and Jørgen belong to a group called IT for Africa interested in technology and learning for development:

> We were excited about investigating how one could create new opportunities for learning through IT technologies. Not just better ways of learning, or other forms of learning, but learning that would be constructive for society as a whole in the longer run.  

(#11 Henrik, interview, 2009 – my translation)

In IT for Africa they discussed different ways of using technology to create new opportunities for learning – like the use of radio for long distance education in rural settings. However, with the launch of OLPC in 2005, Henrik became especially intrigued by the initiative, by their philosophy and the potential of bridging “the IT gap and the social inequality existing between developing and industrial countries” (#11 interview 2009). To Henrik, OLPC combined a beautiful vision with exciting technology and he convinced Jørgen that the two should look into the initiative. Their shared interest in the potential of technology to relieve social inequality thus became an interest in working with OLPC laptops.

In November 2007, Henrik acquired a XO laptop as one of the first in Denmark. After reviewing the laptop in a nationwide newspaper he was contacted by Kristian – a businessman also interested in OLPC. Kristian is partner in a trendsetting IT consultancy with branches in both Denmark and Nigeria. A child of missionary parents, he had spent most of his childhood in Nigeria and still retains close relations to the country. OLPC was appealing to him because
it combined his interest in technology with his desire of doing something about the poverty and isolation of Africa (#117 Kristian, presentation, 2009).

Kristian thus travelled to Massachusetts and networked his way into the OLPC offices in Cambridge. Together with Nigerian friends, he also went to visit the Galadima pilot on the outskirts of Abuja, which had just started at that time. While Kristian thought aspects of OLPC problematic, he retained a belief in the project and concluded on the potential of doing an independent deployment in Nigeria:

An OLPC initiative would leapfrog those children privileged enough to be part of the project, providing them with a unique opportunity to tap into their own potential, to be exposed to a whole world of ideas, and to contribute to a more productive and a saner world community. An OLPC initiative would motivate the children to learn in new ways; it would broaden their horizons; and talents which might never have been realized under normal circumstances will appear. (#138 Kristian, secondment report, 2007)

While in Massachusetts, Kristian also met the American computer scientist Aaron. Aaron was tired of his job at an IT service company, where he worked with deployments and was looking for more fulfilling ways to practice his profession (#31 Aaron, interview, 2009). He had thus volunteered with OLPC looking for a deployment to work on, but so far unsuccessful. But with Kristian there trying to start one, the two agreed that Aaron should become man-on-ground for implementation and infrastructure at Akila’s school.

**Laptops become an affair for missionaries**

Owing to his missionary upbringing, Kristian has strong ties to the Christian communities in both Denmark and Nigeria. Considering the already existing missionary fellowship a suitable facilitator for an OLPC project he contacted *The Danish Mission* (TDM) – the missionary NGO with which his parents were involved.

TDM has a long tradition for collaborating with their Nigerian partner church (*The Nigerian Church*, TNC) on building schools and developing educational capacity. Educational projects are funded and supported by this Chris-

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Christian fellowship because they translate into the Great Commission that Jesus gave his followers upon his resurrection:

> Go, then, to all peoples everywhere and make them my disciples: baptize them in the name of the Father, the Son, and the Holy Spirit, and teach them to obey everything I have commanded you. And I will be with you always, to the end of the age.  
> (Matthew 28:19-20)

For more than 100 years, Danish Christians from TDM have thus gone to Nigeria to teach and build schools as a way to mission their faith. As formulated in the 2012 annual report from TDM, educating everything human—the intellect, creativity and spirit—is part of God's mission for the world:

> When we talk and write and busy ourselves with education [in Africa] then we do it to lift people along the road for which God, our Father, created us—he who is Lord and creator of Man. It's an attention to the full human. That is why education is part of God's mission for the world and for us.  
> (#226 TDM Annual Report, 2012 - my translation)

For Christians in both Denmark and Nigeria, education and missionary work are thus inter-translatable.

When Kristian contacted TDM they were in a process of reorganising their educational activities from sending down Danish teachers to teach Nigerian children (direct involvement) to leaving the teaching to Nigerians and focus instead on providing better training for local teachers (indirect involvement):

> So now when we are sending out teachers it is to inspire, exchange pedagogical ideas, and share principles for teaching. So we are not going there to teach children ourselves anymore, they might as well do that themselves. We are aiming a little wider...  
> (#10 TDM project manager, interview, 2009 – my translation)

Rather than being in the classroom with children, TDM wanted to engage in projects with wider and more conceptual agendas. The OLPC project was a perfect fit. It translated right into this new strategy as it would not only bring in new educational material (laptops) but also carry with it pedagogical workshops with Henrik and Jørgen.
Reconfiguring the pedagogical purpose

OLPC and their laptops are based on a certain pedagogical approach centred on the work of Seymour Papert and, to some degree, that of Paulo Freire (q.v. Educational empowerment, p. 46). We can call this approach learner centred teaching (LCT) and contrast it with the banking approach of teacher centred teaching (TCT) based on rote learning (q.v. The problem with schools, p. 48). OLPC not only promotes LCT, it has build this preference right into the learning activities which ships with the Sugar system, which are open and explorative rather than closed and repetitive:

> With Sugar, we strive for a “learning-centric” approach, where teachers mentor students as they engage with powerful ideas, “teaching less and learning more.” While we want to give children access to knowledge—through media such as electronic books, the world-wide web, and multimedia—we also want them to acquire this knowledge by putting it to use and engaging in critical dialog. (Sugar Website, 2013)

The Danes carried this approach with them. To them the overall purpose of bringing laptops to Akila’s school was to see a pedagogical transformation of TCT to LCT:

> The overall objective of this pilot project is to see a successful transformation emerge at the project school, from a classic instruction based blackboard learning environment to a constructionist learning environment backed by computer supported activities. By doing this the pilot project aims to take the long-standing educational partnership between the Mission and the Church to a new level. (#130 funding application, 2008 – emphasis added)

But the transformation from TCT to LCT envisioned by the Danes was not entirely similar to what was promoted by OLPC.

As mentioned earlier, the degree to which students are self-sufficient learners needing only an interactive source of knowledge to learn has been a matter of debate (The first debate: do laptops empower, right out of the box?, p 44 & The second debate: do laptops stimulate good learning?, p. 52). While OLPC placed their laptop at centre of children’s empowerment, the Danes made teachers an obligatory passage point for better education.
Between the lines there is a fundamental assumption [by OLPC] that as long as the children are active learners then everything will be good. And I think that is a dirty trick when considering the reality that these things are going to be realised in. And it is naive to think that as long as children are able to use this tool [the XO] then they will use it to something that is appropriate in relation to them being in school and having to learn something.

(#11 Henrik, interview, 2009 – my translation)

Henrik and Jørgen, who are responsible for the pedagogical approach, placed much energy on designing workshops and weekly seminars for teachers. Also at TDM, the coordinator considered the project one of changing the culture of teaching, an end to which the laptops were the means.

...the purpose of the project (as I told him [a high-ranking Nigerian] on my first visit) was to change culture and that teachers and everyone else understood and accepted that the project should carry a different type of teaching, where children are at centre and not the blackboard and teacher. The XO is just a means, not the solution.

(#227 TDM project manager, email, 2012 – my translation)

The plan was to start a continuous process where teachers would meet once a week to present and discuss issues and ideas related to doing LCT lessons – with or without laptops. Henrik and Jørgen would then make two trips to Nigeria, half a year apart, to conduct intense courses on themes like classroom management, group work and student evaluation.38

Translating a curriculum of rote learning

To anchor the LCT transformation, Jørgen and Henrik explicitly related the use of laptops to existing Nigerian bureaucracy. All primary schools in Nigeria have to adhere to a centrally controlled and highly detailed curriculum, which are externally audited on the basis of written lesson plans. There is, however, some room for translation between curriculum and practice. By labelling computers as teaching materials no different from black boards and textbooks, they could fit smoothly within the curriculum, and allow teachers to officially document their use of laptops.

The national curriculum, however, is strongly based on the TCT approach.

38 If you remember, I went with them for the second workshop and returned two years later for a second visit (q.v. Tracing laptops – Writing laptops, p. 91).
Here is one example, a primary 4 music lesson:

Here is one example, a primary 4 music lesson:

The objective for the lesson is to define local and foreign instruments, the role of the teacher is to provide the definitions, the role of the students is to copy down the definitions, and the basis for evaluation is students being able to remember at least three definitions. As such, very much a banking approach (q.v. The problem with schools, p. 48). In order to circumvent the TCT approach of the curriculum, Henrik and Jørgen introduced an alternative way to document and evaluate lessons which could translate between the TCT of the national curriculum and the LCT they wished to introduce.

Well-known to teachers and social educators in Scandinavia, the model chosen to translate between TCT curriculum and LCT lessons was the SMTTE (Sammenheng, Mål, Tegn, Tiltak, Evaluering) model developed in Norway. Perfect for the job, the SMTTE model was originally developed to enable Scandinavian teachers to sustain pedagogical focus in a context of performance measurement, rigid bureaucracy and New Public Management (Pedagogisk senter i Kristiansand, n.d., p. 4). The model allows teachers to fulfil rigid documentation while granting them a good deal of autonomy to select the most appropriate criteria for evaluation. In short, it allows teachers to evaluate their class on LCT grounds even though the curriculum enforces a TCT pedagogy. The SMTTE model was renamed the Star Model, after its shape on a piece of paper, and initially did a good job relaying between curriculum and practice (#31 teacher, interview, 2009).
The chronology is false: enter Nigerian trajectories

Until now, I have introduced transfer participants in what appears as chronological order. Starting with Negroponte and Annan, moving over Danes and arriving now at Nigerians in the receiving end. Negroponte made a laptop, Annan helped promote it and Danes rallied behind getting it to Nigeria. As such, a fairly conventional A-B transfer. This chronology helps convey that while Annan and Negroponte are not the cause of laptops in Nigeria, they are nonetheless important actors in the plot.

But the transfer did not follow such a chronology. Rather the transfer was an encounter between several trajectories. So let us begin anew with another chronology, this time one of a school in Nigeria out looking for desktop computers to teach computer skills, which ended up signing on for an OLPC project instead.

Around 2007-8, when first contact was made between Danes and Nigerians over the OLPC project, Akila’s school had already been out looking for computers for some time. All over Nigeria, public and private schools alike have made the acquisition of computers a central priority. As emphasised by a civil servant from the state government, which had just procured a large amount of Intel Classmates for their public schools:

| IT-illiteracy is widespread among both teachers and students. Regardless
what you might think about globalization Nigeria is gradually becoming part of the Global Village and having an IT-literate population is of uppermost importance. IT is also an important alternative to BBC, CNN, Al Jezeera, especially regarding local events such as the Boko Haram.

(*#81 Chairman of the State Board of Education, observation, 2009*)

It is no secret that Nigerian schools are often very poorly funded and lacking such basic equipment as lighting, furniture, toilets and black boards. Most schools must settle with paper drawings of computers and popular software such as Microsoft Windows and -Word.

The reasons for prioritising digital technology at Akila's school was, however, not identical with the theories of OLPC. As we return to in the following chapter, the hunt for computers was, amongst others, strongly associated with the notion of *IT-literacy* – a qualifying adjective for jobs at offices as well as a future in the information society (q.v. Digital divides and IT-literacy, p. 152).

Being IT-literate means first and foremost to be knowledgeable about computers and especially the software used for business such as Microsoft Office (*#95 Nigerian professor, interview, 2009*). IT-literacy lands you several advantages. In concrete ways it qualifies you for attractive jobs in banks and with the government. In less concrete ways it projects a future in which you are included:
We are used to having books, and blackboards, and libraries in schools, and the world has changed. [...] These children are going to be the children of the millennium. Those of us who has children still going to schools with blackboards, our children will be running after them. They are our future engineers and our future medical doctors. They will need to use the computer to do surgery, they will need to use the computer to design, so when they get it early, then we have a brighter future. (38 TNC Bishop, interview, 2009)

**OLPC is a computer lab of 40 desktop computers**

Before the OLPC project, Akila's school had worked with the above mentioned paper models of soft- and hardware while seeking out funds for a proper computer lab. The ambition was for 40 desktop computers to be acquired through external funding – either Church donation, government sponsorship or patronisation by wealthy community members. As explained by the chairman of the school board, the laptops were a perfect substitute for this ambition, which had been difficult to realise:

So Leif introduced their mission, they wanted to see if the community here would be willing to embrace computers as a project in the school. I said look at the draft I am already submitting to the Bishop through the church council, you can see I am requesting for a class to be build and be equipped with at least 40 computers for children [...] I said why not, if that will give me the computers I am asking the Church to buy, so be it, because I know it will take time before the church will be able to buy 40 computers.

(#33 chairman of the school board, interview, 2009)

With scarce resources, the OLPC project provided a tangible way of realising what the TNG bishop said had “always been a dream”:

Then someone comes in and say this can be done. And I say yes I want it but I don't know how to do it. They say OK it will cost so much per child, and if you can do this much we will do this much [...] it was Kristian. I know him from childhood when he was a missionary kid living here.

(#38 TNC Bishop, interview, 2009)

TNC and the Danes then agreed to buy 100 XO laptops from OLPC – allowing the Danes to do pedagogical transformation and equipping Nigerians with a computer lab for IT-literacy. Funding was divided with two thirds to be provided from Denmark (a combination of official state funds and money...
gathered from fund-raising activities amongst missionaries) and one third to the Nigerians (donations and tide from the local TNC congregation supplemented with an increase in school tuition).

![Cover of IT-literacy textbook for primary four students.](image)

**Teacher’s fidelity**

Having translated the OLPC project into a lab for IT-literacy, TNC decided to impose a legal contract on all teachers binding them to the school for five years. This caused almost the entire staff to leave their jobs.39 The fear was that computer knowledge would be such an asset, that it would not only attract students, but also make it hard to retain teachers, because with IT skills they could find better employment elsewhere. So a fresh batch of young and newly educated teachers were hired, all of them TNC members and all of them willing to sign a five year contract.

These new teachers were willing to bind themselves for five years at a salary lower than the one they could have gotten at public schools because they too had their own ways of translating the OLPC project. Just to mention a few: There is John, who used to teach in Niger state, but travelled to the project state in order to enrol himself at a computer science program at the university (#31 John, interview, 2009). John hoped that the OLPC project could help him realise his ambition of becoming a computer professional. There is Angelle

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39 Unfortunately, I have not been able to trace down any former teachers for their account of the incident.
who did not really care too much about computers or teaching; she applied for the job because she felt a call to serve her God and church (#14 Angelle, interview, 2009). There is Chioma, who lost her husband and all except one of her children to AIDS (#64 Chioma, interview, 2009). Chioma is one of the few from the old staff which remained behind and is, for obvious reasons, highly dependent on a steady income to sustain herself and her son. A multitude of such personal translations makes teachers teach with laptops at Akila's school.

**Laptops detour, deviate and betray**

Part and parcel of travelling through translation are detours, deviations and even betrayals. As stated by Latour (1996a, p. 48): “To translate is to betray: ambiguity is part of translation”. We have already seen the laptops translated from being schools-in-boxes to facilitator of teacher centred development, and further into being a computer lab for IT-literacy. Following the Nigerian chronology, we could also say that the ambition for a computer lab had been betrayed for OLPC laptops.

Remember OLPC's five principles meant to follow the laptops wherever they go (q.v. Five principles everyone agrees to, in principle, p. 36)? The first principle was for children to own each their own laptop, to take them home, and to use them in ways unstructured by school and teachers.

> The ownership of the XO is a basic right, coupled with new duties and responsibilities: including protecting, caring for, and sharing this creative environment. (OLPC, 2012)

In Nigeria, however, there are only 100 laptops for 400 children, and school management do not trust children to take home laptops. As such, another deviation, or translation, of the OLPC setup. Teachers and school management argue strongly against children using laptops outside school, they fear that they will break or misplace the laptops or use them for inappropriate purposes such as pornography:

> People taking it home is not the right thing. If you have a brother, you will give your laptop to your brother, and he will give it to his friends, and before you know it it is lost. (#35 teacher, interview, 2009)
> ...they may end up breaking it, they may not end up handling it well, some
will maybe handle them well, but they have friends who are around.  
(#177 teacher, interview, 2009)

Outside school it is not possible because in our area, if one child takes this laptop home, then 7 or 8 children will touch them, and before you know it they will spoil it.  
(#181 teacher, interview, 2011)

I know that there are some bad sides to the Internet like pornography. Our students doesn't know that and we strictly control them since it is only for lessons that we are using the XOs  
(#58 principal, interview, 2009)

While the Danes are in favour of the OLPC model of 1:1 computing and 24-hour learning, they too feared it problematic for the laptops to leave school: “child ownership is something which is difficult to address in Nigerian culture” Kristian warned in an early report:

Children in a rural Nigerian setting do not “own” things in the sense that we know it here in Denmark. Whatever the children receive is to be passed on to their parents. This cultural issue has created some trouble in the implementation at Galadima, because parents would not let their children take their laptop to school, or even allow them to use it at home. Similarly, children do not have much spare time.  
(#138 Kristian, secondment report, 2007)

The ownership debate has ended in compromise. At the outset, none will be allowed to own their laptop in any way, but the school management is to work on a model, where mutual trust can be established between school and families, so that children attending primary 5—which are deemed of an appropriate age—can get each their own laptop both in- and outside school (#10 project coordinator, interview, 2009). Unfortunately, as of writing, no such model has been identified and only a few select students have used laptops outside of school lessons (q.v. Falling Into Limbo, p. 167).

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40 Example from a Danish preparatory document: “Bringing the laptop home where both parents, family and friends will be affected by the project gives us a clear angle at gender, age and social status” (#132 Document, 2008).
Betrayal by customs

Arriving in Nigeria was not easy for the laptops. Besides from being laptops for children, part of charity and development, they are also white men's valuables going through corrupt customs. Aaron and Leif thought they had arranged for the laptops to be transported by air into Abuja, where they could have someone claim them immediately upon arrival “before anyone realise they are valuable and starts setting up numbers” (#32 Aaron, interview, 2009). It was a question of getting the laptops through customs without having to settle\textsuperscript{41} any officials. However, due to an unknown error or miscommunication, the laptops did not fly into Abuja. They sailed into Lagos six days before Aaron and Leif expected them. And in Lagos, of course, they got stuck in customs which came up with unwarranted fees in the area of $2000.

When I first met Leif the laptops were still in Lagos. He was very concerned because they had been working to get them out for ten days without result. The problem was not simply the additional expense of settling customs officers, it was more that the act itself is not within the range of legal and/or moral acceptable actions at TDM. The only available option was to find a patron within the system, and TNC was trying to locate possible candidates amongst their Lagos congregation. Meanwhile Aaron had gone to Abuja to seek the advise of a business associate of Kristian who helped him gain audi-

\textsuperscript{41} To settle is the polite verb for bribing government officials (see e.g. D. J. Smith, 2008, p. 56).
ence with a high ranking civil servant, the son of an emir, who cleared the laptops although he too expected something in return ($600 to be precise). Aaron, however, managed to evade the request through a mixture of deliberate naivety and miscommunication (#32 Aaron, interview, 2009). For a few nerve-racking days, the project was close to being betrayed by a translation of children's laptops into income for corruption, which would have complicated and threatened the whole endeavour.

The missing masses of laptops
Translations are easily misunderstood as alignment of social interest between human actors. At least, the above paragraphs could give that impression with all the humans presented. Translations, however, are criss-cross alignments between actors of all types with the social being no more privileged than the material (q.v. Hybrid equivalence and irreduction, p. 66). We are thus faced with some missing masses in our hitherto travelogue (Latour, 1992, pp. 152 & 169).

The problematisation of OLPC envisioned the $100 laptop to be an autonomous unit capable of taking care of itself in even the toughest conditions. It was to be dependable on nothing but reaching the hands of children. It was to be dust, waster, and dirt proof; it was to withstand physical bumps and being dropped from considerable height; the screen should be usable even in direct sunlight; it should mesh-network even when no network infrastructure existed; and it was to be self-powered by hand cranks (q.v. The XO laptop(s), p. 36).

Besides from being fairly rugged, the actual laptop do not live up to these projections. It does not have a hand crank, the mesh network does not work, keyboards and touchpads are easily worn and in Nigeria many screens are suffering from large stains of dead pixels (see also Warschauer & Ames, 2010, pp. 40–43). For the program of action to be fulfilled, that children should actively learn with internet connected laptops, which can be regularly charged by a reliable source of electricity, some additional actors are needed to mediate the network.
Substituting for a hand crank

A laptop is unusable without electricity. But at Akila's school electricity is scarce and highly unreliable. The Nigerian power supplier NEPA\textsuperscript{42} only delivers electricity a few hours each day – and that might as well be in the middle of the night as during school. In consequence, everything relying on power must have its own independent power supply. In the better parts of town you hear the humming of hundreds of generators powering offices, houses, hotels, etc.: “if you have money you buy a generator. But if you depend on NEPA then... [laughter]” (#34 teacher, interview, 2009). Unfortunately, fuel is expensive and while the school actually owns a generator, it is rarely fuelled – which is properly for the best as it makes a deafening noise disturbing classes.

The laptop presented by Annan looked as if it could suffice with a hand crank. But while the laptop which went into production indeed had a modest power consumption,\textsuperscript{43} it was not low enough for hand cranks to be a realistic power supply and, besides, the crank never made it onto production models. Ensuring a sustainable supply of electricity for the laptops have become something of a challenge for OLPC deployments.

Does anyone remember the hand crank? That masterful bit of marketing set up OLPC's local partners to be blindsided when they had to start paying for generators and diesel to power XOs and Internet routers. The shocking electrical power costs quickly added up. From the Nigeria Chapter of the Club of Rome, we learn that the generator [at the Galadima pilot] has to be stored in the principal's office to prevent theft, requires costly gasoline, and servicing that can take days. (Vota, 2008)

And it is not only the laptops which need electricity. It is also access points, routers, servers and intruder alarms.

Avoiding generators had been one of the lessons from Galadima (Vota, 2008b). Not only because of running costs and noise level, but also because they require substantial maintenance. A more recent alternative to generators are solar panels. Going around Akila's town, however, it is obvious that these

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\textsuperscript{42} The National Electric Power Authority (NEPA) has actually changed name to The Power Holding Company of Nigeria (PHCN), but the NEPA-term seems to linger in common discourse so I too assume it here.

\textsuperscript{43} The XO-1 consumes an average of 4-6 watts (OLPC Wiki, 2013c).
do not have the most impressive track record. Decaying solar projects are seen on almost every street corner as paradoxical white elephants of sustainable energy. As Danjuma, a local engineer working on the project, explained:

...there are so many substandard solar projects that have already been done [...] All the ones on the bridge are supposed to be solar lights but none of them are working. They are substandard. So it is very very difficult to convince people about solar here because they have seen those people. And those people even came from Abuja or Lagos so they considered them as big companies. (Danjuma, interview, 2009)

But in comparison to generators, solar panels still seemed the most viable solution because they require less maintenance when first installed. Furthermore, solar panels would shift the expenditure from a continuous dependency on diesel to an one-time instalment made with Danish development money. Aaron and Danjuma thus ended up ordering 20 solar panels from China to be installed on the school's roof.

Besides from solar panels, various other electrical components help substitute for hand cranks. What is on the surface a simple process of sending electricity from solar panels into laptops actually requires quite a few additional mediators. Batteries and inverters are two examples. The 20 panels send 48v DC down to eight 12v batteries (racked parallel in two series of four), which again pass 48v DC to an inverter imported from Germany that steps up the power to 220v AC, before it is finally send to laptops, routers, ventilation, lighting, etc. through the school's wiring and into specially made charging stations.
The entire installation is then again mediated by strong metal bars in front of doors and windows, padlocks, intruder alarms and a constructional reinforcement of floors and roof so as to withstand the weight of solar panels and batteries. The whole setup is quite substantial, the batteries alone weigh more than 500kg, and the cost of a stable power supply ended up being as much as for the laptops themselves – $25,900 for 100 laptops against approximately $25,000 for solar panels, batteries, inverter, and so forth (#153 deployment guide, 2010 & #32 Aaron, interview, 2009). Akila’s laptop thus inhabit a quite different reality than the $100 laptop for which electricity is of little concern:

For a little piece of solar panel this big now which gives you five watts, which can power the laptop, only costs $12. We can put a solar-powered gang charger, a multi-battery charger in the back of the classroom, and since our battery itself costs less than $10, we can have extra batteries in the classroom, swap them in and out, so the kids go home with the fully charged battery, and then come in the next day; lots of things like that.

(Negroponte quoted in OLPC Talks, 2007c)

Much effort has gone into making the instalment sustainable. Gell cell batteries have been bought to reduce maintenance and a generator automatically sets in, if the batteries are discharged more than 50%. However, if the instalment is to function properly, somebody has to climb the roof and clean the panels from time to time, so they do not clog up. This is specially an issue dur-
ing the Harmattan, when the wind brings in sand from Sahara. And when something goes wrong, a person with both technical capacity and organisational status must be enrolled to remedy the problems. Recently, for instance, two batteries died and were not replaced, which crippled the whole installation, because such a person could not be mobilised (q.v. Betrayal of missing masses, p. 186). Adding to the complexity, after some years, and in spite of having been reinforced, the roof also gave way to the weight of the panels and collapsed. A metal tower is now being build for the panels and new batteries have been procured.

Bridging the digital divide by enrolling satellites
Another important promise of the $100 laptop was to help bridge the digital divide through internet connected mesh networks. Here again, the $100 laptop could not keep its promise. The highly publicised mesh network enabling the laptops to communicate with each other without any other infrastructure does not work well in practice.

OLPC has sort of put the mesh network on hold, it seems more in favour of more standard network technologies, which just work better to be frank […] they are recommending that you not try to use that technology, you just use regular access points and a school server, which is what we are doing now.

(#32 Aaron, interview, 2009)

The networking infrastructure must thus be delegated to a more conventional
setup with router, sever and access-points.

Another problem with routing internet to Akila’s school, which is far inland, is that there is little infrastructure between the school and the fibers reaching coastal Africa. The school is on the wrong side of the digital divide. So, in compensation, a satellite has to be made part of the plot. Internet packets going to Akila are not travelling through Nigeria, but directly to a teleport in London that forwards them single hop to the project school via satellite. Unfortunately, this type of connection is both slow and expensive. You get 128 kbps download and 64 kbps upload for a subscription of $366.66/month and an one-time instalment of $1688. These are very steep prices. In comparison, a trained and certified teacher at the school makes about $105/month.

The satellite is not a silent mediator of connected laptops. It makes loud calls for attention each time the slow connection times out (which is often) and each time the quarterly invoice claims $1100. But there is no other way. Satellites are an obligatory passage point for internet in this area, and only by their enrolment in the network, do laptops become developmental devices capable of bridging digital divides.

**Discussion: transfer by way of translations**

It is tempting to imagine technology transfer as a single trajectory, or phase-divided process, along which various problems with infrastructure and cultural difference are handled as an unchanged technology is deployed. However, while this may be a convenient way of modelling projects, it was not how laptops went to Nigeria.

As we have seen, many deployments are going on, intersecting at various points of transformation, all engaged in deploying the same thing in different ways. Pedagogical researchers are deploying a transformation of teaching culture, missionaries likewise, Nigerians are deploying IT-literacy, engineers are deploying solar panels and satellites, which in turn are deploying substantial invoices. As we investigate in more detail in the following chapter, all these are configuring not only what the laptops are, but also what they may hope to do! It is unclear if they are $100 laptops capable of being school-in-boxes, instruments for pedagogical transformation or alternatives to a computer lab.
This carry consequences for how to think of technology transfer – especially within a development context where a history of failed expectations and white elephants have led to certain customary scapegoats such as problematic culture, in blaming the poor, or developmental imperialism, in blaming the rich.44 If laptops are what results in the end by virtue of constructional movements running criss cross, it is problematic to motivate transfers with impacts claimed to be known beforehand. When sometimes technologies do stay the same—which of course also happens—they likewise do so only in the end by merit of all those participants carrying them along (e.g. Law, 1986). Either way, what results results just as much through work beyond the site of invention as it does within.

This is the famous quandary of technological movement (or quandary of the fact-builder). If no-one takes up the $100 laptop, it can never be anything more than a fund-raising device, a future vision or a media hype. It is stuck on the conference table in Tunis. But if someone does take it up, and bring it to Nigeria, it might be transformed it in all kinds of unpredictable ways:

If Diesel [or Negroponte] is the only person who believes in his perfect engine, the engine sits in an office drawer in Augsburg. In order to spread in space and become long-lasting they all need (we all need) the actions of others […] most of them unpredictable, which will transform the transported object or statement. So we are now in a quandary. (Latour, 1987, p. 108)

Accordingly, it is misleading to say that the laptops were transferred when in fact they were translated and reinvented by those carrying them along. As John Law (2006) writes: “one of the things we are going to learn is that there is no such thing as technology transfer”.

The above travelogue relates to various other frustrations with linear conceptualisations evaded by practice. Within business school literature, for instance, Kristian Kreiner has risen to fame in Denmark by pointing at the multiple dilemmas facing project managers submerged in ”a world torn between the symbolism of a modernist culture and the practical requirements of achiev-

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44 Amongst many examples, we have already seen the post-colonial critique of development (p. 23) and while not explicitly part of this analysis, others are fond of blaming the special Nigerian Factor when working in the Nigerian culture (see e.g. Lawal & Oluwatoyin, 2011; D. J. Smith, 2008).
ing a task under highly imperfect conditions" (Christensen & Kreiner, 1991; Kreiner, 2012). Likewise, an entire field called social informatics are working to replace what Rob Kling terms “standard tool models” for IT deployments—which are based on more or less deterministic causalities between artifact and impact—with “sociotechnical models” of ongoing negotiation (Kling, 2000, p. 200). Theories of technology transfer needs to re-conceptualise both process and outcome in order to appreciate the transformative dimension of moving things along. As I was warned early on by Jørgen, when talking with him and Henrik about how to guide the project, perhaps transfer is not the best choice of words:

...this notion of transfer so often used in development, maybe it should be re-placed with another notion […] Things developed in a context and there are transformations. You can of course have general inputs but things are shaped in relation to local contexts, it is more about transformation than transfer. That is a better notion. (#11 Jørgen, interview, 2009 – my translation)
There are multi versions of Akila's laptop. There is one backing a pedagogical transformation, there is one upholding discipline amongst students, there is one bridging the digital divide while providing IT-literacy, one is a Bible and yet another is used by children to play around and have fun. These are investigated in this chapter as *enactments* made by partially connected actor-networks of Danes, Nigerians, internet and Christianity. Enactments are performative achievements and they are different from perspectives. Enactments make difference belong to objects themselves whereas perspectives multiply everything around them: culture, context, social meaning, etc. As will be discussed, perspectives are yet another manifestation of the Cartesian divide. After further substantiating the difference between enactments and perspectives, the investigation begins by contrasting two enactments of learner-centred teaching (LCT), one made in Denmark and the other in Nigeria. The two LCTs, in turn, enacts two contrasting laptops, but also one that is a compromise. The next enactment runs through an actor-network of digital divides and IT-literacy, and makes the child-like XO laptop aspire to be a ThinkPad or MacBook. Towards the end, it is investigated how actor-networks of Christians and Muslims make the laptop a Bible of strategic importance while one of unsupervised children enacts the laptop as a children's machine for playing with. Finally, implications of raising the stakes from perspectives to enactments are discussed in relation to technology and development.

The previous chapter investigated how technological movement is prompted by multiple agencies flowing through the plot in heterogeneous ways. In this chapter, the argument follows that processes of translation between solar pan-
els, Nigerian teachers, Danish missionaries, OLPC and so forth not only ensured technological propulsion for Akila’s laptop, but also made it a specific socio-technical construction.

The process was one of several actor-networks merging at certain points while not at others, thus remaining partially connected. While these actor-networks enact and sustain Akila’s laptop, they also have diverging agendas and different compositions. This makes the laptop come out multiple. Before investigating this multiplicity, however, the notion of enactment is further explored as an alternative to perspectives; an alternative which focus on performativity rather than interpretation, and one which raises the stakes of multiplicity from meaning to being, from epistemology to ontology.

**An alternative to contextual multiplicity**

When multiplicity arise during technology transfer, it is commonly attributed to context and socio-cultural perspectives (q.v. Research agenda: divergence and multiplicity, p. 28). Kraemer et al. (2009), for instance, scold OLPC’s transfer strategy for “misunderstanding the social and cultural environment in which the innovation is to be introduced”. Although cultural understanding is important, the relational metaphysics of ANT obstinately refuses any bounding container such as culture or context for technological movement (q.v. Implications for time, space and other such scales, p. 70). As we will see below, one reason for this contextual reluctance is that it removes multiplicity from the technology itself and relay it instead to everything around it.

This section thus seeks to replace the multiplicity of context and socio-cultural perspectives with one of actor-networks and performative ontologies. As we have seen, actor-networks are dynamic constellations which bring into being (q.v. Genesis is translation, p. 73). In this chapter, the bringing into being is investigated through Annemarie Mol's (2002) notion of *enactment* which captures firstly, that ontology is performative and secondly, that symmetric multiplicity needs to include nature and objects alongside culture and context (q.v. Hybrid equivalence and irreduction, p. 66).

**A singular nature makes for social multiplicity**

The Cartesian divide maintains an opposition between a singular and tran-
scendent nature and a range of human interpretations lending it meaning. Put abstractly, a model of one nature with multiple cultures. Or to be specific to René Descartes himself, a model with a single “corporeal nature that is the subject-matter of pure mathematics” beyond all those secondary categories we as humans impose on it—colour, smell, taste and other sensory perceptions—which however useful “give only very obscure and confused information” (Descartes, 1641, pp. 28 & 31). Beeswax is a good example for Descartes:

> It has just been taken from the honeycomb; it still tastes of honey and has the scent of the flowers [...] But as I speak these words I hold the wax near to the fire, and look! The taste and smell vanish, the colour changes, the shape is lost [...] the wax was not the sweetness of the honey, the scent of the flowers, the whiteness, the shape, or the sound, but was rather a body [...] what is left is merely something extended, flexible and changeable.

(Descartes, 1641, pp. 6–7)

What does not belong to nature, to the wax itself, quite literally melts away in the fire. The essence of wax is the physical body, something we can know and investigate independently of context or condition.

I use Descartes as eponym for what Latour (1993c, p. 32) calls the Modern Constitution: the general distinction between a transcendent nature and the multiple social or cultural perspectives imposed on it. The relationship between biological sex and cultural gender is one example. Sex is that which signifies a non-contextual biology of the body while gender, on the other hand, is a cultural variable shaping what it means to be man or woman. As famously formulated by Simone de Beauvoir (1983, p. 267): "One is not born but becomes a woman", which can be reformulated by Latour (2002, p. 7), that while we must accept only one embryogenesis, there are many debatable postnatal ways of bringing up children.

While the sex-gender divide helped second wave feminism problematise and multiply cultural gender, it also excluded any such dealing with biological sex. Physical materiality was made a passive reserve to become “appropriated, preserved, enslaved, exalted, or otherwise made flexible to disposal by culture” (Haraway, 1988, p. 592). The multiplicity of the Cartesian divide extends only halfway. It thrives in the debate over how to culturally raise your children as
man or woman, but also banish biology and the corporeal from being included as anything other than possible trump cards. This is also what Mol has called a circle of perspectives multiplying everything other than the object of discussion:

This multiplies the observers—but leaves the object observed alone. All alone. Untouched. It is only looked at. As if it were in the middle of a circle [...] In a strange way that doesn't make it recede and fade away, but makes it very solid. Intangibly strong. (Mol, 2002, p. 12)

Social or cultural perspectives make objects and nature distant and untouchable. That is, except from a few chosen perspectives which know them better than others. For Descartes, for instance, the most privileged human perspective was mathematics:

God would be a deceiver; and he is not. So bodies exist [...] bodies have all the properties that I vividly and clearly understand, that is, all that fall within the province of pure mathematics. (Descartes, 1641, p. 30)

But in other times, and for other types of ontology, the privileged perspectives have included the clergy, witchdoctors, agitators, missionaries and development officials. These have seen the real thing, so to speak, but may generously come to value the interpretation of others as long as they don't challenge the proclaimed universal bedrock, be it theological, ideological or scientific (Laplan, 2002, p. 30; Law, 2002, p. 138).

It was a challenge to exactly such privilege which sparked the science wars; that sociologists began studying scientific facts as social facts (q.v. In development as in science, the stakes extend to ontology, p. 67). Similar stakes apply to Akila's laptop: who holds the proper perspective to determine the nature of the laptop, and who must settle with more or less appropriate social interpretations? Is it OLPC who in authority may say that this is the real laptop, or is it Danes, or Nigerians, or Christians, or perhaps the author of this thesis?

The whole predicament is based on the assumption, that there is only one true laptop beyond the perspectives, one which has been established within a perimeter of invention, and one which can settle any dispute over what it is (q.v. Abolishing the invention perimeter, p. 99). This chapter does the opposite. It includes the object in the multiplicity by treating it as an actor-network,
as an enactment. In such an outlook, there is no longer an object beyond for perspectives to debate, but only that which is actively being brought into being by actor-networks.

**Amerindian symmetry makes for multi-naturalism**

One important resource for multiplying objects and nature lie in Eduardo Viveiros de Castro's (2004) account of Amerindian animism in the Amazon rainforest. To the Amerindians, something may appear in everyday life as person, plant or animal, but these are temporary envelopes rather than fixed beings. Rather than people being former animals, as Charles Darwin has taught us, they believe it the other way round, that animals are in fact former humans enacting a nature of their own, where humans are the animals, and they are the humans (de Castro, 2004, p. 465). The Amerindian cosmology thus propose that while everyone are human to themselves—this includes both animals and spirits—they are either spirit (predator) or animal (game) to others. In this way preying people see animals as animals; preying animals see humans as animals; spirits see everyone as animals and people and animals alike see predators as spirits (ibid., p. 466).

A little confusing at first, the point is that this cosmology is symmetric to multiplicity. Since humans, animals and spirits are all considered equally human, there is only one shared dimension which can multiply and that is nature—the real reality. We thus get *multi-naturalism* rather than multi-culturalism (ibid.).

It works like this. All species are humans doing the same things although they do them with different bodies, with different assemblages of affects and capacities, transforming those things that humans know as maggots into grilled fish for vultures: “Animals see in the *same* way as we do *different* things because their bodies differ from ours” (ibid., p. 474). The outset is not one true nature, it is rather the assemblage with which things are done, and with no true being beyond, multiplicity becomes a primary quality.

...there are no autonomous, natural facts, for what we see as nature is seen by other species as culture (as institutional facts). What humans see as blood, a natural substance, is seen by jaguars as manioc beer, an artifact.
Amerindians reserve no privilege to say that what is blood in their assemblage must be blood *always-everywhere* (Latour, 1996b, p. 253). What is blood is also beer; beer-blood is simply a multiple thing.

**Multiplicity is a hybrid achievement, an enactment**

Multi-naturalism not only thrives in the Amazon. Mol (2002) has done extensive fieldwork at a Dutch hospital where she studied atherosclerosis. If relayed through the Cartesian divide, atherosclerosis has only one being: it is a thickening of the vessel walls. There may be other perspectives, like that of the patient, but this is what atherosclerosis is. If looked at as an assemblage, however, we find that atherosclerosis too is multiple.

At the hospital atherosclerosis usually starts in its clinical form, as pain when walking, and only in rare cases ends up in the pathology department as thickened vessel walls. Clinical atherosclerosis and pathological atherosclerosis are not the same. The former is a matter of patients with leg pains while the latter deals with cross sections of arteries from amputated limbs. When atherosclerosis as pain when walking becomes too heavy a burden for patients to carry, a surgeon may amputate the limb in question, thus enabling atherosclerosis to travel to the pathological department, where it is enacted as cross sections and vessel walls.

> Atherosclerosis in hospital Z is one thing here and it is something different a little further along. It is both pain and a clogged up artery but not both in the same site. It is pain in diagnosis and a clogged-up artery in treatment. Reality is distributed. (Mol, 2002, p. 96)

To add further to the complication, there is also the atherosclerosis enacted during vascular operations, which can be both something that is stripped away (endarterectomy), something that is pushed aside (angioplasty) or something that is circumvented in a bypass.

These diverse practices all enact atherosclerosis in different assemblages of cut of limbs and patients in pain (Mol, 2002, p. 33). The patients are living it, the walking therapists are coaching it, vascular surgeons are bypassing it and pathologists are making cross-sections of it. They are all performing athero-
sclerosis, bringing it into being through their practice. But it is not quite the same atherosclerosis that they enact. Like blood-beer in the Amazon, the varying gravitations in the actor-networks of pain, patients, limbs, pathologists, operating theatres and workout gyms make for multiple atherosclerosis. A disease which is more than one but less than many (Mol, 2002, p. 55).

What both Amerindians and Mol are doing, is to remove the object from its immediate materiality in order to redistribute it instead to an assemblage, an actor-network, an everyday practice, making it a hybrid achievement rather than fixed object. This extends multiplicity to either side of the Cartesian divide and makes ontology—the word with which we can best designate the true being of laptops, blood and atherosclerosis—an accomplishment by these assemblages rather than a distant, universal bedrock. This is what is captured by the word enactment:

...that ontology is not given in the order of things, but that, instead, ontologies are brought into being, sustained, or allowed to wither away in common, day-to-day, sociomaterial practices. (Mol, 2002, p. 6)

**Pedagogical multiplicity**

We return to the principle debate on multiplicity at the end. But for now, it is time to investigate the enactments of, and around, Akila’s laptop. Our first multiplicity, however, does not belong directly to the laptop but to the pedagogical approach of learner centred teaching (LCT) which underpins it.

As it is, Danes and Nigerians enact each their variant of LCT, and this makes for contrasting laptop enactments. One is a disciplinary device while the other is a development device meant to soften up the discipline that the former enforces. In practice, however, these enactments manage to coexist in spite of their frictional relationship. They are mediated by different geographies, where one is present the other is absent, but their relationship is also negotiated by a special black school translation which makes the Nigerian LCT an unprogressed version of the Danish LCT.

As we remember, the laptops have a built-in preference for LCT from OLPC (q.v. Educational empowerment, p. 46). They are good machines for a

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45 John Law & Vicky Singleton (2002; 2005) have shown how patterns of absence-presences are intrinsic to the heterogeneous ontologies of alcoholic liver disease and aircraft design alike.
project with the stated goal of transforming the pedagogy from “instruction based blackboard learning” towards a “constructionist learning environment backed by computer supported activities” (#130 project document, 2008). However, this is only one enactment of LCT. We have already seen how Danes enacted a different LCT to that of OLPC (q.v. Reconfiguring the pedagogical purpose, p. 113). And in addition to the LCTs of Danes, we can now add a third: the one they were already doing in Nigeria!

In Nigeria, LCT is officially implemented by law; it is part of the strictly controlled national curriculum, it is audited by civil servants and it is what the teachers are taught at teacher’s college:

For the pedagogical approach, the centred approach professor Henrik and professor Jørgen presented to the teachers during training is not new at all because our teacher training in this country is child centred. The child is at the centre. The activities are child generated activities, the child is deeply involved in the activities during classroom teaching.

(#33 chairman of the school board, interview, 2009)

In the Nigerian variant of LCT there is strong focus on discipline and teacher authority. During morning assembly children are marching, standing in ranks, praying and pledging allegiance to the country. If you are late, or caught sabotaging the discipline by cracking jokes, a teacher or prefect will award you one out of several corporal punishments. Similarly, during class, students are expected to sit quietly and pay attention in an atmosphere of concentration and discipline.

However, the system is difficult to maintain. The children keep undermining it by making noise, fighting and so forth. Great importance is thus attributed to rattan canes, known locally as bulalas, to help keep children in line. Like one very frustrated teacher told me when even her rattan cane wasn't enough to ensure order amongst some older students:

...these students are like donkeys, unless I cane them they don't work, so now they are bringing an even bigger cane, then you will see them work!

(#208 teacher, observation, 2011)

Fetching an even bigger cane, she hoped, would reinstate the lost discipline of
her class. Accordingly, most of Akila's teachers carry around bulalas as a token of authority and if a student misbehaves they will “flock” him/her with it:

We are holding the stick in order to mould the students behaviour. If the students see you with the cane, maybe the students used to go out unnecessary, by seeing you with a cane the student will behave normal. He cannot misbehave, he cannot behave disrespectfully. Because they know that if they misbehave we are going to flock them. (#60 teacher, interview, 2009)

I asked Esther, a member of the school board, why corporal punishment and bulalas are so important:

When they see you with a cane, they might not be doing some stupid things in the class. You know, while you are teaching these children do some funny things; dragging their feet, talking to somebody, making unnecessary noise. When they see you with a cane they think: "let me shut up my mouth, I don't want this cane to touch me, so I will do what the teacher say". So most of them you see them holding the cane to just scare the students. I am sure you don't do that in Denmark... (#36 Esther, interview, 2009)

As Esther explains, the habit of carrying around canes lingers because it helps construct a teacher capable of maintaining a position of authority towards the students. If the construction falters, a bigger and better cane is needed to help strengthen the position.
Laptops as disciplinary carrots

The focus on disciplined children make classroom management “the main thing” at Akila’s school (#33 chairman of the school board, interview, 2009). Intern teachers from the local teachers college are, for instance, audited in their classroom management skills by lectures showing up unannounced, and here the bulala is an important aid for the inexperienced (#181 intern, interview, 2011). As Danish volunteers workers visiting the school also experience, going without the cane can be quite challenging:

...many of the children see it [refusal to cane] as a sign of failure. It presents you with the additional challenge of creating respect around your person. And I wouldn't say that I succeeded entirely. It was very challenging and while I sometimes succeeded I also often left highly frustrated.

(#234 volunteer, interview, 2012)

Introduced into such a practice it is, perhaps, not surprising that the laptops become enacted towards a facilitator of classroom management and especially towards strengthening the authoritative position of teachers.

During a workshop, for instance, the teachers argued that the prospect of using the laptops as disciplinary carrots was an important good of the project (#73 observation, 2009). Laptops can motivate students to be more disciplined and this could be further stimulated by awarding good students extra time with laptops while excluding those making clamour:

Because the more you carry the XO into the class the students will be quiet and they will listen attentively to what you are going to command. From then on we can start using it in our policy that if a student misbehaves we will not give him the XO again.

(#52 teacher, interview, 2009)

Similarly, during both my visits I observed the laptops being used as a means of pressure getting parents to pay tuition on time. For instance, it was not uncommon for morning assembly to feature a request for tuition under the threat of computer sanctions:

I want you to know that those of you that did not pay school fees, next week you wont be allowed to participate in computer practice.

(#200 teacher, observation, 2011)
For reasons we will explore in the subsequent chapter, the laptops never gained a widespread existence within class. This, of course, limits the strength of the enactment. The bulala is still the disciplinary teacher prosthesis of choice. However, those students from the older classes who perform well, behave well and hold positions of trust (a group of boys, for instance, helps keep the laptops charged) are awarded extra time with the laptops. These students get to use the laptops between classes, after school and a few of them have even gone with teachers for additional computer training at the local university. For these older students, good behaviour is indeed awarded with privileged access to laptops.

**Laptops as development devices**

While the laptops in Nigeria aspire to become disciplinary prostheses, they take a quite different form when observed in Danish practice. Pictures, power points and human presenters travel around Denmark enacting the laptops as development devices, which can help replace rote learning and corporal punishment with more appreciative and open ended pedagogy:

> A little green laptop *is on its way to displace black boards and rote learning* in the Third World […] The project school management agree that computers will carry great changes to their pedagogy and teaching methods. The teachers are used to thinking of learning as a one way process from teacher to students, from the blackboard to the desks, and it is thus a *challenge* to them when alternative knowledge all of the sudden enters the classroom through the Internet.  

(#158 project website, 2010 – my translation, my emphasis)

OLPC too is part of the actor-network enacting such a laptop. At the pilot in Galadima, for instance, one teacher supposedly “threw the stick—used for corporal punishment in the classroom—out the window, as it was no longer needed to keep students engaged” (Bender et al., 2012, p. 1). As such, the laptops are no longer disciplinary carrots but close to the opposite: a challenge to authoritarian and colonial ways of teaching:

> Little green laptops are helping to *develop the teaching* in Nigeria where they are still using colonial ways of teaching. Computers with access to new knowledge and new methods of learning are helping to *revolutionise pedagogics* from one-way rote learning towards two-way learner centred teaching.
A central issue in the envisioned transition from one-way rote learning to two-way learner centred teaching is a group of corporal punishments based on awkward positions. These are in the same category as time-outs, being sent to the corner, one's room and so forth. But at Akila’s school, they have a strong bodily dimension where children are forced to stand in uncomfortable and awkward positions for the duration of their exclusion. There is the Sallen Kwado (frog jumps) where children are asked to jump back and forth like frogs, there is Tukan Machine (bike riding) where children stand in kneeled positions as if riding a bike, there is one where children kneel down while keeping their hands above the head and finally there is the infamous stoop down—especially resented by missionaries—where the child is made to stand on one feet while stooping down and balancing on his/her index finger (#161 teacher, email, 2010).

While canes are not that unfamiliar for Danes, the awkward positions are highly controversial. The missionary coordinator has had some “mighty discussions” with teachers and management and made it clear that these punishments are “irreconcilable with the pedagogical aim of the project and must be phased out” (#10 project coordinator, interview 2009; #74 observation, 2009). In spite of Danish damnation, however, awkward positions are still in daily practice and simply disagreeing on the matter is not viable for the laptop-as-developer enactment. The Danish enactment thus involves a special black school translation to keep the peace.
The black school ensures co-existence

While in Nigeria I met Andreas and Casper. They worked at a school for handicapped children and paid occasional visits to missionary projects like that at Akila's school. Upon their return to Denmark, they were employed to advertise and inform about these projects among missionary grassroots (local congregations, Bible groups, missionary societies, confirmation classes and so forth). These presentations served the dual purpose of creating awareness and ensuring support and funding.

One evening I had arranged to come with them to a Christian congregation in a small rural village. There were approximately eighty persons of all ages present and everyone had paid 50 kroner (~$10) for coffee, buns and cake, which was to be donated to missionary work in Nigeria. We sang some hymns, the pastor made a few announcements and then Andreas and Casper took to the stage and started a slideshow with pictures, videos and music from Nigeria. Some time into the presentation the subject turned on children and Nigerian schools. Andreas turned to a group of children and told them that “the first thing I noticed was that in Nigeria, the children stand up whenever a teacher enters the room” (#166 observation, 2010). The children laughed a little while Andreas turned to some elderly people in the back suggesting that “perhaps some of your grandparents remember how it was when they went to school” (ibid.). Then pictures of the awkward positions appeared and Andreas started
to account for the various ways in which physical punishment is a central part of Nigerian LCT.

There was a specific purpose to what Andreas was doing that evening. In order not to alienate the Nigerian LCT, he made explicit comparisons between Akila’s school in the present and Danish schools of the past. Casper and Andreas had thought long and hard on how to present the Nigerian pedagogy to their Danish audience:

Casper: We show them the picture with the children in that strange position and we also tell them that they use canes. We have stories that are much worse but that is not what we want. What we do instead is try to explain that 30-40 years ago it was like that too in Denmark.

Andreas: And if we are amongst elderly people it is actually very easy to make them understand as they themselves went to this type of school.

(#66 Casper & Andreas, interview, 2010 – my translation)

While the awkward positions make their audience react with disapproval, they are nonetheless relateable to something Danish, although that something is a thing of the past.

Back when the project was new, a Danish newspaper sent a journalist and photographer down to visit the school. Even though they were only there for a few hours, and even though teachers know that Danes disapprove, some boys had misbehaved and were awarded awkward positions right in front of their visitors. An excellent photo opp for the photographer, the controversial postures—which had until then only figured at presentations like those of Andreas and Casper's—made it into Danish press coverage. The article read:

The black school is alive and well in Nigeria where teachers establish respect with the cane [...] Nigerian schools have many similarities with what we in Denmark know as »the black school«. Knowledge is crammed into students and consists to a wide extend of rote learning and copying from the blackboard. (#160 newspaper article, 2009 – my emphasis, my translation)
The notion of a *black school* has nothing to do with the colour of Akila and his teachers. It is a term designating a certain period of Danish school history dominated by catechism, rote learning and the occasional beating of children. I interviewed the journalist about his black school angle:

> Even though we wrote an article about it I didn’t think we could criticise it too much. In reality we could have made a history titled “Danish project supports school violence”, but we did not do that because it would be unfair. The things they are collaborating on would fall apart if we wrote like that.  

(#67 journalist, interview, 2010 – my emphasis, my translation)

As the journalist notes, he could have written an article making Nigerian LCT a contemporary equal of Danish LCT, but that would make it difficult to morally justify a continued collaboration, as it would by implication make Danes support school violence. In a move similar to that of Andreas and Casper, the journalist thus dispersed the multiplicity of LCT into a temporal trajectory, where one LCT is simply *prior* to the other. It is no longer a Nigerian LCT and a Danish LCT, but rather a black school LCT of the past, which will eventually develop into something similar to the Danish LCT of the present. As such, the two LCTs are aligned into only *one* LCT developing over time.

In this case, when considered an empirical actor, the linear conceptualisa-
tion of development as historical progress is thus an important facilitator of the multiple LCTs. It translates frictional enactments in a way that makes their co-existence possible. And this, in turn, makes possible encounters between the two LCTs at Akila's school where Henrik and Jørgen, the two pedagogical researchers, carry out workshops with Nigerian teachers. The result of these, as we shall now see, has been a compromise open-open laptop enactment.

**LCT encounters**

Connections between the two LCTs thicken at Akila's school when workshops are carried out and Danish volunteer workers come to visit. These encounters are frictional although some mutual ground has been established.

The Nigerian teachers and parents do not consider their LCT a thing of the past in need of being developed. This temporality is not hegemonic across the network (q.v. Implications for time, space and other such scales, p. 70). Asking into the matter, I was generally responded along the lines of “kay[hey]!, you know, this is Africa!” indicating an acknowledged difference in how things are done at Akila's school and in Denmark (#178 vice principal, interview, 2011). Noticing my disapproval, one father who had just disciplined his child explained to me that Africans simply prefer to do things differently than Europeans:

> This is one of the differences between Africa and Europe. Do you not think it is right that a father is entitled to discipline his children very well? In Europe your children have no discipline and are becoming spoiled. Here we do it differently!  
> (#188 father, observation, 2011)

The father, and the teachers with him, know very well that the Danes consider their own way of handling children superior to physical discipline. However, they strongly disagree that over time, they will come to practice something like the Danish LCT.

> ...it is not for you to come over night and say those thing you are doing, you should stop. It is very very difficult. In our society a child […] already knows his place. When he come to the class it is expected of him to sit down and face his business.  
> (#59 teacher, interview, 2009)

Another example from an interview with a teacher who several students identi-
fied as their favourite even though they called him uncle “bring it on” because he “will hit the table saying bring it on, bring it on... and if he hit you, you will feel it!” (#174 girl in JSS1, interview, 2011):

Teacher: My own opinion is that as an African I believe in physical punishment!

Me: Are Africans different from other people? Why are you saying as an African?

Teacher: No, Africans are not different from other people, but you know one thing, Africans have their own norms and beliefs which we are brought up with. An African man, in his culture, he believes physical punishment is a way of handling a child. (#179 Uncle bring it on, interview, 2011)

The disciplinary LCT is enacted as African rather than undeveloped. And indeed it is, insofar as it is being enacted by teachers, parents, patriarchy, rattan canes, inherited British school systems and so forth.

**The open-open encounter**

The developmental device enacted in Denmark is thus “not coming down to nothing” as Jørgen warned at a meeting in Denmark (#115, observation, 2010). Henrik and Jørgen used the pedagogical workshops to place *wedges*—such as laptops and Star Models—to see if these could shift the enactment of Nigerian LCT towards something less authoritarian (ibid.).

However, they were also frustrated about not getting through and wedges being circumvented or misunderstood by teachers46 (#82 observation, 2009). Henrik and Jørgen thus devised a clear and outspoken exercise based on a four square matrix listing various LCTs from those which are open-open to those which are closed-closed:

<table>
<thead>
<tr>
<th>1. Open-Open</th>
<th>2. Closed-Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow students to experiment with different things – allow for multiple learning outcomes.</td>
<td>Give students a single task – allow for multiple learning outcomes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Open-Closed</th>
<th>4. Closed-Closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow students to experiment with different things – expect a single learning outcome.</td>
<td>Give students a single task – expect a single learning outcome.</td>
</tr>
</tbody>
</table>

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46 During the first workshop in 2009, a group of Danes including representatives from TDM, me, Jørgen and Henrik lived together at the same hotel. Evenings were spent debating the day while preparing the next (q.v. Tracing laptops – Writing laptops, p. 91).
Henrik defined to the teachers what is meant by open as in contrast to closed: “an open approach is when you allow the pupils to do many experiments and activities to reach the goal” whereas a closed approach is “when the learners have to do exactly what the teacher tells them to do” (#84 observation, 2009). For the exercise, the matrix had been drawn on the concrete floor with chalk and teachers were asked to physically position themselves in the field offering the best quality of learning. All teachers moved to either the open-open or open-closed fields.

Henrik and Jørgen then asked the teachers to reposition themselves according to how they currently teach. Here, again, everyone went to either open-open or open-closed. Jørgen then fetched some posters made earlier in the workshop and read them aloud:

You [the teacher] have a knowledge, and this you want to give to the students. They don't have it, they are not creating the knowledge, they are not giving you the knowledge. You have it and they should have it. That is closed answers; closed instructions and closed answers. Right? [Jørgen points to the poster and continues] we have not written those, it's your words. So nobody wants to go here [pointing at the closed-closed field]?

(#84 Jørgen, observation, 2009)

A nervous laughter ensued and some teachers made for the closed-closed field instead. Jørgen continued: “We have more, the learner's role is to concentrate on the teacher's instruction” (ibid.). A few more teachers moved to the closed-closed field. Henrik then took the word to make clear which type of LCT they were trying to promote:

What we are trying to show you here is that what we want to do as teachers is one thing and what we actually do sometimes is different [...] We would like to encourage you to use more of the open-open approach because this is where the learner centred teaching takes places the most. We know from many studies that students that are active, motivated and have a chance to be creative, they learn faster and better. So ideally a lot of the teaching should be here [pointing to the open-open cell].

(#84 Henrik, observation, 2009 – emphasis added)

The matrix translated all the different LCTs into a matrix on a concrete floor.
and the moving bodies of teachers made explicit the ongoing negotiation: that Danes want teachers to move from closed-closed to open-open (or at least open-closed / closed-open).

The open-open laptop

Many exercises were carried out during the two workshops but the open-open matrix came to designate most clearly what was at stake in doing LCT. At various occasions when teachers debated amongst themselves, open-open became a norm to argue either for or against. It became another dimension of the pedagogical debate alongside various insights from the Bible.47

Following the workshops an open-open LCT went into practice. It was no total transformation from closed-closed to open-open but manifested itself as slight resettlements of the disciplinary LCT. Most prominently, teachers seemed to be more appreciative towards wrong answers than before:

I try to be friendly with them, try to communicate with them, but holding the cane, at times, it makes them to compose. But flocking the child makes them to loose concentration. (#177 teacher, interview, 2011)

Some of the students are very afraid of asking questions. The issue is that some of the teachers, if you ask the students a question like what is a computer, the student will stand up, and if he gives a wrong answer the teacher will condemn you, and if care is not taken, some teachers will flock you. (#182 teacher, interview, 2011)

The above teachers are still holding on to their bulalas but avoid their use in order to be more friendly, to communicate and allow students to ask questions without fear of punishment.

After having observed a class where the teacher was unusually friendly with the students, encouraging each of them to see if s/he could remember definitions from the curriculum, applauding them even if they got it wrong, I asked the teacher about his approach: “ever since professor Henrik and Jørgen

47 When debating pedagogy, teachers and management also seek advice in their religion and the Bible. Especially in the Biblical passage Proverbs 23:13-15: “Withhold not correction from the child: for if though beatest him with the rod, he shall not die. Thou shalt beat him with the rod, and shalt deliver his soul from hell” (#194 book on child discipline, 2011). “You have to punish them a little bit” one teacher accordingly told me, “Like they say, when you spare the rod you spoil the child. I think it would be wise to punish him. But me I don't like using it too much” (#178 teacher, interview, 2011).
came and did the workshop, and we had that big discussion about open or closed teaching, I have used the open approach towards the students” (ibid.). Another teacher was even more radical in his open-open approach. In a class on office equipment he had the students make up their own definitions (#98 observation, 2009). The students greatly enjoyed this although when class was over, and the teacher made signs to leave, they cried “Uncle, Uncle! What are the correct definitions, please write them for us uncle” (ibid.). He then wrote the textbook definitions on the blackboard whereafter the students spend their entire break copying them down.

John was properly the teacher experimenting most with using laptops for open-open teaching. He had students research subjects of their own choice on Wikipedia, prepare presentations and share with their classmates what they had learned. I observed a couple of these classes. They were based on self-guided, exploratory learning but the outcome was rather unreflective readings of Wikipedia text:

The students read out loud the article text from the XO (including lines such as “This article redirects here”). If they do well John encourages them and gives them credit. He tells them “good work” and “well done”. If they don't do well or can't answer any questions related to their topic, he sends them back to their seat without further comment. (#105 observation, 2009)

Inexperienced in this type of learning, the students simply read everything aloud, even meta text such as “This article redirects here”.

A travelogue of 100 laptops
The laptop enacted by the open-open LCT is thus not the children's machine known from the Media Lab and neither is it the developmental device enacted in Denmark. It is a machine for reading aloud Wikipedia text, making hand drawings of pictures from the internet, practising how to write with keyboards and other such lessons I observed (#102, #105, #209). One teacher, for instance, used the laptops mainly because of their keyboards. Teaching primary 1 students English (a non native language), she had the children copy down text from the blackboard and onto their laptops:

She asks students to copy down “Accidents are those bad things that happen to us when we do not expect them” […] The children make many, many spaces between words. Some have discovered the use of backspace and return while others are highly insecure. One boy does not write more than “ac-cip9” which the boy next to him copies. (209 observation, 2011)

The newly started students did not understand the language, they were intimidated by the situation and while the laptop is interesting and motivating, almost none of them finished or understood the sentence.

While not the rich learning environment advertised by OLPC, the open-open laptop is that which was achieved in the actor-network of Nigerian teachers, nationally enforced curricula, pedagogical workshops, open-open debates,
Digital divides and IT-literacy

As we remember, OLPC is not only about education (q.v. Being digital and social inclusion, p. 39). It is also about bridging the digital divide in order to allow a new generation to “emerge from the digital landscape” (Negroponte, 1996, p. 230). Accordingly, documents and evaluations from the project make frequent mentions of an IT enabled future: “An OLPC initiative would leapfrog those children privileged enough to be part of the project” says one report while another adds that children must become “effective participants in our information and technologically driven society” and that the project gives “students hope for a brighter future” (#138 Danish secondment report 2007; #46 Nigerian evaluation, 2010).

Such statements run from an archive of convergence, leapfrogs and digital divides (q.v. Digital divides: the debate resurrected, p. 17 & Molar lines from the archive, p. 207). And while they are somewhat fluffy, hopes and theories of the future carry plenty of empirical agency (q.v. Research agenda: OLPC as theory and practice, p. 22). Back in 2009, for instance, Esther told me that she was motivated by the project being an:

...opportunity for every child in this church, in this state, Nigeria to become computer literate. Because if you train them young, when they grow up they
will not have so many problems. The world is becoming just like a small village through the Internet [...] I think there is hope for us. Maybe to be able to part with this poverty because if you are literate you can be employed for work. (#36 Esther, interview, 2009 – emphasis added)

A similar motivation helps justify the money spent on laptops while many other problems are left unremedied. Laptops signify future inclusion in a way that blackboards, for instance, can not:

In this school we lack classes, there is not enough classes and there is not enough chairs. In fact the classroom we are using here is not meant for learning. But all these problems are because of economic matter. But what we are doing is future planning. So the future planing is to use the laptops!

(#60 teacher, interview, 2009 – emphasis added)

On a more mundane level, however, the digital divide revolves around a notion of IT-literacy which qualify teachers and students for attractive jobs with the government or large private companies.

**IT-literacy attracting students**

Remember that the school translated a computer lab into an OLPC project? (q.v. The chronology is false: enter Nigerian trajectories, p. 116). They were out looking for desktop computers to make their students IT-literate so as to give them better job opportunities. Just like traditional literacy, the gold standard of occupational worth is expected to become increasingly that of IT-literacy: “if you are not computer literate, it is like you are illiterate” the chairman of the school board told me (#33 interview, 2009).

When it became known that Akila’s school had succeeded in acquiring laptops there was a large increase in student enrolments. Parents withdrew their children from other schools and enrolled them at the project school instead. In fact, Akila was one of those transferred. In a group interview, I asked him and some of his new classmates what had caused them to change school:

Chioma: Because we need to know something about computers.

Prince: We need to know computers so that we can be computer literate.

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49 While Nigeria is a poor and developing country, I was confirmed on this when visiting the local university and the state government (#95 jotting, 2009 & #37 interview, 2009). Both private companies and state organisations are rapidly digitalising which is reflected in job postings.
Godwin: Because I live close by and my mummy say that this computer is good for me.

Akila: I like school because I am supposed to be someone in the future. And it is good for a child to be in school. All these people are hungry and waiting for food. Imagine all of them, they have nobody to help them! [...] And this school is very important because they brought laptops for us to learn. If you are 20-25 you can go to an office.

(#62 primary 5 students, group interview, 2009)

As envisioned by Akila, having attended a computer enabled school held the prospect of working in offices later in life. The chairman of the school board gave a similar answer to that of Akila:

Nigerians are poor people, most of us are economically poor. So anything that will liberate you, will set you free from that poverty, you grab it with both hands. The parents can see that when the children acquire computer knowledge, that means that child is already liberated from poverty, because the child with computer knowledge can go into the world of work and gain employment with a bank, and banks pay heavily. So that is what the parents see in computers.  (#33 chairman of the school board, interview, 2009)

In accordance with the added value of having computers, the school decided to double their tuition from ₦12000 to ₦24000 a year (~$75 to $150) for primary education, which greatly improved their finances but also meant the withdrawal of the poorest students (q.v. Lines of marginalisation, p. 213).

The TNC Bishop, however, feared that once his staff had gone through computer training “some of these banks may snatch the teachers, pay them a lot of money” (#38 interview, 2009). Together with the school board he thus devised the mentioned legal contract bonding teachers to the school for a minimum of five years (q.v. Teacher's fidelity, p. 119). The chairman of the board, who himself has two daughters working in banks, similarly motivated the bond with fear of teachers seeking employment elsewhere if becoming IT-literate:

...the danger was that if we had left it open, they will receive the training from the professors from Denmark, become computer experts, desert the service of the school and go into the banks and earn a salary properly 10 times of what the school can ever afford to pay them. Because none of them make more than 25,000 and the banks pay 250,000 per month at least.
A trained teacher with a NCE (National Certificate in Education) earns ₦16,200 (~$105) a month (₦20,500 if they have a university degree). Comparing that to the $1,625 they might earn in banks, it is obvious why management fear an IT-literate brain drain. However IT-literacy also helps attract and sustain teachers at the school. Here one example:

Me: So why did you agree with it [the bond]? Was it because you really wanted a job or because of the computers?

Teacher: The reason why I agreed for signing the bond is that I need computer skills, I want to be a computer literate [...] in that place you will get double benefit: you will serve your God and also become a leader of tomorrow.

(Certificated IT-literate)

Being IT-literate works the best if you have something to show for it. And what you usually have to show for it is a certificate stating that you have attended this or that course on computers and IT. These are offered at a wide range of institutions and to my experience the most affordable ones are priced somewhere between ₦10,000 and ₦50,000 (~$65 to $330), which is to be seen in relation to the ₦16,200 monthly salary of teachers. Certificates are thus an important but expensive part of being IT-literate.

Following the pedagogical workshops it was thus appropriate that teachers should be awarded certificates. Sanctioned by Henrik and Jørgen, the certificates carry weight since they are signed by European professors. As a teacher enthusiastically told me: “If we collect our certificate from Denmark, we know that we are going to be hot bread” (#52 teacher, interview, 2009). However, in line with the ambition to bond teachers, the Bishop decided to keep the certificates in his office from where they were only released when he was replaced in 2010. When that happened I received this happy email:

I am so happy to hear that the certificates are with him, you know this is an international certificate and it is highly recommended, if at all I will get the opportunity to have another certificate from Denmark, I will be very happy.

(#146 teacher, email, 2010)

Later on, the school helped finance further training for teachers and a select
few students at the local university. This was one of the more expensive courses with 32 sessions over an 8 week period and those teachers holding both certificates are now well equipped to define themselves IT-literate:

I did not allow it to jump because I knew it was a good certificate on my CV. It carries weight. So all these things. When I am familiar with the knowledge of the XO I can open any system and tell children or adults this is the importance of this ting. (#180 teacher, interview, 2011)

The XO is a ThinkPad
The XO is a small laptop running children's software and designed with a similar aesthetics to that of Fisher Price. It does not resemble the normal desktop computers the school was originally out to acquire and neither does it run Microsoft Windows, Office or other such programs. This is a problem because IT-literacy mostly translates into mainstream computers, Microsoft Office and Windows, emails and internet. A local computer science professor, for instance, told me that IT-literacy in the eyes of employers “is primarily to be skilled in using Microsoft Office, and to be comfortable with the internet services” (#95 CS professor, interview, 2009). Similarly, when TNC announced internal job openings in their administration, they emphasised that “it is especially important for applicants to be skilled in Word and Powerpoint” (#96 job announcement, observation, 2009).

Unfortunately, the award-winning design of the XO does not help convince people that it is a business type laptop, and there was some initial disappointment, that what arrived from Taiwan were children's toys rather than proper computers:

...some of them call it a toy. Whenever they call it a toy, its not a laptop, I will say just come and I will start showing them some activities, and some of them become happy. (#16 teacher, interview, 2009)

When I first saw the laptop I was saying what am I doing with this toy, what am I going to do with this toy? (#36 teacher, interview, 2009)

Their disappointment, however, was replaced with enthusiasm as they discovered that the XO, in spite of its toy-like design, could do many of the same things as traditional computers. Esly, for instance, had long wanted to use the internet to expose himself to the world, and he planned on acquiring the neces-
ecessary skills on the XO and then afterwards go into cyber cafes and do more complex operations:

> With the help of this XO I can go into the big laptops and work [...] I have even created a Picasa Album and placed 3-4 of my pictures there and I wrote my name as esly_. You will see first of all my greeting card, and second I put a picture of me and my friend, and then another picture that I snapped. And also now I have registered with Facebook and maybe on Monday or Tuesday I am going to use a big laptop to get more pictures on Facebook.

(#52 Esly, interview, 2009)

And yet another teacher admitted that he used to have dreams in the night of how to “manipulate the mouse; how to move it around and how to interact with the the computer” (#106 observation, 2009).

Even though the XO is not the type of computer that banks use, it is still possible to enact it as a normal laptop because it has a browser, a word processor and is operated through keyboard and touchpad. In the practice of attaining IT-literacy, the laptops are used more as if they were from Lenovo than OLPC. You see adult community members being trained on XOs alongside Dells and Toshibas, you see teachers carry their laptops around with pride and children are being transferred in order to become IT-literate. While the design is for children and the software constructionist, the XOs are nonetheless, and quite importantly, still able to perform as laptops.

> You see even though the XO computers are different from the ones banks use. The operations are the same, once you master the skills, you can transfer your knowledge [...] We are living in a changing world, even your laptop, properly by next year a new one will come out, and you have to throw away this one, and get a new one, things are changing but the principles remain the same.

(#11 chairman of the school board, interview, 2009)
Laptops are doing God's work

Akila's laptop is not only about better education or bridging digital divides. It is also concerned with Christianity and the missionary commission of that religion (q.v. Laptops become an affair for missionaries, p. 111). The Nigerian church running Akila's school, TNG, was founded a little more than 100 years ago by the Danish missionary society TDM to help spread Christianity south of Sahara. As such, TDM and TNC have a long tradition of collaborating on healthcare, education, diakonia and all other things which translates into the overall missionary effort:

As a Christian you have the missionary commission where Jesus says go into the world and make all people my disciples, to which many have been much opposed. Why should you go and convert a Muslim or Hindu, bash them with the Bible and perhaps destroy their culture? But if you look at TNC, it has grown from 400,000 members in the 1970s to 1.6 million today, and as a Christian that is of the good, we are supposed to preach, that is why we have this house [TDM headquarters].

(#230 TDM board member, interview, 2012 – my translation)

While Danish missionaries still go to Nigeria, they have largely been surpassed by Nigerians in doing the missionary ground work, so to speak, amongst
Muslims and traditional believers.  

Religion helps sustain the project. In Denmark, for instance, a good number of congregations are supporting the project with funding and volunteer workers. Amongst other, they organise charity bicycle races, lectures by former missionaries and maintain recycle stores to ensure sufficient funding. Talking at an event at a Christian boarding school, the TDM youth coordinator argued that since everyone is entitled to a decent life near God we are obliged to do something about the inequalities of the digital age:

“If the whole world is a village of 100 inhabitants” he tells the audience, “then only three would be on the internet”! “We in this room have the world's highest educational level and that oblige us to make an effort to ensure that everyone can live a decent life and a life near God”

(#114 observation, Christian youth school, 2009)

Also in Nigeria, helping to do an OLPC project translates into serving one's God. This is important for teachers who are all devoted TNC members:

Many of my friends discouraged me that I was going to be bonded for five years, but I said yes my God has told me to serve him.

(#57 teacher, interview, 2009)

I just decided to make a sacrifice for the church. But I never had any interest of working as a teacher. [...] It is all about commitment, giving ourself for work. For me it is just doing Christian work...  

(#61 teacher, interview, 2009)

Even if they will bond me for ten years I will bond because I know that God has something planned for me.  

(#64 teacher, interview, 2009)

**Enacting a Bible of strategic importance**

At the school, a favourite activity is Sword Read. Sword Read is a small program enabling the user to browse biblical texts. You type in the passage you want to read, e.g. John 1:1, and then it displays the English version of that chapter and verse. Being close to biblical texts is important. At each Sunday service, a section of the Bible is read aloud and interpreted while the congregation keeps pace in each their own Bible. Sometimes there are even competi-

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50 My room-mate while living in Nigeria in 2011, for instance, was part of a group of Christian youths who went into remote villages to mission their faith and construct churches – often in competition with other Christian denominations or Muslim missionaries from the north.
tions over who is able to recite most correctly random parts of the Bible. Consequently, laptops have come to serve as electronic Bibles.

During breaks and in-between classes teachers are studying the scripture and the little laptop has even appeared in Church during Sunday service. While the laptop is an extra Bible for teachers—all of them own a paper one—most students are dependent on borrowing one from parents or older siblings. While this might not be a problem at home or at Sunday service, it is an obstacle in school where they have weekly Christian Religious Knowledge (CRK) lessons which, to a large extent, take the form of Bible studies. Accordingly, the CRK teachers have been “using the laptop as a Bible to give to the students” (#181 CRK teacher, interview, 2011; #177 CRK teacher, interview, 2011).

The laptop is supported by missionary grassroots in Denmark, it has literally been blessed in church in Nigeria, been the subject of Sunday sermons in both countries and is used by students in CRK to study the Bible. Translated into the demographic situation in Nigeria—which is divided between a Christian south, a Muslim north and some 250 ethnicities—the laptops also becomes part of the complex and sometimes frictional relationship between ethno-religious groupings. One day, for instance, a Muslim trader sought me out where I lived and queried me for the possibility of his niece attending Akila's school now it had computers. I presented the request to the TNC Bishop who declined:

| They want to get into our schools, the Muslims, because they know that they get good education for their children. They want their children to be in our schools – even at [another school]. All over Nigeria they want their children to be in our schools, but we say no we cannot. |

(#38 TNC Bishop, interview, 2009)

The Bishop wanted to retain a competitive advantage over Muslims. He believed it the work of Muslim civil servants that TNC had lost all their primary schools to a grand nationalisation scheme in 1973. As formally declared by TNC: “The church considered the decision as a calculated plan to stop the fast

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51 In spite of the rhetoric, an official agenda for the TNC-TDM collaboration is improving Christian-Muslim relations – especially in the face of current events associated with the Boko Haram movement.
spreading of Christianity in Nigeria through its programs” (#X TNC website, 2013). Today, the nationalised school is walled out of the compound, Akila's school has been built to replace it, and while the two are separated by a wall it is not unusual to see groups of Muslim children peaking in at their Christian peers using laptops, until shooed away by teachers.

**Children's machines once in a while**

As we explore in the next two chapters, Akila and his friends don't really have much free time with the laptops. Their parents transferred them for IT-literacy and they go through Wikipedia lessons. But outside these, children and laptops are mostly kept apart. However, at the occasions when children actually do get time with laptops, they enact them as proper children's machines for playing around with.

The above in mind it should not be surprising that children like to use Sword Read to study the Bible. However, on the more creative side, a group of primary boys also video record themselves preaching with proper evangelical rhetoric. The boys call out to their imaginary audience:

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I say HAAALLELUJAH, yes Lord, talking about the rivers of Babylon, Hallelujah! The holy spirit walks with me, Hallelujah! When I say Jesus comes to my life, if you know you have a sickness, come and collect your miracle, you'll be healed today, Hallelujah...
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(#X video recording, primary student, 2010)

They also record local songs complete with table drumming and dancing. Other students have recorded cover versions of popular music – for instance the all prevailing Nigerian hit song Chop my money\(^{52}\) by P-Square (#206 observation, 2011). Similarly, primary students are fond of drawing houses, cars, animals and so forth in the Draw activity.

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\(^{52}\) Chop is pidgin for eating, consuming, appropriating or, in more extreme, cases to steal something in a scam. In this case, chop my money refers to a wealthy man not minding his woman consuming his money.
Laptops are also vehicles of youth culture. Many of the older students are on Facebook, have Gmals and if given the opportunity, they will use the Browse Activity to look up Premier League Footballers or Hollywood celebrities on the internet (#117 observation, 2010; #162 evaluation, 2010; #207 observation, 2011). John and one of the Danish volunteers even managed to establish online friendship classes between Akila’s school and a school in Denmark. The students exchanged emails and became Facebook friends. However, this initiative veined because the internet started to fail (q.v. Betrayal of missing masses, p. 186).

Another dominant children’s practice with laptops is to play games. If the students are new to the machines, they are mostly fond of the Maze and Implose activities (#198 observation, 2011). In the former, you must find your way through an increasingly complex maze and the latter is basically a variant of Tetris. The more experienced students search out Scratch for playable projects like BeeStory and PacMan (#206 observation, 2011). Scratch is a graphical programming environments and given some stimulation, there is certainly some potential for these game happy students to start building their own games rather than simply opening and running what others have created.

While not heavily experienced with using the laptops, students nonetheless

know very well what to expect from them and that they are meant for their usage. During my first stay in 2009, for instance, I queried a group of primary students what they would do with the laptops if given the opportunity to use them without instructions:

| Me: But what about you, what would you like to do with the computers? |
| Boy: Uncle uncle, browse! |
| Me: If I were to give you computers right now what would you do? |
| [Many children raising and waving their hands to be allowed to speak] |
| Girl: I would write an email. |
| Boy: I would take photos and play games. |
| Boy: And draw and send pictures to my friends. |
| Boy: Play games! |
| Girl: Record activity. And write a letter to my friend. |
| Boy: I want to watch DVDs and chat with my friend. |
| Me: How often would you like to use the computers? |
| All: [Shouting and laughing] Everyday! |
| Me: For how many hours? |
| All: 24 hours. (54 primary 5 students, class session, 2009) |

So the children are excited. They want to surf the internet, write emails, play games, draw, take pictures, watch DVDs and many other such playful activities. However, as investigated shortly, they do not get many opportunities to do so. This frustrates them: “Everyday they cry for XO” a teacher entrusted me (#182 teacher, email, 2011).

**Discussion: heterogeneous ontology**

Like atherosclerosis is held together as one in spite of being differently enacted across various hospital departments, so too is the laptop as disciplinary prosthesis the same laptop as the one being a pedagogical developer. And these are the same as the children's machine, Bible and ThinkPad. They are all Akila's laptop.

The variations are equally real. They are not just perspectives but socio-
material enactments, or multi-naturalisms. The laptop simply is, in the full ontological sense, multiple and dispersed. It is composed, performed and achieved by the described actor-networks of OLPC, pedagogy, Danes, Nigerians, Christianity, IT-literacy and digital divides as well as the missing masses of solar panels and satellites (q.v. The missing masses of laptops, p. 123).

Patterns of absence-presences alongside black school translations mediate some of these enactments (Law, 2002; Law & Singleton, 2005). The $100 laptop in Tunis can easily settle with its hand crank for electricity, but the one at Akila's school must struggle with an elaborate and expensive solar-installation (q.v. Substituting for a hand crank, p. 124). Similarly, the laptop enacted in Denmark is transforming the pedagogy, while the one in Nigeria must settle with slight resettlements. And since things would fall apart if the disciplinary device came too close to the development device, a temporal translation ensures the peace by pushing the former back in time. At least in this case, the development discourse is quite productive (q.v. Critique of the development apparatus, p. 200). Meanwhile, wedges such as the open-open confrontation have made way for an open-open laptop enacted by students researching Wikipedia and teachers being more open and appreciative.

Prinsloo and Wolton (2008) describe how the common expectation that IT will enhance and improve learning for children in poor and deprived areas is often contrasted with what can be observed in practice. For instance, they describe how South African children researching the internet on how to handle illegal and exposed electrical installations in their neighbourhood, produced only verbatim copies of texts from American websites on coal mining (Prinsloo & Walton, 2008, p. 110). Similarly, the students at John's Wikipedia classes read aloud everything from their articles, even meta-information such as “this article redirects here” (#100, #105 observations, 2009). Getting laptops to work in the sense of ensuring power, maintenance and internet is difficult but getting them to work for education the way envisioned by OLPC seems even more difficulty – both at Akila's school and in general (Bender et al., 2012, p. 102).

This is the point of making multiplicity and heterogeneity ontological rather
than contextual: that not only laptops but also pedagogy truly exist-in-reality in many variants which makes it difficult for one to simply take over the other. And if it does, this would be far from neutral (Marques, 2012). When children enact laptops as rote learning devices, reading everything Wikipedia says, they are not alone in doing so. This enactment is a shared achievement between the national curriculum, teachers, parents, patriarchy, colonial inheritance and the vast amount of static information made available by computers and internet.

This does not mean that the laptops described are the only ones achievable. By definition, performative ontologies are those which could have been otherwise. However, pointing at ontology is also to emphasise that making things different is quite a lot harder than simply changing perspective. If laptops owe their existence to dispersed and heterogeneous actor-networks, it takes dispersed and heterogeneous actor-networks to make them different. There is no position of control from where people and things can be forced to align. There is only the problematisations, translations and displacements occurring upon specific encounters (q.v. Discussion: ANT and development encounters, p. 78).

This is one implication for technology in development if we give up the conception of a singular, ordered world through which singular, ordered entities travel. That if we assume instead that both laptops and their context are achievements of dispersed tangles of actor-networks we gain the crucial advantage that things could always be different, that order is an outcome, not an outset, although we just as importantly loose any strong, universal foundation for making them so.
Falling Into Limbo
Towards a notion for impasse

In spite of all movements, translations and enactments described, the laptops have not retained a strong and stable existence. The project, and as such also the laptop-as-actor, is caught in a kind of impasse. In this chapter I suggest limbo as an analytical concept to describe this impasse. Limbo is an ontological instability of not only what the laptops are but also of what they may hope to become. After a short description of the project impasse, the chapter begins with a positioning of limbo within the ANT genesis alongside such other modes of existence as black boxes, bush fires and fluids. Limbo is here suggested as a special mode of existence associated as much with exodus as with being and becoming. The ANT limbo is then associated with three other limbos to help substantiate the concept: Catholic limbo of the innocent, limbo the slave dance and limbo as liminal period. These help specify that the cause of limbo is elsewhere, that limbo can be a recurring affair and that it may be escaped through metamorphosis and Deleuzian lines of flight. The cause of limbo for Akila’s laptop is then traced in the translations running through the project, which also point at possible lines of flight from the situation. The argument being that while the laptops were not doomed from the outset, they nonetheless ended up in limbo, a situation from which a few lines of flights offer themselves, although there is no guarantee that these can fix the situation for Akila, so to speak.

Back in 2009, parents were transferring their children to Akila’s school, teachers were hired and trained, Danish missionaries came up with money and support, electricity was provided, hardware acquired, OLPC support ensured and

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54 This chapter is based on a paper presented at the DASTS conference in 2012 (see Andersen, 2012a) and an evaluation written after my second visit to Nigeria in 2011.
internet connection established. In short, a collective was positioned to sustain the laptop-enactments described above. Enthusiasm was widespread. The missionaries in Denmark were planning to expand the project to many other schools and the school management was counting on the laptops to greatly benefit their community.

I see the school becoming very popular and people scrambling to get their children in, and I see the teachers exited and wanting to continue because they have this unique opportunity. And I see the church insisting on the success of the program. And at the end of the next five years, we will see a completely different crop of children in the community.

(#38 TNC Bishop, interview, 2009)

Things were going well and a five year roadmap for the continued development of the project was agreed upon (it still hangs at the school).

![Picture of the 1-3-5 year vision-mission roadmap for the project.]

At the principal's wall, alongside pictures of the Danish Crown Prince and Princess, is the 1-3-5 year vision-mission roadmap for the project.

With the project well under way, the Danes (myself included) went back home and sustained our own enactments. I wrote papers and did presentations, and so did the pedagogical researchers, seminars were held and the missionaries made the project a profile initiative – writing enthusiastically on their website:

The school is dying to give their children a future-proof education. The school has accepted that it will carry great changes in the current pedagogics and teaching methods [...] With the 100 dollar laptop the students are in-
cluded in classes as active players, that explores, are curious [...] The Mission also needs your help! Send your help, 300, 500, 1000 kroner (the price for one laptop) – or what you can spare...

(#144 project description, TDM website, 2010 – my translation)

But since then things have changed and, for the most part, frustration and doubt has replaced ambition and enthusiasm.

When I returned to Akila’s school in 2011, I was confronted with laptops rarely used, teachers either frustrated or indifferent, absent management, annoyed parents and children missing out. While a similar situation was already brewing in Denmark (volunteer workers had, for instance, criticised the project upon their return) I helped to further establish a project in crisis by writing a disheartening evaluation to my Danish peers (q.v. Tracing laptops – Writing laptops, p. 91). This conversation, which I had with a teacher in 2011, presents the situation fairly well:

Me: So now this XO project, what do you think is going to happen to it? The next couple of years, how is it all going to end?
Teacher: Honestly, if there is no change, if no any action is being taken, the XO is not going to be continued, honestly.
Me: Who should take that action?
Teacher: The school head and the chairman of the board.
Me: Do you think they are going to do it?
Teacher: I cannot say, but you know Lars Bo, I would have liked you to have a time with [the chairman of the board]. He will listen to you, truly, you can have a time with him, discuss with him, and tell him that for the period of three months that I have stayed here, this is what I have seen.

(#182 teacher, interview, 2011)

As stated by the teacher, if there is no change, the laptop will perish. But there is also hope of re-vitalisation. If I could have a talk with the chairman of the board, a powerful figure in the community, some of the problems might be overcome, the teacher argued. But for now, the situation is one of a stalemate where the laptop, which has been well under way, is now caught halfway in genesis. A state in which it will either linger, perish or re-emerge as something else.

Falling Into Limbo 169
The ANT Genesis

Within the ANT genesis, entities such as laptops gain reality when attracting composites and lose reality when shedding them (e.g. Latour, 1999b, p. 257). And if the setup is right, if enough actors translate (into) the actor-network, a stable construction will emerge. It is these constructions that are the facts, objects and phenomena of our world. At times the actor-network falls apart—as when the fishermen in St Brieuc Bay betrayed the larvae experiment—while, at others, lasting entities like the diesel engine emerges (Callon, 1986a; Latour, 1987, pp. 104–107).

The ANT genesis goes from disassociation at one end, through processes of translation and enrolment, towards existential stabilisation at the other. One highly influential notion to describe what awaits at the far end of this genesis is the black box (q.v. Genesis is translation, p. 73). A black box is a collective so tightly knitted together that it appears as an essence-in-itself, a singularity rather than a collective. The black box has been used to describe the collectives which disappeared into scientific facts—such as the double helix shape of DNA and the TRF(H) peptide—as well as technological objects like the VEL electric vehicle in France\(^{55}\) (Callon, 1986b; Latour, 1987, pp. 1–62; Latour & Woolgar, 1986, pp. 105–150).

Although taking into account that entities have to be maintained in existence—that even if a driver considers his car a black box, the mechanic does not—the notion of black box has not been deemed precise enough to describe the multiple modes of existence mediated by translations and collectives. Mol and de Laet (2000), for instance, have suggested fluid to describe objects with vague, moving, and undefinable modes of existence. They describe the Zimbabwe Bush Pump (ZBP) as a number of different things all at once: it is, of course, a piece of mechanics in Africa, it has a lever and may pump water for villagers to drink, but at the same time it is also a specific hydraulic system, a sanitation device, a community builder, a national standard and a nation builder (ibid. 237).

\(^{55}\) Although science and technology are the traditional areas for ANT analysis, notions such as the black box have transgressed into a multitude of other areas such as gender studies, arts, politics, health, and many others (see e.g. Law, 2000).
Law and Singleton (2005) have made a similar contribution in their description of alcoholic liver disease as having a *bush fire existence*. Alcoholic liver disease is a *messy* object, it “jumps, creatively, destructively, and more or less unpredictably” from the home to the hospital, from the abuse centre to the general practitioner (ibid., p. 347). While in the hospital there is abstinence and treatment, in the home there is spending time with children and moderate drinking, but there is no drinking in the hospital and no abstinence at home. This makes alcoholic liver disease a messy object, difficult to study as well as to manage because it is organised around patterns of absence-presences – much in the same way as Akila’s laptop (q.v. The object of study and its field, p. 85 & Discussion: heterogeneous ontology, p. 163).

It is to this expansion of modes of existences that I suggest limbo. As described in the previous chapter, the laptops indeed share many characteristics with both black boxes, bush pumps and liver disease. But their impasse is also a distinctive form of existence itself. Before introducing the characteristics of being in limbo let us first consider a case in point which has already been well described: Latour’s (1993a, 1996a) Aramis.

**Aramis spent 17 years in limbo**

Aramis was a personal rapid transit (RPT) system meant to innovate public transport towards small personal vehicles transporting people point to point. In what Latour (1996a, p. 100) calls the nominal Aramis you would enter a vehicle somewhere close to home, type in your destination and then be transported directly without detours or intermediate stops. While in commute, the personal vehicles would form trains with others heading the same way before branching for each their individual destination. This fusion between personal and public transport was to be achieved through non-material couplings allowing each vehicle to attach or detach from the train on the fly (Latour, 1996a, pp. 18 & 100).

For 17 years Aramis was in the making, so to speak, before finally getting cancelled in 1987. According to Latour, what killed off Aramis was not technological inability and neither was it a badly conceived idea to begin with. Rather, the bane of Aramis was twofold: first the actors involved could not
agree what Aramis should do or become, and, secondly, in all 17 years of existence, nominal Aramis did not undergo any substantial change (Latour, 1993a, 1996a, p. 292). There was a long list of potential Aramis’—one for the Mayor of Paris, one for left wing politicians, one for engineers, one for the Matra company, and so on—but none of them were able to translate into nominal Aramis, which remained the same until finally perishing, alone and frustrated:

I’m quite willing to satisfy any one of them; I’d like to satisfy them all. But they'll have to come to agreement about me. How can I become a being, an object, a thing—finally a self, yes, a full set, saturated with being—without them […] How can I interest them all in me when they all love me differently? I can give them all only what they have given me. I can hold them assembled together only if they keep me assembled. (Latour, 1996a, p. 201)

With Aramis, there was no inherent sin to cause damnation. It was no more ill-conceived or doomed from the outset than dinosaurs or the diesel engine (Latour, 1996a, p. 35). The bane of Aramis was that it did not translate beyond its nominal self.

The story of Aramis presents a symmetrical way of explaining why some projects fail where others succeed. It is not that one idea is technologically feasible from the outset while the other is infeasible. Rather, all technologies come into being through metamorphosis and inter-actor translation: “The only way to increase a project's reality is to compromise, to accept socio-technological compromises” (Latour, 1996a, p. 99). With Aramis, the engineers tried to keep it pure, true to the original idea and ended up with nothing.

What is meant by compromise is, of course, made complicated by different beings having different modes of existence. Whereas compromise for Aramis means transforming the nominal it could also be a modest inventor managing his own dissolution as with the ZBP (de Laet & Mol, 2000, p. 249). But in all cases, the collective must somehow be able to find ways of translating each other before stable existence is achievable.

What I want to highlight in this chapter is the possibility of a collective failing to do so for a prolonged period of time. Aramis itself was complaining that “they want me to stay in limbo forever” (Latour, 1996a, p. 294). As such, limbo was Aramis' mode of existence before it got cancelled.
Introducing Limbo

There is a place for limbo in the ANT genesis. Limbo for Aramis was not only an inability of actors to translate each other, it was also the prolonged suspense and eventual failure of a technology which had committed no sin, which kept hoping for redemption through transformation and which had to pass through several negotiations before finally falling out of existence. Let us consider in more detail these traits of limbo before returning to Akila and the OLPC laptops.

Limbo of the innocent

In Catholic mythology, limbo (from Latin *limbus*: edge, border) is a place on the outskirts of hell for those not entirely condemned but not entirely fit for heaven either. In the *Divine Comedy*, to take one prominent example, we follow Dante and his companion Virgil into limbo – the first out of nine circles of hell (the other eight are lust, gluttony, greed, anger, heresy, violence, fraud and treachery). In these circles sinners are made to suffer their sins. In the second circle, for instance, the lustful are blown around by an endless whirlwind representing aimless, restless desire (Alighieri, 1306, p. 268). There is thus a direct relationship between cause and effect – being lustful in life gets you blown around in death.

But in the first circle, limbo, things are different. Those here suspended are not sinners. The circle is more like a waiting room, not entirely unpleasant. Dante finds in limbo not only the ancient Greek philosophers, but also political leaders such as Julius Caesar and Saladin. They are “Virtuous Pagans and the Un-baptized” who for a multitude of different reasons did not, or could not, accept Jesus the first time around and must await his Second Coming for a chance to do so (Alighieri, 1306, p. 16).

...they had not baptism Which is the portal of the Faith thou holdest; And if they were before Christianity, In the right manner they adored not God; [...] Great grief seized on my heart when this I heard, Because some people of much worthiness I knew, who in that Limbo were suspended.

(Alighieri, 1306, p. 16)

Limbo filled Dante with great grief, that people of much worthiness should be
suspended like this, having done no wrong. Perhaps the infant died before it could be baptised, perhaps it was Chinese and since Platon lived before Jesus, he could not have accepted him even if he wanted.

Those in limbo share the consequence, the impasse, not the cause, that hides elsewhere, somewhere in the collective. Accordingly, one cannot say of Aramis or Akila's laptop that they were destined to fail, that they committed a common sin deserving them a common punishment. Suspense must be considered a specific and distributed achievement.

**Limbo as recurring passage**

A similar limbo is depicted by the Caribbean dance of limbo, where dancers circulate under a wooden stick which is continuously lowered. Perhaps most commonly known as a party game or carnival showpiece, limbo (from English *limber*: pliant, flexible) carries deep historic meaning and importance. The dance is closely bound to the violent transformations of the Middle Passage – the second leg of the triangular slave trade between Europe, Africa, and the New World (Fabre, 1999). Dancing under the stick symbolises slaves being forced into contorted postures in the narrow confines of overloaded ships headed for the New World. The stick is not only the slavers whip but also the crowded hull, the prison and the violence endured during the passage. When the stick is cleared, the dance becomes celebratory until the next passage.

Edward Kamau Brathwaite (2002) elaborates on the stages of limbo in his poem of the same name. First, there is violent subjection of man into slave, the distorted descend below the stick, down into the slave ship hull.

<table>
<thead>
<tr>
<th>limbo, limbo like me</th>
</tr>
</thead>
<tbody>
<tr>
<td>long dark deck and the water surrounding me</td>
</tr>
<tr>
<td>long dark deck and the silence is over me</td>
</tr>
<tr>
<td>limbo, limbo like me</td>
</tr>
<tr>
<td>stick is the whip</td>
</tr>
<tr>
<td>and the dark deck is slavery</td>
</tr>
</tbody>
</table>

(Brathwaite, 2002)

And so is the passage: full of darkness, fear and suffering. But having defeated the stick, survived the passage, there is relief as daylight replaces darkness.
limbo, limbo like me
sun coming up
and the drummers are praising me
out of the dark
and the dumb gods are raising me
up, up, up
and the music is saving me
hot, slow, step
on the burning ground. (Brathwaite, 2002)

The sadist practice of dancing the slave is translated into a ritual of defiance, rebirth and a view of new horizons: “up, up, up, and the music is saving me” (Brathwaite, 2002). Rebirth, however, is not easy. Having survived the passage, “dump gods” are “raising” the slaves which will be walking “hot, slow, step[s]” on the “burning ground” (ibid.). The dance is circular, new forms of limbo await in the colonies of the New World and again in post-independence poverty. A trait we return to shortly, lines of flight from limbo lead to other territories, but not necessarily better ones with less violence.

On board slave ships, “dancing the slave” started as a European way of subordination (Fabre, 1999). The crew would gather on deck with whips and cats o’ nine tails, beating and mucking their prisoners while making them dance. This “healthy exercise” could then be used by slavers to advertise good business conduct while, at the same time, oppress and ridicule their captives (ibid., p. 42). However, in spite of this, dancing also came to symbolise defiance and, eventually, re-birth or re-emergence as something more than just slave or exile African, but a kind of New World hybrid:

Haunted by memories of Africa, beset by the slave trade whose laws and economic proscriptions violate their inner beings, the dancers perform an epic drama that announces the emergence of the New World Negro […] a craving for meaning enables them to deal with their dilemma symbolically; the "limbo imagination," as Wilson Harris calls it, "points to new horizons"

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What is meant by “dumb” is ambiguous; it could be a critique of an indifferent Christian God allowing, or even justifying such injustice, or a reference to African Gods considered pagan by Europeans but a source of strength to slaves.
Transformation is inevitable for those who survive the passage. They cannot remain Igbo, Yoruba or Ashanti, they become something else: plantation slave, rebel, independent people, Caribbean Man, Afro-American.

While limbo is suffering and oppression, it is also defiance. It carries a “limbo imagination” pointing at new horizons (Fabre, 1999, p. 42). Passing the stick, doing the limbo, is a continuous process of becoming that is both violent, defiant, oppressive and victorious all at the same time. While those in Catholic limbo awaits one-time redemption, the Caribbean dance reminds us that limbo can also be a recurring passage, one which may present itself once and again while lines of flight are taken and metamorphosis undergone.

**Limbo is liminal**

As emphasised by the Caribbean dance, limbo can also be characterised as a liminal period (from Latin *limen*: margin, threshold, cross-piece). Victor Turner (1967, p. 98) describes the liminal as an interstructural situation – a position somewhere in-between normality and exclusion. Anthropologists such as Turner, and before him Arnold van Gennep, have used the notion to describe initiation rituals, the so called *rites de passage*, such as coming of age rituals in puberty or wakes upon death.

Like those forced through the Middle Passage, liminal subjects are pushed to the margin of existence. For instance, in kinship societies, those in liminal transformation are treated as neither male nor female, they don't own anything, they have no status and are referred to through notions of death and rebirth:

> They are at once no longer classified and not yet classified, the symbols that represent them are, in many societies, drawn from the biology of death, decomposition, catabolism, and other physical processes that have a negative tinge, such as menstruation...

(Turner, 1967, p. 96)

Those suspended in a liminal passage have physical but not social reality, they have been pressed to the margin and are only allowed back upon transformation: the boy must return a warrior, the dead must become spirits and man and woman must emerge in the morning as a couple.
How limbo riddles the ANT genesis with exodus and lines of flight

These are the traits of limbo: impasse, innocence, causality from elsewhere, recurrence, metamorphosis, suspense at the margin and lines of flight. These traits not only help describe Akila’s laptop, but also tie into a critique of the ANT genesis, which proceeds rather unidirectional from disassociation in one end towards stabilisation and black boxes in the other (q.v. New and critical insights of ANT, p. 77).

Steve Brown and Nick Lee (1994, p. 785) have criticised ANT for providing a “monstrous genesis without offering an exodus”. ANT colonize the situation, they argue, when it only concerns itself with those lines (translations) leading back and forth from micropolitics to stabilised order without seeing that the tangle is, at the same, time riddled with lines of contradiction, of exodus and otherness (ibid., pp. 779-785). Their critique is based on Gilles Deleuze and Felix Guattari (2008, p. 216), who pointed out that in rhizomatic assemblages, such as actor-networks, there is “always something that flows or flees, that escapes”:

Every rhizome contains lines of segmentarity according to which it is stratified, territorialized, organized, signified, attributed, etc. as well as lines of de-territorialization down which it constantly flees. There is a rupture in the rhizome whenever segmentary lines explode into a line of flight, but the line of flight is part of the rhizome. These lines always tie back to one another. (Deleuze & Guattari, 2008, p. 9)

These lines of flight tie into the other lines—those going from disassociation to black boxes—although we may have to look between obligatory passage points and black boxes to see them. Susan Leigh Star’s (1991, p. 45) transsexual is an example, s/he lives at the margin, in the “high tension zone” between the stabilised order of Male<>Female, but s/he also represents a line of flight from that order (Lee & Brown, 1994, p. 786).

Ivan da Costa Marques (2012) has suggested lines of flight as a central figure in what he calls ontological politics – the politics which arise at the focal point between different versions of reality. Marques (2012, p. 575) argues that lines of flight are central guards against colonizing realities because they escape and potentially undermine dominant “frames of reference”. He gives the
example of a poor favela woman spending price money on a television (entertainment) rather than a refrigerator (health and nutrition), which is irrational in the frame of reference of those outside the favela:

A (colonized) poor woman who lives in a favela (shanty town) in Rio de Janeiro, wins a prize of about R$3,000.00 and a TV station goes to her hut to interview her. The (colonizer) journalist asks:

What are you going to do with the prize money?

The woman replies:

I’m going to buy a television set.

The camera takes a 360° shot of the whole hut. The journalist asks:

But you don’t have a refrigerator!

The woman retorts:

I don’t need a fridge to preserve the kind of food I eat.

Her reply de-territorializes implicit (and moral) pre-agreements or frames of rationality related, in this case, to consumption needs seen from the immediate perspective of more educated people (in which a fridge ‘should’ come ‘before’ a television set).

(Marques, 2012, p. 573)

The favela woman takes a line of flight from the reporter’s rationality, and the interview ventures into another territory, where televisions are before refrigerators.

Brown and Lee (1994) want to sensitise ANT to this play of lines. That some lines inhabit well-determined and well-planned order—“I am a man, you are a woman; you are a telegraphist, I am a grocer; you count words, I weigh things; our segments fit together”—while others are supple, rhizomatic and involved in micropolitics—“It is hard to tell who is who anymore, or what anything means”—and yet other cross through the whole tangle in creative ways leading to new territories—“I may be running, but I’m looking for a gun as I go” (Deleuze & Guattari, 2008, pp. 195–204).

We already know that the gun is a line of flight for the inferior assailant—

if he pulls one we are in an entirely new territory—but it is fair to criticise

57 See Latour’s (1994, p. 30) gun example in Genesis is translation, p. 73.
ANT for having been predisposed towards supple lines of micropolitics leading to stabilised and predictable black boxes which, in the words of Deleuze and Guattari “have a future but no becoming” (ibid., p. 195). Limbo is a point in this direction, that when things fall apart, loose their immediate future, this does not exhaust the potential for becoming. On the contrary, it is possible that such crisis widens the leeway for lines of flight to materialise.

However, lines of flight do not operate like Marxist dialectics, they do not lead to superior places with less friction. This we know from Caribbean limbo. They always tie into the other lines, the black boxes and the micropolitics, and proceed from one territory to another, from tangle to tangle. They are leakages, not revolutions:

> Lines of flight, for their part, never consist in running away from the world but rather in causing runoffs, as when you drill a hole in a pipe; there is no social system that does not leak from all directions.

(Deleuze & Guattari, 2008, p. 204)

There are, however, not always lines of flight to be taken (ibid., p. 202). And even if there are, there is no necessity forcing a situation down their path. And neither do we possess an external, or innocent, position from which they can be evaluated or enumerated (Berg, 1998; Haraway, 1988). A potential danger with post-ANT and ontological politics is exactly this idea that one can freely choose between different versions of reality (Gad & Jensen, 2009, p. 71). Limbo offers neither such clarity nor such power.

**Returning to laptops**

With limbo in place let us recap the situation: The laptops at Akila’s school rarely leave their charging stations and when they do it is almost exclusively for lessons called computer practice (we return to these) where John, the computer science teacher, teaches IT-literacy (#184 interview, 2011; #198-9 observations, 2011). Besides from computer practice lessons—which are often cancelled due to technical problems or John being elsewhere—the laptops have great difficulty finding any use and purpose for themselves. To my knowledge, the situation has neither improved nor worsened during 2012 and 2013.

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58 The body of knowledge known as post-ANT have accommodated much of this critique (q.v. Cui bono?, p. 75).
There is a divide between what the collective tried to make the laptops become and what they actually ended up becoming. The question is what caused this divide. Asking one of the teachers, he told me that since Danes had not kept a close enough eye on the project, it had stalled in the hands of him and his colleagues:

Because you [Danish] people, when you were around, you saw that it was going and thought you [Nigerian] people can sustain it. And then you went back home, and when you went back home, you started thinking OK I am contend, and you send emails with “how are things”, “things are just fine” and you sat back. You were contended that these people on their own can sustain it, but obviously that is not it, it is not being sustained because there is no continuity. (#180 teacher, interview, 2011)

The teacher was blaming the Danes for not being more present and he was blaming the often used Nigerian factor (footnote 44, p. 129): Danes must “always be here to check” he argued because “one thing we understand here is that when we are being pressed to do things, that is when you see things happening” (#180 teacher, interview, 2011). As we have seen, blaming the cultural context for badly functioning laptops is quite customary (q.v. An alternative to contextual multiplicity, p. 132).

Another customary causality is directed at the laptops themselves, or at least the determinism with which they are deployed (q.v. Criticism of technological determinism, p. 20). This causality is often suggested to me when presenting at conferences and other places academic: that the early construction of the laptop was false, or, at least, based on utopian ideas of technology, blind repetition of digital divide discourse, deterministic understandings and doomed from the outset.

However, as indicated above, the causality I want to suggest with limbo is different. Here the causality is elsewhere, among the translations between hopeful parents, solar panels, missionaries, learner centred pedagogy, IT-literacy, children, teachers, digital divides and so forth. When traversing these we find not only traces of what brought about limbo but also potential lines of flight.
Laptops are no good in classrooms

A first trajectory leading to limbo is that the laptops meant to improve education does not fit comfortably within classrooms. Not long after my arrival at the school in 2011, the principal sought me out and asked me to come up with a list of strategies for incorporating the laptops into non-computer classes such as fine art or home economics (#190 observation, 2011). The problem was that those teaching non-technical subjects had experienced that the laptops stole away their subject matter. Teachers had tried using laptops to improve spelling proficiency, teach students how to make laundry detergent and draw in perspective, but the laptops made students distracted and required a lot of extra work: “They forced themselves to use them, but it hurt the subject” the principal explained (#201 observation, 2011).

The principal was searching for good ideas and best practices in various papers he could find on the subject. Amongst others, he was reading the Australian researcher Paul Newhouse as well as Osei Agyeman's (2007) World Bank survey of ICT in the Nigerian school system. He had, however, not succeeded in answering the question which bothered him the most: “how can you use computers to teach practical skills that are not computer skills?” (#190 the principal, observation, 2011).

Back in 2009, teachers had hoped that laptops would increase efficiency and make children more compliant (q.v. Laptops as disciplinary carrots, p. 140). The principal, for instance, was timing classes to prove that laptops make students learn faster and better (#112 observation, 2009). But since then their experience had changed. When giving laptops some children will start playing games and become distracted while others sit idle awaiting step-by-step instructions “like little robots” as one observer noted (#67 journalist, interview, 2010). And before the teacher could instruct those sitting idle and control those distracted, the class would be over and the prepared lesson left unaccomplished. This has made most of the teachers consider the laptops as too time-consuming (q.v. The open-open laptop, p. 149):

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59 While I am unaware of the principal’s exact readings, you can see a list of Newhouse's publications here: http://www.ecu.edu.au/schools/education/staff/profiles/associate-professors/associate-professor-paul-newhouse
...most of the teachers are seeing the use of the XO is time consuming. Those that I have talked with, it is taking a lot of time to use, a single lesson is not sufficient. One hour cannot be enough for this, you have to start the computer, and before you know it, the time is gone. So that is one of the things making them not to use it. And secondly there is the challenge that not all of them have the idea of how to use the XO as a teaching tool.

(#184 teacher, interview, 2011)

Of course, constructionist pedagogy would point out that students need more confidence learning to learn and that the drive of those already confident offers the best possible foundation for educational empowerment (q.v. Educational empowerment, p. 46). Problems do not originate with laptops nor children, but rather from a classroom situation mixing unruly (bored) students with shy and subdued ones as well as a teacher supposed to be in control of everything.

But on ground in Nigeria, where teachers are expected to be in control, the established pedagogy being to “make steps that people follow” and where a national curricula enforces detailed learning outcomes for each class, the laptops had difficulty finding a place for themselves (#175 principal, interview, 2011). Although they did become open-open laptops for a period, the additional labour required to transform the classroom situation in a way beneficial for laptops proved too much – especially with increasingly unmotivated teachers (a point we return to shortly).

Accordingly, teachers came to consider learning with computers “as part of computer science and not their subject” (#201 chairman of the school board, observation, 2011). After all, a principal enactment of the laptops is that of ThinkPads to provide IT-literacy, which can still be maintained even if laptops are not used English or home economics (q.v. OLPC is a computer lab of 40 desktop computers, p. 118 & Digital divides and IT-literacy, p. 152).

Most of the teachers have an eye on me that I should be the one to teach the primary school computer, that I should be the one to teach nursery computer, and that I should be the one to teach JSS computer.

(#184 CS teacher, interview, 2011)
Teacher trouble

The workshops conducted at the beginning of the project aimed at exactly the above problem: how to transform the classroom situation so as to cater for laptops (q.v. The open-open encounter, p. 147). But the teachers who attended these are leaving the school. Since the project started, 7 out of 16 trained teachers have quit their jobs, most of them for positions at public schools—which are worse for students but better for teachers as the salary is higher and includes pension. A consultant working with pedagogical development in the area called the inconsistency in staff “the greatest challenge” for doing a lasting difference in the private school system (#X educational consultant, TDM website, 2012). A good number of the remaining teachers likewise tell me that they themselves are looking for positions elsewhere.

Me: How about you, if you get offered a new job?
Teacher: Then I will go because in government job there is better pay, benefits, pension, there is security [...] But this one is private. It is only salary we are depending on. After you leave there is nothing for you to go with. If the board or the missionaries will do something for the staff, then some of the staff will not even think about going anywhere. Then we will stay here, and it will also be about God's work. How much are they paying us with NCE, just ₦16,000, it is not much. (#181 teacher, interview, 2011)

As described, the TNC Bishop made all teachers sign a five year contract bonding them to Akila's school (q.v. Teacher's fidelity, p. 119). But for reasons of internal church conflict, of which I know only little, he had problems enforcing it and when a new bishop was elected he abolished it altogether. In consequence, the moralising contract and the call to do God's work was abolished by the new Bishop leaving teachers free to go (q.v. Teacher's fidelity, p. 119).

New teachers dare not use laptops

The problem for Akila and his laptop is that the new teachers hired to replace the old ones have not been trained in the open-open pedagogy and neither do

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60 Public schools are infamous for very large classes (numbers approaching 100 is not uncommon) and unmotivated teachers. “They don't care about what they are impacting upon the children” as one teacher described it (#177 teacher, interview, 2011).
61 As of writing, a certified teacher is officially entitled to ₦18,000 ($112) and most public schools pay around ₦20,000 but Akila's private school is only able to pay ₦16,200NGN. However, the public system is haunted by delayed or absent payments.
they know how to operate a computer. They are not IT-literate and are awaiting training and instructions before allowing their students time with the machines (#179 new teacher, interview, 2011). While John and a few of the other teachers actually did arrange for some training a range of technical problems, as we shall see, got in the way.

When I came the Internet facility was not on. And after some time they will start the Internet and then they will give the new teachers some training. So that is what we have been waiting for […] But what I want for now, I want to know more about how I can use the computer for my field, math.

(#179 new teacher, interview, 2011)

As this teacher told me, he did not want to jump right into using laptops. In fact, he had never used a computer before and had no idea how to use it for teaching math, although he would like to explore it if given some guidance.

However, among the teachers, new and old, there is little comfort in asking for help and guidance and many are reluctant to expose their lack of experience to students and colleagues:

You know we Africans, sometimes we have this habit that what you don't know, you don't want to ask to get to know it. You don't want to expose yourself that you don't know […] They don't want to ask, they don't want nobody to teach you. To humble yourself and ask them to teach them what you don't know.

(#182 teacher, interview, 2011)

For example, one intern who was eager to impress her supervisor by using the laptops, but had no experience with actual computers, conducted a full computer class where the students were forbidden to even touch the laptops in front of them (#207 observation, 2011). While she was brave enough to give it a try, the conditions were that she could conduct an abstract and theoretical lesson on the booting process without allowing students to engage in any other practical activity than to turn the laptops on and off again.

**Staff-room limbo**

While new teachers have not been trained the old ones have lost motivation for their job. Rather than teaching classes, a good portion of them remain in the staff-room and ignore the students pleading them to come and teach. They are stuck in the same kind of staffroom-limbo that they accuse their colleagues in
the public system of (q.v. footnote 60, p. 183). While the school has a principal and a management, which one could expect to command teachers to do their job, these are limited by the structure of the Church organisation.

All teachers are members of TNC. This has enabled them to translate Akila’s laptop into serving their God and Church (q.v. Laptops are doing God's work, p. 158). But their religious affiliation has since become somewhat of a problem. Like with the public system, there is a certain attitude that each tribe (or social group) within TNC is entitled to each their piece of the cake (#X teacher, interview, 2011). And in this puzzle, the quality of work rendered in return is not a major issue. As a result, the principal cannot fire or otherwise exercise authority over lazy teachers without getting into trouble with his church:

This school is not owned by individuals. It is a group or congregation. So that is why nobody can put an eye on anybody because the school does not belong to you like it does not belong to me. So that is why the principal himself will be very scared to do something against any teachers, because then in the congregation, there is a problem for him. (#X teacher, interview, 2011)

This does not mean, however, that there is total acceptance of teachers not teaching their classes. As we shall see, parents have started to withdraw their children and one day I stumbled in on an intense discussion amongst teachers in the staffroom:

...a heated discussion is going on between Joy [old teacher] and Dauda [new teacher]. They are mostly speaking Hausa, but mixed with fractions of English. At one point Dauda says “I just feel like the project is facing out” to which Joy gives a long and annoyed Hausa response with a lot of references to bature [Hausa for white man] while looking at me. After things calmed down I asked her what that was all about, to which she replies with a crooked smile, dogo bature, comut for road!  (#208 observation, 2011)

Dogo bature is me, and comut for road means it is not for me to know, don't go there, step aside. Joy holds a minor position in the school management and often criticises her superiors and colleagues for neglecting their job. Curious of what had happened I failed to respect Joy's petition and later asked Daudo to relay their argument:
She said: Why are we thinking about us learning to use the XO when most of us, she used that term, are not even committed to teaching. You will not always find a teacher going into class to teach the subject [...] we are pressurising each other: go to class when you are supposed to. So I think that was the reason why we were arguing and she was telling you to stay off. She was trying to make me understand that I shouldn't so much insist that we should focus so much on how to use the XO, I should focus more on that we the staff are here and being paid for doing a job, so lets do our job.

(#180 Daudo, interview, 2011)

In other words, Joy told Daudo to forget about the laptops because the real issue was to get teachers to do their job in general. There seems to be no surplus energy to get laptops to work for education with insufficient training of newcomers and unmotivated teachers in staffroom limbo.

Betrayal of missing masses

Further frustrating teachers and crippling laptops are problems with keeping the missing masses in line (q.v. The missing masses of laptops, p. 123). Since November 2011, the school has been without solar power since two of the eight batteries died and crippled the whole system. New batteries are expensive but locally available and money was pledged from TDM in Denmark. However, due to the staff problems mentioned and disagreements within TNC, it was not until June 2012 that somebody acted on the problem and new batteries were ordered with money donated by the local congregation in Nigeria (#238 technician, email, 2012). However, since accidents rarely come alone, the roof carrying the solar panels has since collapsed and left the school without stable electricity once again. A strong metal tower is now being built to sustain them instead (#241 coordinator, email, 2013).
It is not only the electrical setup which induces limbo. Problems with routing internet is an even greater agency leading to impasse. The school cancelled their subscription around Christmas 2010 following problems with their server⁶² (#203 observation, 2011; #244 email, 2010). It took several months before the server could be made to work again and during this time the school gave up paying the costly $366.66/month internet subscription.

...we are still finding very difficult to control the situation, the university consultant tried all possible networking on the Server, but it is still giving Error, our concern much is our pupils and the staffs, it has reached almost three weeks now since all of them last browse the internet or use the XO for any Assignment with the internet... (#243 teacher, email, 2010)

In late 2011, the school again resumed subscription but now other problems kept internet from reaching Akila's laptop.

First off the switch⁶³ died from heat and dust and took with it the school's local network. As a short term solution, a single access-point was connected

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⁶² The specific problem at the school was that the ISP had changed the IP of their DNS, so a new had to be specified, but the server kept defaulting back to the old one each time it was re-booted (which is often when solar panels are no longer available and one must rely on the highly unreliable national power grid). In the end, however, a linux competent person from the nearby university managed to solve the problem.

⁶³ A switch interconnects networks and routes traffic between them, it connects the laptops with the school server and internet.
directly to the server although this caused connectivity problems and bad reception in most classrooms. And while the connection has been upgraded to a shared 200/64 kbps, time-outs became more and more prevalent. In one fine arts class, for instance, the teacher wanted students to do a Google image search on “airport art” and then open one specific image, but it was only about half the students which were able to do so within the 40 minute lesson duration. The other half either could not connect through the single access-point or kept timing out due to lack of bandwidth (#246 observation, 2011). While these problems may seem simple, additional bandwidth is very expensive and there is no trained system administrator at the school, only a few self-taught teachers who must struggle with Linux servers and network configuration.

You know, the problem with all this is that machines don't talk, they just sit silent, so unless you have an experienced mind, there is no way for you to know.  
(#245 teacher, observation, 2011)

All of these problems again made the school give up on their subscription and, as of writing, it has not been resumed. As we turn to now, lack of internet undermines the potential of bridging the digital divide and it makes laptops appear empty to teachers and school management.

**Technology or pedagogy? Laptops are empty without internet**

Many of the classes I observed, like the one described above on airport art, are dependent on internet. Likewise, since the XO software is designed for children, teachers are more interested in their use when internet is working and they can access Facebook and so forth (#207 observation, 2011):

So without subscription we can't use the XO for nothing. It is only for playing with. You can't browse or nothing...  
(#177 teacher, interview, 2011)

Both teachers and management tie the technical installations so closely to pedagogical purpose, that if the former is failing the latter is no longer worth pursuing. Again, the school was not out looking for pedagogical development, they were out looking for someone to help sponsor 40 desktop computers for IT-literacy training (q.v. The chronology is false: enter Nigerian trajectories, p. 116).

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64 Several customers share the same bandwidth, so the actual speed of your connection depends on what the other clients are doing.

A travelogue of 100 laptops
At a 2011 meeting between TDM and TNC, I observed the principal and chairman promise that *as soon* as money could be raised for internet and *as soon* as the infrastructure would be up and running, then the project would resume momentum. The Danish TDM coordinator, on his part, insisted that the open-open pedagogy can easily be worked upon even if the technical installations are down. He told them that:

> When we have had similar projects with schools or healthcare, what usually happens is that while the technology breaks down the training and the knowledge remains behind. What I am seeing here is the opposite […] we are thinking different here. To me this is not about the XO, it is about this life changing education […] We are seeing this differently. The technology on one side and the teaching on the other.  

(#201 observation, Nigeria, 2011)

If the school is willing to continue working on their pedagogy and sustain the open-open enactment, then TDM can help solve the technical problems. Then the laptops can become development devices once again (q.v. *Laptops as development devices*. p. 141).

Some days after the meeting, however, the principal told me that “you cannot talk about commitment on a system that is not working. And you cannot talk about method on a system that is not alive”:

I know that there are some activities that can be used like calculator, memory, wikipedia, etc. But the whole of the basis of ICT is based on internet [...] Take for instance I that are teaching art, I want for instance a picture of Egypt art, of Pharaoh art, how he has decorated his palace. You know these *empty computers*, I can’t use them for achieving my objective.

(#175 principal, observation, 2011 – emphasis added)

The principal referred to unconnected computers as empty. And indeed they are in relation to his own teaching practice of googling pictures and having students draw paper copies in Fine Arts. As for most of the remaining teachers, they too gave up on their teaching as well as personal use when the school went offline, they simply “dropped the thing” as formulated by the vice-principal (#178 interview, 2011).

**Students are disappearing**

In 2009 and 2010, the project carried with it many new student enrolments...
In spite of increased tuition, the hope of bridging the digital divide and the promise of IT-literacy attracted so many new students that classes grew beyond the physical capacity of the school:

> You see our JSS1 now it is already filled up and we are looking for a class to separate them. And it is because of the XO. You know before it took some time to get our salaries and we had sometimes to go to the church and plea for offerings before they could pay us.  

(#61 teacher, interview, 2009)

The student increase carried with it a much more solid financial foundation and teachers could now be paid on time, which had not always been the case. The popularity and increased tuition also shifted the student demography towards the more wealthy (relatively speaking). Basically, the laptops forced out the poorest children (q.v. Lines of marginalisation, p. 213).

With the present limbo, however, parental support has started to dilute and the student body is down to its former size. Those who can afford better schools are leaving because of the limbo. During my visit in 2011 many of the classes were half empty. Primary 6 had gone from about 30 students to only 6 and the two JSS1 classes had been merged to a single class of 10 students. The principal attributed the missing student enrolments to the technical problems.

> So what I am saying is that there are some parents that will even remove their children because of this issue of the internet, because they are saying, that their money are supposed to go to internet and now they are not getting it.  

(#175 principal, interview, 2011)

With no internet it is hard for the school to justify their high tuition. As we remember, the cost of subscription is more than the salary of three teachers (q.v. Bridging the digital divide by enrolling satellites, p. 127).

Amongst parents, however, the dissatisfaction is also with the non-use of laptops and the general poor quality of teaching, especially the classroom limbo is a problem:

> The teachers who are supposed to teach the students especially do not know

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65 I had problems locating more than a few parents. The school has no parental representation (like a PTA) and I was not good enough tracing down parents on my own. The little I know comes from questionnaires I send home with students as part of their homework and from those few parents living in the same neighbourhood as me.
anything about the computer system such as the newcomers. The teacher is always absent from the class, he is always in the staff room chatting with his colleagues instead of teaching in the class. (#209 parent, questionnaire, 2011)

With dissatisfied parents withdrawing their children, the school again started to have problems paying salaries and debates ensued in the staffroom: “The problem is not only that parents are late paying school fees, it is more that they have stopped sending their children altogether” one teacher argued (#190 observation, 2011). “No one knows the timetable, the students have to come here and get their teacher […] those sitting around outside knows very well who of us is working and who is not” another continued. (ibid.).

**Missionaries can no longer translate the project**

The limbo also extends to Denmark. The Danish missionaries are not happy with how the project is going. To them it is not so much the technical problems as it is the lack of pedagogical development, it erodes at the enactment of laptops as development devices. TDM representatives have at several occasions stated to the school management that they are still interested in collaborating on the project, investing money, helping with the infrastructure and conducting more workshops but there has to be some pedagogical commitment (#201 observation, 2011; #227 email, 2012).

However, the missionaries are not optimistic, they are doubting that they can do much to revitalise the pedagogical work. As one of them wrote following my 2011 evaluation:

> As expected, Lars’ report from the OLPC project in Nigeria was quite a thriller to read, and there was no happy ending […] I do not know, maybe I am wrong, but I find it difficult to suggest a way out.

(#217 missionary, email, 2012)

It does not mean that the project group or TDM are going to withdraw from the project, at least no such decision has officially been made. But they have stopped advertising it on their website and in various publications, and have debated heavily how to revitalise the project (#230 project coordinator, observation, 2012).
The black school is no longer enough

Besides from TDM, a network of congregations are also supporting Akila's school with funding and volunteer workers. Volunteers go to Nigeria, help out for some months and then return to tour Christian communities to ensure continued support. We have previously seen how this practice is dependent upon a translation of Nigerian LCT into a developmental trajectory leading from a historical black school to the present (q.v. The black school ensures co-existence, p. 143).

The translation is still in practice. When learning about the punishments of the Nigerian LCT people still become “wildly astonished” one volunteer told me, “but when we argue that we ourselves were hitting a few years back, they go ‘ah, yes, so we did’” (#234 Volunteer, interview, 2012). However, while volunteers can still translate the general collaboration between Danish missionaries and Nigerian schools into a development trajectory it is becoming difficult for them to include Akila's laptop in the plot:

Volunteer: We had been told how it [the laptop project] was supposed to be, but I must say what we observed was in contrast to this.

Me: But what then when you had to tell about it?

Volunteer: Then we were in conflict with ourselves. What we could tell were more general things, also because our congregation are supporting the project.

Me: So you didn’t feel you could go home and undermine it?

Volunteer: No, but we had to home and tell them how it was going. That it wasn’t all that well [...] it is only the fewest who have been down to see the project, so we felt obliged to tell what was actually going on.

(#232 volunteer, interview, 2012 – my translation)

Like I helped perform a project in limbo through my evaluation, so too are volunteers writing evaluations of their own, which supplement their presentations in extending the limbo to missionary congregations – some of which have now chosen to support other projects instead.

We wrote some evaluations. Like the place where we come from, they subsequently arranged a meeting with TDM to confront them with the criticism. But we wrote some long evaluations on the subject...
A cybercafé on the horizon

Leading into limbo are thus a difficult fit between laptops and Nigerian classrooms, unmotivated teachers, failing electricity and problematic internet, disappearing students, empty laptops for Nigerians and non-pedagogical ones for Danes. Leading out of limbo, on the other hand, are computer practice sessions and a cybercafé.

In 2008, Akila's school received a large donation from a local philanthropist to construct a new building double the size of their old one and with better equipment. Construction has been slow but in 2012 the building was more or less complete.

The building has a science laboratory complete with equipment and a somewhat stable power supply from a large diesel generator connected to the neighbouring church. Accordingly, the computer science teacher has moved a portion of the laptops to the laboratory, where he conducts special computer practice classes (#242 CS teacher, email, 2013).

The computer practice classes are lines of flight for the laptops since they remove them from the normal classroom situation. These classes are exempt from any curriculum and have been especially designed for the children to use...
the laptops. Sometimes they are structured around specific tasks such as the creation of business cards and sometimes students are free to do what they want. It is in these classes that laptops rise to become children’s machines after all (q.v. Children’s machines once in a while, p. 161). But this is also a territory void of any pedagogical transformation.

There is also another line of flight afforded by the new building. That the computer practice sessions may permanently come to occupy their own room, extend into the afternoon and transform into a fully fledged cybercafé. As we remember, great value is attributed to IT-literacy and while children have been pushed to the side, teachers are still pursuing this label, collecting certificates and taking additional courses (q.v. Digital divides and IT-literacy, p. 152).

Not long after internet had been established in 2009, adults started going to the school to surf the net and receive training on computer use. This development continued well into 2010 when Kristian returned from a visit to the school and told me that it had almost become too much, the adults were taking up all the bandwidth:

...so internet was working and it had almost evolved into a cybercafé with all kinds of people showing up [...] but they drain the bandwidth and that's a problem they have to deal with, that they are sharing the connection with people who are not contributing to expenses in any fair way.

(#149 Kristian, interview, 2010 – my translation)

I don’t know who came up with the idea, but shortly after my return in 2011, the principal told me that they were planning to establish a commercial cybercafé to help pay expenses (#187 observation, 2011): “people are sneaking into our school for browsing, using our internet, from our own observation, if we commercialize this thing it is going to help us” a teacher elaborated (#182 teacher, interview, 2011).
Since then management has had a consultant draw up a ₦1,000,000 (~$6200 USD) proposal to equip one of the new classrooms with desktop computers and network equipment. The cybercafé should not only capitalise on internet but also offer certified IT-literacy training:

Principal: So when we start we can organize, if the freedom is given to me, we should run a course with competent people from outside, competent in software application, and then we can negotiate with them what the students will pay and how much they will gain. People will come to do their IT-literacy classes.

Me: So you want to do courses with certificates.

Principal: Yes with certificates for adults and youths.

(#175 principal, interview, 2011)

As we remember, due to TNC politics the principal has limited authority over teachers, he “does not have any right to impose anything on any teacher” (#X teacher, interview, 2011). The principal thus argued that rather than teachers, it should be people from the outside who should do the training of both adults and youths because these he can control.

The missionaries from TDM also like the idea of a cybercafé if it could be made a refuge for children. Simply removing laptops from classrooms and placing them instead in afternoon activities would circumvent all the problems
with unmotivated teachers and the difficulties of getting machines to work for formalised education. However, the Danes fear that removing laptops will also kill the pedagogical development they are trying to induce (q.v. Laptops as development devices, p. 141 & participant observation, 2012). A related problem is that many students, especially girls, are busy doing chores in the afternoon and would not be able to attend such a café.

So the computer practice sessions represent one line of flight already materialised and there is a potential cybercafé on the horizon. They leak from the ambition to empower children with laptops and while the cybercafé is targeted at improving economy and providing IT-literacy, it may also bring Akila back together with his laptop. Of course, these lines are translational. There is no guarantee that Akila's will benefit from his laptop even if given plenty of time with it. As John Law (2002, p. 138) writes, the “conditions of possibility are lumpy and different, multiple in character”. But it does illustrate that the 100 laptops still have some potential for becoming.

Discussion: towards a notion for impasse

I argue for limbo to expand the ANT genesis with a mode of existence full of despair, frustration and unravelling translations. But also with defiance, metamorphosis and lines of flight. A genesis riddled with exodus if you will. It is wrong to say that the laptops are over and done with. At least, it is not very precise. They have been strong, they are still doing some work around the theme of IT-literacy and they still attract some support in spite of all the problems:

 Me: But I know some parents are complaining that the school is not using the computers enough.

 New teacher: But the computers still help because we Nigerians don't have access to it like that. The computer is a privilege in an area like this. Imagine me, a graduate in mechanical engineering, I am not that good in computers, but that is just because we don't have access to it much.

 (#179 new teacher, interview, 2011)

Occasionally, Akila has computer practice lessons and there may be a cybercafé on the horizon for him. Meanwhile in Denmark, there is talk of doing oth-
er projects based on the experiences at Akila's school:

And again, let's make another project - learning from the experiences in Nigeria, that makes more and deeper change. Because I don't think the end-solution will be: let's keep away!!!

(#212 Danish participant, email dialogue, 2011)

I hope we can look forward and build on the learnings from this pilot project instead of shutting everything quietly down. We have not had so much time to discuss the issue here at the office, but our opinion is, that we don’t want to shoot the project down.  ( #219 Danish participant, email dialogue, 2011)

Of course, it won't help Akila that Danes can take a line of flight to make his laptop a background experience for other projects, or that teachers can benefit from their certificates and get better jobs elsewhere. If our chosen concern is with the students, then the limbo seems rather entrenched. As noted by Deleuze and Guattari (2008, p. 202) there is no guarantee that lines of flight are for all.

Aramis was in limbo for 17 years and the laptops may be caught in impasse long after the publication of this text. I have pointed to computer practice sessions and the cybercafé because they are the lines of flight I have come across, but there may be plenty of others. I hold no God's position to enumerate them all (q.v. Method & Travelogue, p. 81). The important thing for defining limbo is that the project retains some potentiality. Limbo is at the margin of existence, not beyond it.
Lines of the Apparatus

A multilinear take on development encounters

This is a reflection chapter. It is organised around lines and themes from the travelogue and provides through these an alternative take on the development apparatus. Critics have argued that rather than helping the poor and/or oppressed, development is an apparatus operating in accordance with an uniform top-down logic, ignoring history, context and politics, and producing mostly unintended and inappropriate consequences (Easterly, 2007; Escobar, 1995; Esteva, 1992; Ferguson, 1994; Friedmann, 1992). A similar critique of technological determinism has been made in relation to projects wanting to induce social change through technology (De Miranda, 2008; Leye, 2007; Markus & Benjamin, 1997). Are development and determinism, then, the causes of the described limbo at Akila’s school? The argument here is that while these indeed are part of the plot, the responsibility for limbo is much more distributed. The laptop project is described as a tangle of lines and agencies, which not only failed to benefit Akila, but also escapes any coherent logic. In fact, blaming development and determinism, like adhering to them, is to neglect all those other lines which are also present. The chapter begins by introducing Michel Foucault’s concept of apparatus and its use by Arturo Escober (1995) and James Ferguson (1994) in criticising development. Then follows a reading of the apparatus as a multilinear tangle based on Gilles Deleuze and Foucault himself, before returning to Akila’s laptop where lines of different nature are identified and investigated for their role in the travelogue. These include rigid lines from the archive of technology in development, supple ones intersecting these at Akila’s school and some that forced the poorest children to

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66 This chapter is based on a paper presented at the 4S/EASST conference in Copenhagen, 2012 (Andersen, 2012b).
67 The reader should we warned that there will be many references to earlier chapters as insights from these are brought into play anew.
leave school. In the end, the chapter turns critical in discussing why the investigated lines are problematic in relation to each other.

While development institutions, and associated field of development studies, investigate the poor and impoverished they are themselves being investigated by post-colonial scholars considering development, not the poor, as the phenomenon in most dire need of scrutiny (q.v. Post-colonial critique of development, p. 23). Here, development is not the progression of people and societies through history and neither is it a benevolent way of engaging the world's problems. Development is simply the word we use to describe the special Western way of relating succeeding colonialism in the second half of the 20th century (e.g. Escobar, 1995; Esteva, 1992). A way of relating which comes across as the humane incorporation of others, those who lack development, but is in practice an exercise of power.

The post-colonial concern, for which Foucault is needed, is how does this power operate and to who's advantage? Bringing matters to a head, the most general answer from post-colonialism has been that development operates as a “flexible positional superiority” allowing the development official the same privilege as the missionary or colonialist before him; that is to engage with the orient without ever loosing the relative upper hand (Esteva, 1992, pp. 11–12; Said, 2003, p. 7). As we shall now see, this flexible superiority is, amongst others, achieved through the removal of politics from what is deeply political.

Critique of the development apparatus

Like colonialism was justified by its civilizing mission so too does development present itself as a professional and objective science working for an universal end, namely development. Against such a “field of objectivity, authenticated by the 'sciences'” which has taken to “function openly as treatment” post-colonial scholars have mobilised Foucault's (1991, p. 256) notion of apparatus (or dispositif) famously known from the latter's analyses of the prison, mental asylum, sexuality and so forth.

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68 To reconcile the oppression of foreign people with the liberal philosophy of European nations, colonialism was justified as a necessary means to an end, a way to guide and supervise uncivilized nations toward liberal and civilized values (Kohn, 2012).
The apparatus is one of those tricky notions following Foucault more or less explicitly all the way from the 1960s to the early 1980s, although taking most decisive form in *Madness and Civilization, Discipline and Punish* and *The History of Sexuality* (Peltonen, 2004, p. 213). While the most famous example of an apparatus is properly the Panopticon, the most often used resource for defining the term is an 1977 interview called *The Confession of the Flesh* where Foucault is asked: “What is the meaning or the methodological function for you of this term, *apparatus* (*dispositif)*?” to which he gives the rather precise answer that the apparatus is “the system of relations” which can be established between elements in “a thoroughly heterogeneous ensemble” which has risen at “a given historical moment” in response to an “urgent need” (Foucault, 1980, pp. 194–6).

Accordingly, post-colonial scholars have outlined how a system of relations arose between such heterogeneous elements as Marxist modernisation theory, dependency theory, USAID, the Marshall Plan, Harry Truman (and so forth) following the Second World War to address the urgent need of the West to find new ways of relating to the rest (q.v. *The post-war birth of development*, p. 10).

If prison produces crime it is a consequence, not a contradiction
Foucault (1991, p. 256) wrote of the prison that it came from elsewhere. Besides from being a means of incarceration prison was, and is, an apparatus operating on individual lives to ensure the cure and normalisation of deviant behaviour through such techniques as penal labour, isolation, surveillance, education, guidance and confession.

> It is a question only of reforming the evil-doer. Once this reform has come about, the criminal must return to society.

(C. Lucas 1837 quoted in Foucault, 1991, p. 245)

Prison comes across as much as treatment and re-socialisation as exile and punishment.

In practice, however, the apparatus “cannot fail to produce delinquents” by the “very type of existence that it imposes on its inmates” (Foucault, 1991, p. 266). But rather than lament that re-socialisation is producing worse criminals
than it receives, we should instead investigate the lines along which the prison apparatus succeeds quite well, where the production of delinquents is “a consequence rather than a contradiction” (ibid., p. 272):

Prison is a recruitment center for the army of crime. That is what it achieves. For 200 years everybody has been saying, "Prisons are failing; all they do is produce new criminals." I would say on the other hand, "They are a success, since that is what has been asked of them." [...] What we have to denounce is not so much the "human" side of life in prison but rather their real social function-that is, to serve as the instrument that creates a criminal milieu that the ruling classes can control. (Foucault quoted in Droit, 1975)

This is what Foucault meant when he wrote that prison came from elsewhere. That the urgent need which gave rise to prison was not re-socialisation, but rather the colonisation and specification of “the delinquent, a biographical unity, a kernel of danger, representing a type of anomaly” amongst the workers, peasants, poor and other such segments of potential danger to the ruling classes (ibid., p. 254).

The prison apparatus, like any other power configuration, seeks to be productive by strengthening, not impeding, the social organisation:

...its aim is to strengthen the social forces – to increase production, to develop the economy, spread education, raise the level of public morality; to increase and multiply [...] it can be exercised continuously in the very foundations of society, in the subtlest possible way... (Foucault, 1991, p. 208)

Prison becomes useful when it produces criminals who can be absorbed and rendered docile, who's actions are politically and economically less dangerous, sometimes even useful, and who's doings can be relayed to pathological subjects rather than forms of protest and confrontation (ibid., p. 277). The prison apparatus quite simply induce a milieu of crime productive or, at least, not disruptive to disciplinary society. Accordingly, our debate should turn on the purpose and composition of this milieu rather than the cure, or re-socialisation, of delinquents: “one should reverse the problem and ask oneself what is served by the failure of the prison” (ibid., p. 272).

**The consequence of development is anti-politics**

Following Foucault, a principal critique of development has been that its main
consequence, by which we should understand the whole endeavourer, is not the elimination of poverty but the removal of politics. Although optimism was high during the development decade of the 1960s, development has no more eliminated poverty than prison has cured society of crime (q.v. The post-war birth of development, p. 10). Accordingly, development must be investigated along the lines where it works well, those that have allowed it to persist in spite of white elephants and unintended consequences (q.v. A troubled past of white elephants, p. 15). In short, what is it that development does if not eliminate poverty? One famous attempt to answer this question is Alex Ferguson's (1994) study of the development apparatus in Thaba-Tseka, Lesotho (q.v. Post-colonial critique of development, p. 23).

Ferguson describes how a large development project was established in Thaba-Tseka in order to develop a livestock industry through a comprehensive package of grassing associations, farming machinery, new cattle breeds, new markets and better infrastructure. The development officials considered Thaba-Tseka an unconnected, isolated and backward area inhabited by subsistence farmers which made livestock industry a viable path for development.

However, neither the region of Thaba-Tseka nor its residents aligned well with this identity; they were already deeply entangled in the regional economy with many residents being migrant workers in the mines of South Africa. Ferguson (1994, p. 182) furthermore describes how residents invested their income from migrant work in livestock as a sort of retirement fund only to be sold in “dire need or personal emergency”. Consequently, all the initiatives aimed at getting remote and isolated farmers to produce cash crops and sell livestock were circumvented by migrant workers unwilling to let go of their pension. As it turned out, livestock too had diverging ontologies across the encounter (q.v. Laptop Multiplicity, p. 131). To development agencies, cattle was agricultural revenue, but to migrant workers, it was a safe way to bind capital for old age.

What the development apparatus in Lesotho did, if not develop a modern farming industry, was to extend the political reach of the ruling party in Maseru through better infrastructure and enhanced control and administration.
of the area:

The project did not transform crop farming or livestock keeping, but it did build a road to link Thaba-Tseka more strongly with the capital; it did not bring about “decentralization” or “popular participation,” but it was instrumental in establishing a new district administration and giving the Government of Lesotho a much stronger presence in the area.

(Ferguson, 1994, p. 252)

The whole project served to remove politics from movements that were deeply political, treating resistance as lack of education and the Maseru government as a neutral machine for delivering services rather than a political agency (Ferguson, 1994, pp. 186, 225 & 247). “It seems that politics is nowadays nicknamed 'development’” as one informant is quoted saying (ibid., p. 247).

To Ferguson (1994, p. 256)—and with him Escobar (1995, p. 145)—the only intelligible and coherent consequence of development is the removal of politics from what is political in order to governmentalize the poor and position them within Western frames of reference. The dimensions along which development seeks to be productive is thus the translation of resistance into lack of development along with the institutionalisation and professionalisation of political questions. Development is quite simply an anti-politics machine (Escobar, 1995, p. 145; Ferguson, 1994, p. 14).

Like prison reform is as old as prison itself, so have the years since World War II seen several attempts at reformulating the strategies of development (Foucault, 1991, p. 234; Jolly et al., 2004). However, Escobar (1995, pp. 212–227) urges us to not to salvage development by making it sustainable, appropriate or alternative but rather to abandon it all together. This does not mean that we should give up working for the betterment of people. What Escobar desires is an alternative to development—rather than an alternative development. So far he has found such an alternative in the social movements of Latin America (Escobar, 1992). What these offer is an opportunity to study how actors at the micro are engaged in “adapting, resisting, transforming or subverting” macro processes of domination, which ultimately can leverage “alternative ways of organizing societies and economies, of satisfying needs, of healing and living” (Escobar, 1992, pp. 30 & 48).
Another take on the apparatus

In a number of cases, development has been an oppressive technique forcing Western identities on third world poor while removing politics from decisions influencing their life. It is important and appropriate that studies like those of Escobar and Ferguson sensitize us to the functioning of such anti-politics machines. However, with ANT one must not assume that this must “always be the case” (Gad & Jensen, 2009, p. 59). At least not if we are to maintain analytical symmetry in the encounter between development officials and Basothos (q.v. Development Encounters, p. 59).

With Foucault and Deleuze there is, however, also another take on the apparatus, one which takes the form of actions upon actions, of elusive tangles of lines incapable of inducing homogeneous effects in any calculated manner. Such an apparatus may still amount to anti-politics. But it may also render politics more visible, as is the case with the pedagogical conflict around Akila’s laptop (we return to that). In either case, the outcome is a specific achievement.

In the Confession of the Flesh, one of the interviewers criticises Foucault for his method of tracing apparatuses through history, jumping back and forth drawing lines, which he argues provide only huge and coarsened concepts:

J.-A. Miller: […] Why, instead of using your microscope, are you now taking a telescope, and looking through the wrong end at that? […] I'm not very happy with the huge concepts you're employing here. They seem to me to dissolve as soon as one looks at things more closely.

Foucault: But they're meant to be dissolved, these are only very general definitions… (Foucault, 1980, pp. 215–16 - emphasis added)

In response, Foucault objects that if his concepts are huge and coarsened it is only because they’re meant to be dissolved. The apparatuses traced through history do not “reduce everything to the same thing”—one apparatus does not explain the other—but makes the “differences stand out more clearly” (ibid., p. 217).

Apparatuses are “not results acquired once and for all, but tactics that shift” which have always been “met with resistance; they have given rise to struggles
and provoked reaction” (Foucault, 1991, p. 285). For instance, the specification of delinquency—which made pathological such acts as looting, refusal to pay tax, theft of private property and organised strikes—was confronted from the outset by the workers movement, which considered these necessary forms of political protest (ibid., p. 272).

Are you not afraid that the poor man put into the dock for snatching a piece of bread from the baker's stall will not, one day, become so enraged that stone by stone he will demolish the Stock Exchange...

(La Ruche Populaire 1842 quoted in Foucault, 1991, p. 288)

Even our most extreme contemporary example of a penal apparatus, The Detention Camp at Guantanamo Bay (DCGB), is undermined by hunger strikes and attempted suicides when trying to transform “unlawful enemy combatants into beings who are docile, obedient, and useful for the expressed objectives of producing intelligence” (Welch, 2009, p. 7). Military personnel must struggle to keep inmates alive through fixation, constant surveillance, forced feeding and medical treatment. DCGB is approaching the final term of any power configuration seeking to be productive: a system of domination in which bodies are destroyed rather than produced, a total impotence leading to either warlike confrontation or static fixation (Foucault, 1982, p. 794; Welch, 2009). Like the wars in Afghanistan and Iraq from which it grew, this extreme penal apparatus may become a tragic example of the elusiveness of power relations to induce effects in any calculated manner.

The apparatus is a multilinear tangle drifting along

As Foucault later wrote “there is no relationship of power without the means of escape or possible flight”:

Every power relationship implies, at least in potentia, a strategy of struggle, in which the two forces are not superimposed, do not lose their specific nature, or do not finally become confused. Each constitutes for the other a kind of permanent limit. (Foucault, 1982, p. 794)

An apparatus, developmental or not, can thus be considered a dynamic ensemble where “instead of manipulating and inducing actions in a calculated manner” one must be “content with reacting to them after the event” (Foucault, 1982, p. 794). The apparatus being a “set of actions upon other actions” we
should expect that it drifts and flows through an ecology of relations (ibid., p. 789). In Thaba-Tseka, for instance, Ferguson (1994, p. 225) describes the development project as a "bread crumb thrown into an ants' nest. Pushed and pulled in all directions".

In the indicatively entitled anthology Differentiating Development, Casper Bruun Jensen and Brit Ross Winthereik (2012, p. 85) have similarly argued that Foucault takes leave from his own work when post-colonial scholars translate them into "systems of hierarchy and dominance”. In the assumption that development encounters are homogeneously oppressive, we loose the “analytical sensibility towards the surprising effects or the lack of effects” that these may also have, that perhaps the “discourses of the powerful are not themselves so powerful, at least not everywhere, or all of the time” (ibid.).

Following Deleuze (1992, p. 159), we can say that the apparatus—and with it the actor-network and rhizome—is first and foremost “a tangle, a multilinear ensemble. It is composed of lines, each having a different nature”. The lines do not form opposing dualisms, but are instead multiple and entangled. And neither do they proceed in any straightforward or calculated manner, they are more like translations: “broken and subject to changes in direction, bifurcating and forked, and subject to drifting” (Deleuze, 1992, p. 159).

Like prison, so too did laptops come from elsewhere. Certainly, they came from the archive of development and the aspiration to induce socio-economic change through transfer of technology (q.v. A history of technology transfers and development, p. 9). They also came from the understanding that education is the most crucial vehicle for empowerment (q.v. Educational empowerment, p. 46). But so too did they come from the missionary commission of Christianity and from the notion of IT-literacy (q.v. Laptops are doing God's work, p. 158). Indeed, multiple lines run through the apparatus, but they don’t add up to any tangible whole such as an anti-politics machine. Tracing through the apparatus one last time, we see that their only shared consequence is the described limbo, which has marginalised both children and laptops.

**Molar lines from the archive**
Deleuze (1992, p. 165) wrote of Foucault, that while in his books he specifies a
precise archive tracing the hospital, prison and sexuality through the centuries that was only “half of his task”. The other half was that of the present and of becoming: “What new modes of subjectification can be seen to appear today which are neither Greek nor Christian?” (ibid.). Foucault partly delegated this second task to his readers and partly undertook it himself through his many interviews. In each apparatus we have to untangle two groups of lines, Deleuze argues, those of the archive and those of becoming.

In each apparatus [dispositif] it is necessary to distinguish what we are (what we are already no longer), and what we are in the process of becoming: the historical part and the current part. (Deleuze, 1992, p. 164)

This thesis has sought to combine the archive, which was described in the first chapters, with the lines of becoming, the translations, through which laptops went to Nigeria, the enactments sustaining them there and the lines of flight which may provide their escape from limbo.

We dealt with the archive of development in the introduction. Here we identified two rather consistent lines of technology transfers to developing countries (q.v. A history of technology transfers and development, p. 9). One of convergence and one of empowerment against polarisation.

The line of convergence runs roughly like this (q.v. Hopes for convergence and modernisation, p. 12): In the wake of the Marshall Plan, president Truman (1949) launched a “bold new program for making the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas”; some 10 years later, the UN made the “redirection of science and technology to attack the problems of developing countries” an official agenda of the development decade (Jolly et al., 2004, p. 89); add 30 years more, new hopes arose that information technology may enable poor countries to “leapfrog some of the long and painful stages of development” (Kofi Annan quoted in Pal, 2008); in 2005, OLPC came along with the “key to full development and participation” (OLPC Website, 2013a); until 2009 when Akila’s school got 100 laptops in order to “leapfrog those children privileged enough to be part of the project” (#138 secondment report, 2007).

The line of empowerment against polarisation runs zigzag with the one on
convergence (q.v. Fears of dependency and network imperialism, p. 14). It
goes from the warnings of dependency writers of the 1970s that exploitive
 techno-economic links would “form and dissolve in rapid succession” (Gal-
tung, 1971, p. 95); over Castells (1999, p. 12) who argued in the 1990s that we
are “confronted with a spiral of exclusion” and must urgently seek “reintegra-
tion of social development and economic growth through technological innov-
ation”; to OLPC warning that as “the pace of change in the world increases
dramatically, the urgency to prepare all children to be full citizens of the emer-
ging world also increases dramatically” (OLPC Website, 2013a); and again to
Nigeria where “educationalists across the country are fully aware that com-
puter knowledge is an essential prerequisite for the next generation” (#130
funding application, 2008).

Here we have what Deleuze and Guattari designates as “molar or rigid line
of segmentarity” (2008, p. 195 - emphasis in original). These are lines which
outline “well-determined, well-planned territories” where laptops in Nigeria
will empower against polarisation and leapfrog children across existing in-
equalities (ibid.). They run more or less unchanged from an archive of techno-
ology and development before intersecting with the laptop apparatus in both
Denmark and Nigeria, where they lend meaning and purpose to the project.

Molar lines helped make OLPC famous and ensured support from a wide
array of actors (q.v. Constructing an immobile $100 laptop, p. 101). Similarly,
their promise of reducing the “the IT gap and the social inequality existing
between developing and industrial countries” intrigued those carrying laptops
to Akila's school where people are eager “to catch up and develop more like
the white men“ (#11 pedagogical consultant, interview, 2009; #35 teacher, in-
terview, 2009).

There are, of course, a good deal of the devspeak and devthink described by
Ferguson and Escobar (1995, p. 146) in these lines. For example, a report from
Nigeria paints a picture where “tears of joy were flowing” as children are giv-
en laptops for the first time, excited by the “hope for a brighter future and a
chance to become cyber participants in our society” (#46 status report, email,
2010). However, as Deleuze and Guattari write, molar lines are not bad lines
and neither are they alone:

> It would be too easy to say, “This is a bad line,” for you find it everywhere, and in all the other lines. (Deleuze & Guattari, 2008, p. 195)

As we turn to below, we (I include myself here) all tied something other into the situation alongside well planned territories of laptops giving new opportunities to children (q.v. Laptop-researcher travelogue, p. 90).

There is a play of lines which cannot be purified and in which the molar only takes up part of the plot. Molar lines are not only opposed to, but also intimately entangled in, lines of micro-politics – the *molecular*. The molar and molecular are “constantly interfering, reacting upon each other, introducing into each other either a current of suppleness or a point of rigidity” (Deleuze & Guattari, 2008, p. 196).

**Molecular intersections**

Christianity is important in both Denmark and Nigeria. There are lines of Christian fellowship running between TDM and TNC for more than 100 years (q.v. Laptops are doing God’s work, p. 158). Along these, the Great Commission translates into a wide range of activities on healthcare, social work, education and, of course, diakonia and missionary work.

In Denmark, senior citizens spend time selling used clothing, charity events are organised, volunteers dispatched and money collected to help fund Akila's laptop. Likewise, in Nigeria, tithes and donations are sponsoring the school and teachers find additional purpose for their engagement with laptops, “you will get double benefit: you will serve your God and also become a leader of tomorrow” (#52 teacher, interview, 2009). Occasionally, these lines transform the $100 laptop into a Bible, the digital divide into a question of being near God, and make by implication those to jump the divide Christian followers (q.v. Laptops are doing God’s work, p. 158).

There are also lines of IT-literacy running from banks and government offices through global villages and digital divides (q.v. Digital divides and IT-literacy, p. 152). IT-literacy proceeds along both molar and molecular trajectories. It is as much about the physical motor skills of moving the mouse, typing on the keyboard and knowing how to use Microsoft Office, as it is about future
inclusion and global convergence. While not ideal for IT-literacy with their Linux/Sugar software and childish design, the laptops are nonetheless very much about acquiring concrete computer skills so as to enable a better future ahead (q.v. The XO is a ThinkPad, p. 156).

As we have seen, the limbo does not allow children much time with laptops. However, during computer practice and other such occasions, the laptops are no longer just about the prospect that if “you are 20-25 you can go to an office” (#62 Akila, group interview, 2009). Lines of children’s play make laptops become proper children’s machines (q.v. Children's machines once in a while, p. 161). A toy with which to play, experiment and learn. Children record themselves giving awakening speeches to an imaginary audience, they record action videos and make cover versions of popular songs, they google for pictures of premier league footballers, play Maze, Implode and search through the programming environment Scratch for something fun to play with.

We could also add some academic lines, those running through this thesis, attempting to make laptops become actor-networks and enactments (q.v. The researcher-researched entanglement, p. 84). All these lines dissolve the well planned territory of OLPC into a range of other things. However, molecular lines do not refute the molar ones, they tie into these and add dimensions to the laptop, making it multiple (q.v. Laptop Multiplicity, p. 131). While IT-literacy may land you a desk job with the government, it is also about visions of information societies and developmental leap-frogs.

Opposing points of rigidity

There are other lines from the archive. Lines of learner centred pedagogy are running from Paulo Freire via Seymour Papert and into the Sugar software of OLPC's laptops (q.v. Educational empowerment, p. 46; The XO laptop(s), p. 36). These lines too proceed all the way to Akila’s school, where the stated purpose for the project is to induce a transformation “from a classic instruction based blackboard learning environment [banking approach] to a constructionist learning environment backed by computer supported activities” (#130 funding application, 2008).

These lines, however, diverged already in Freire and Papert's disagreement
over the role of computers in education (q.v. The second debate: do laptops stimulate good learning?, p. 52). A divergence stretching all the way to Nigeria where OLPC’s five principles were betrayed in a project backgrounding laptops to make room for teacher training, which provided only 100 computers for 400 students and did not allow children to take home laptops (q.v. Five principles everyone agrees to, in principle, p. 36 & Laptops detour, deviate and betray, p. 120).

...teachers and everyone else understood and accepted that the project should carry a different type of teaching, where children are at centre and not the blackboard and teacher. The XO is just a means, not the solution.

(#227 TDM project manager, email, 2012 – my translation)

The pedagogical lines of OLPC, however, were not cleansed out. They were simply translated into a more teacher centred problematisation than the one outlined by OLPC (q.v. The OLPC problematisation, p. 101): If teachers can be convinced to stop teaching by rote; if teachers can be convinced to translate the curriculum into more open ended activities; if teachers will do workshops with the children – then, and only then, can children with laptops become educationally empowered (q.v. Reconfiguring the pedagogical purpose, p. 113).

However, the well defined territory outlined by OLPC and Danes, where laptops can help transform the banking approach was in contrast to an equality well defined territory, where the teaching is already learner centred (q.v. Pedagogical multiplicity, p. 137). Along one line of learner centred teaching, Akila’s laptop was “on its way to displace black boards and rote learning in the third world” while along the other, it makes students “listen attentively to what you are going to command” (#158 project website, 2010 & #52 teacher, interview, 2009).

While the project was running strong, the black school translation enabled molecular encounters in the form of workshops, which resulted in the open-open approach (q.v. The black school ensures co-existence, p. 143 & The open-open laptop, p. 149). But with the current limbo, Danes and Nigerians have no means of relaying between their respective enactments of the project, which have become increasingly opposed in points of rigidity (Deleuze &
Lines of marginalisation

The lines of IT-literacy made Akila's school popular with families more resourceful than those it had previously attracted (q.v. Digital divides and IT-literacy, p. 152). Prior to the project, the school had been haunted by bad economy and was often delayed in paying salaries. But with laptops, it became a passage point for IT-literacy and many new students transferred. Like one teacher told me in 2009, there is no way the project can stop when attracting such resourceful students: “Big men are now bringing their children, the commissioners, the secretaries [...] If it was not for this XO nobody would bring their child here” (#14 teacher, interview, 2009).

In this new empowered position, school management decided to raise tuition so as to be able to pay salaries on time and maintain technical running costs. And while this was of benefit to most, it pushed out the poorest children who silently transferred to public schools or less expensive private schools, leaving behind mostly “middle class” children with government employed parents (#180 teacher, interview, 2011).
...because of these computers they have increased the school fees. Before we paid 10,000, but now 15,000 plus. I can not afford to pay it. I must get government school for him. (#64 parent, interview, 2009)

The lines are elusive. While they empowered the school, improved the economy and provided laptops for middle class children, they also forced out those who could not afford the new tuition.

Meanwhile, the improved pedagogical and financial foundation should have made the school much better for those students who remained. But they too became rather unfortunately positioned as the project fell into limbo. Fearing theft, breakage and moral decay through pornography, school management has strongly resisted any unsupervised use of laptops (q.v. Laptops detour, deviate and betray, p. 120). If children want to use laptops, they need a teacher to unlock the computer room and monitor their use. No teacher, no laptop. And with teachers in limbo, Akila and his friends are not only excluded from laptops and the open-open pedagogy, but also have to struggle with teachers unwilling to teach even regular classes (q.v. Staff-room limbo, p. 184).

In consequence, parents are withdrawing their children, taking lines of flight to other schools with no laptops but better teachers.

The only thing the parents do is to complain, complain, complain, and maybe after some time where you see there are no changes, after some time you will withdraw your child […] my school is becoming lean instead of becoming fat. (#182 teacher, interview, 2011)

Akila’s and his friends are thus left behind at a school with diminishing enrolments and teachers in limbo. We are back at the observation, that an apparatus does not induce effects in any calculated manner, it consists in actions upon actions, the lines bifurcating and drifting, turning what is empowerment for some into marginalisation for others.

Discussion: multilinear development encounters

The apparatus is a relational composition similar to an actor-network or rhizome. Also much like actor-networks, apparatuses interrelate such diverse entities as “discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and
philanthropic propositions” and readily mix up everyday micro-level practice with a macro-level history of ideas without letting one fully guide or explain the other, allowing them both to tie into the situation (Foucault, 1980, pp. 194–5; Peltonen, 2004, pp. 212–3).

As we have seen, the laptop apparatus established itself for a multitude of ends which all translated into bringing laptops to Nigeria (q.v. Rendering Laptops Mobile, p. 97). While it shares an archive with many other development apparatuses, it also dissolves beyond these. The lines and logic at Akila's school do not reduce to Truman's Point Four Program, OLPC, the Nigerian school system or Christianity. As we remember, the purpose of the apparatus was not to reduce everything to the same thing, but to make differences stand out more clearly (Foucault, 1980, p. 217).

Accordingly, both Latour (2002, p. 40) and Deleuze have argued that instead of confronting the same causality across apparatuses, we should make immanent criteria our foundation for investigation and intervention:

> Does this mean that all social apparatuses [dispositifs] are equal valid (nihilism)? It has been a long while since thinkers like Spinoza and Nietzsche first began to show that modes of existence have to be assessed according to immanent criteria, according to their content of 'possibilities', liberty or creativity, without any appeal to transcendental values. (Deleuze, 1992, p. 163)

This, however, does not stop us from following Foucault’s (1991, p. 272) advice and make the laptop limbo a consequence rather than a contradiction. But it is futile to blame any particular line in isolation since they are all “bound up with one another, even cross into each other, changing according to the point of view” (Deleuze, 1992, p. 209).

This, however, does not mean that none are to blame. On the contrary, all lines are to blame, all played their part and all share the responsibility for the limbo. The laptop apparatus is problematic because the Danish ambition to make a pedagogical transformation mixed up badly with unmotivated teachers, weak management and diverging ontologies of learner centred teaching; because school management is mostly interested in IT-literacy but unable to maintain the technical installation; because the satellite charges huge amounts.

69 For the archive of missionary work in colonial Nigeria see for instance (Achebe, 1994).
for its services; because TNC gives teachers safe-conduct not to do their job; because high tuition makes an unfortunate pair with low quality of teaching; and because we underestimated the difficulty and elusiveness of getting laptops to work for education.\textsuperscript{70}

The beauty of Foucault’s work on prison, and Ferguson and Escobar’s on development, is the simple idea of analytically sticking to that which results in the end, to see cui bono. In Lesotho it was the ruling party and for prison it is the ruling classes. In the case of the laptop-apparatus, if we follow the consequence of limbo to see cui bono the answer is less clear. The project sought to be productive by transforming the pedagogy, providing IT-literacy, sponsoring laptops and strengthening missionary ties. But as we have seen, it failed to deliver on any of these. It is hard to see for whom the consequence of limbo is productive. In fact, I am properly the one benefiting the most since I gained a scholarship with pay and pension (q.v. Laptop-researcher travelogue, p. 90). But we find no ruling class or central government. And neither has the encounter served to remove politics. In fact, tensions over pedagogy versus technology have been rendered quite visible in face of faltering translations (q.v. Technology or pedagogy? Laptops are empty without internet, p. 188).

Meanwhile, we could formulate a plan of rescue: If only teachers could be made to work; if only Danes would provide more workshops and support; if only everyone could agree on the pedagogy; if only an engineer could be hired to keep things running; if only the management was stronger; if only some line of flight could be taken from limbo, then we could surely fix the apparatus and make it work towards more productive ends. But as Donna Haraway (1988, p. 475) has famously argued: “we are not in charge of the world” and if we tried to force through such a plan we would surely be hoodwinked by the play of lines. There is, however, no alternative to keep searching for fidelity when responsibility is scattered across an elusive tangle. When lines tie into each other and displace responsibility between them, \textit{all} agencies are tasked to seek out creativity and alternative becomings as they drift along, action upon action.

\textsuperscript{70} The lines of critique are not meant to be exhaustive, many more could be added from many other positions than mine.
Conclusion

Information technologies are intrinsic to all types of activity for citizens in the world's developed regions. They are awarded great economic, social and political importance. Meanwhile, citizens in the world's impoverished regions have limited, if any, contact with these technologies – with the notable exception of mobile telecommunications. Accordingly, national governments, development agencies, NGOs, the UN and a range of other actors see the transfer and redistribution of information technologies as an important safeguard against further socio-economic polarisation and a possible way to induce developmental leapfrogs.

While surrounded by great enthusiasm, the focus on technology in development initiatives has also been heavily criticised for problematic understandings of technology. Most notably for technological determinism and for ignoring historical lessons of earlier technology schemes (De Miranda, 2008; Leye, 2007). The motivation for this thesis has been to align with these and question the nature and logic of technology. But the approach taken is not critical in the sense that it seeks to repudiate claims of technological agency. Rather, the study has been guided by a curiosity towards what technological projects actually end up doing and how the grand themes of development look like in concrete practice.

The thesis has investigated technology and development through a qualitative study of 100 laptops from OLPC being transferred to a small school in Nigeria. In the introduction, this overall concern was made specific on a backdrop of development history, post-colonial critique and re-inventions during technology transfer. Five agendas were outlined and pursued through the chapters: 1) to investigate the organisation and theoretical underpinnings of OLPC; 2) to study the process which got laptops to Nigeria; 3) to do so with ANT as vocabulary and metaphysics; 4) to investigate divergence and multiplicity in and around Akila's laptop; and 5) to address the state of limbo in which the project has ended.
OLPC is a good example of the ambitions and problems associated with technology in development. On the one hand, laptops are presented as a means to empower against a “rapidly evolving, global information economy, hobbled by a vast and increasingly urban underclass” (OLPC Website, 2013e). On the other hand, the same global information economy is promoted as a better and more inclusive future no longer limited by geography, and where old prejudices are overcome as digital technologies bring information and learning to all (Negroponte, 1996, p. 230). In both cases, however, the large scale transfer of laptops and other digital technology is crucial (Negroponte quoted in OLPC Talks, 2005). The outlined trajectory is that laptops will bring new and better learning opportunities to children and include them in the globalised information order.

As such, OLPC can be positioned in continuation of well established themes of technology transfer in development: that moving technology can foster leapfrogs and convergence and/or empowerment against polarisation (Castells, 1999; NTIA, 1999; Rostow, 1990; Seely, 2003). OLPC also share with a history of development the tendency of technology not to carry the envisioned effects upon arrival (Jolly et al., 2004, p. 73; Unwin, 2009, p. 5; Vota, 2008b). Laptops were supposed to ensure that “children in emerging nations will be opened to both illimitable knowledge and to their own creative and problem-solving potential”, but, on ground, their value has been much more obscure and described as neither magic nor fast (Bender et al., 2012, Chapter 7; OLPC Website, 2013e). This dilemma extends to the Nigerian school where, as we have seen, the laptops failed to provide students with a rich learning environment and instead ended up in a state of limbo.

OLPC has been heavily criticised for underestimating the problems associated with getting laptops to work in remote locations: That their attention to infrastructure, capacity building, community involvement, support and training has been insufficient (Warschauer & Ames, 2010). A related criticism is that even if laptops are made to work in remote conditions, there is no guarantee that they will educationally empower children (Papert & Freire, 1985; Toyama, 2010). Both these criticisms turn on the question of technological agency. Can laptops substitute for a human facilitator in learning and critical thinking, are
their logic and impact consistent from place to place and what is decided by contextual factors?

The argument developed in this thesis has been that both technology and technological agency take the form of hybrid tangles called actor-networks. Actor-networks are not social phenomena and neither are they technical; they are not set in a context nor do they provide one (Latour, 2005). Actor-networks are simply networks of relations running between heterogeneous elements which are also actor-networks. An ontological recursion of actor-networks of actor-networks. The laptops in Nigeria are actor-networks, OLPC is an actor-network, this thesis is an actor-network, and so forth. In each case, agency is a specific achievement derived from the network, it is not determined by uniform forces of technology, culture or society.

Neither OLPC nor their laptops are singular and invariable entities. They are heterogeneous achievements. OLPC is an actor-network of MIT researchers, open source enthusiasts, politicians, NGOs, national governments and private companies. These are in the network because it translates into who they are and what they do (Law, 1992, p. 381). The scales are big not only to provide “a big, big push forward” in development but also because private companies are part of OLPC (Cowell, 2005). The laptops are for education not only because OLPC proclaims they are, but also because they are bought by ministries of education and deployed at schools.

Without Quanta (the manufacturer in Taiwan) there would be no laptops, without governments there would be no place for laptops to go, without the digital divide and pedagogical theories there would be no purpose for laptops. The OLPC laptops encompass all of these and they, in turn, substantiate what the laptop is and what it can do. This is the principle insight of the thesis.

This is a radically different way to think of technology in development. That instead of children with laptops imposing some predictable causality on their environment there is dispersed actor-networks deploying a range of causalities which, then, are summarised as the impact of laptops.

Transferring laptops from the assembly line in Taiwan and out into schools, such as the one in Nigeria, require novel translations. In the case here de-
scribed, these included Christian missionaries, solar panels, Nigerian teachers and IT-literacy. What the laptops are, and what they may hope to do, is achieved anew by a reconfigured network. Of course, the laptops in Nigeria still relate Quanta with Negroponte, and AMD Geode processors with Sugar software. But they also relate IT-literacy with office employment, computers with physical punishment and gell cell batteries with Chinese solar panels.

This is why technology transfer is a process of becoming rather than a process wherein non-human laptops change human hands. Technology transfer is a re-arrangement of humans, materials, infrastructures, ideas and theories from which a transformed laptop emerges. A laptop the agency of which is derived from the agencies of the network and which, in turn, helps substantiate these agencies. The laptops in Nigeria were disciplinary devices to the extend that teachers could use them for classroom control; they were development devices to the extend that Danes could convince Nigerians to change their pedagogy; they provided IT-literacy only because they were real computers and they were real computers only because they provided IT-literacy; they were Bibles only because Christians used them to study the scripture; and children's machines only when children played around with them. This is why impacts are hard to predict. They do not come from laptops in any direct sense. In fact, there are no laptops in the direct sense. They come from elsewhere; from a network translating and transforming the laptop beyond what is presented by OLPC.

While this thesis does not intend to formulate consequences for the field of practice—to those seeking to facilitate social change through technology—it does however offer some valuable insights. First is the insight that transferring technology is to engage in multilinear encounters. That linear models of cause and effect should be substituted with multilinear ones, where it is not technology doing the impact but a multitude of other things following different trajectories. Technology is these other things. A second insight is that impacts are evasive, they go through translations and come out different and even surprising (Jensen, 2008). This is a consequence of linear agency being replaced with multilinear agencies, in the plural. A third insight is that encounters are political on an ontological level, they negotiate a dispersed process of becoming where the outcome quite literally is as real as it gets.
There are political and metaphysical complications from dispersing laptops into actor-network achievements. Most prominent is the observation that the divergence and multiplicity in and around the Nigerian laptops are not just social perspectives, or cultural interpretations, but laptops in the full ontological sense. This makes it a lot harder to settle controversies. Neither OLPC, Danes nor Nigerians can claim that they enact the true laptop and that the others have only a wrong idea. The $100 laptop, the development device and the disciplinary device are all equally achieved by actor-networks; they are all equally real and they are all equally hard to challenge or change.

Importantly, this does not mean that they are all equally good. Variations can be evaluated on criteria immanent to them. For instance, the $100 laptop was good at gathering support and attention but less so at empowering impoverished children. Negroponte and OLPC should be credited with a laptop highly successful at conferences and in the media, a famous laptop good at setting the agenda, but they can also be criticised to the extend they made others believe that laptops could be dropped from helicopters and automatically benefit children (Vota, 2011).

Similarly the laptops in Nigeria were good at attracting support and finding a place for themselves, but less so at ensuring that this place would be long-lived. As laptops were difficult to position within the classroom situation; because teachers lost motivation and management enforced no plan for revival; because batteries died and internet became too expensive; and since missionaries could not sustain their black school translation, the only laptop achieved, as of writing, is one in limbo.

The strength of such an evaluation is that it refrains from reducing criticism to OLPC’s view of technology, Nigerian culture, Danish development discourse, expensive internet or authoritarian teachers. If the laptop in limbo is a shared achievement, then the whole network is to blame, all share the responsibility, and none escapes being related.
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Information technologies are intrinsic to all types of activity in the world's developed regions. But citizens in impoverished regions have limited, if any, contact with these technologies. At the same time, underfinanced educational systems struggle to prepare students for an increasingly globalised economy.

The American One Laptop per Child (OLPC) initiative seeks to remedy both these disparities through massive distribution of laptops meant for digital inclusion and education.

This thesis is the travelogue of 100 laptops from OLPC ending up at a small Nigerian school. I call this school Akila's school and the laptops Akila's laptops after a primary 5 student named Akila, who transferred to the school because of the laptops.

The thesis is based on Actor-Network Theory (ANT) and a multi-sited, qualitative fieldwork conducted in both Denmark and Nigeria in the period 2009-2013.

The overall concern for the thesis is to investigate themes of technology and development through the laptops at Akila's school.

On a backdrop of development history, post-colonial critique of development and observed re-inventions of technology during transfer the introduction translates this overall concern into five more specific agendas:

1. From a critique of technological determinism in the debates over the digital divide, an agenda is to investigate the theories on which OLPC is based as well as their empirical agency.

2. From a post-colonial critique of development as an asymmetric exercise
of power, an agenda is to present ANT as metaphysics and vocabulary for development encounters.

3. From the observation within transfer and diffusion theory that technology does not travel out of necessity, that it requires the hard work of transceivers to carry it along, an agenda is to investigate the process which got laptops to Akila's school.

4. From an observed tendency of transfer participants to transform and reinvent what they carry along, an agenda is to investigate divergence and multiplicity in and around Akila's laptop.

5. From problems with white elephants and unintended consequences in the history of technology transfer, an agenda is to investigate why the project at Akila's school has ended up in limbo.

These agendas are investigated through seven chapters.

The first chapter is an in-depth account of OLPC and the theories on which the organisation is based. OLPC aims at massive distribution of laptops to the world's impoverished children in order to leverage these along two dimensions. The first is inclusion in an increasingly globalised information order. This is presented through the work of OLPC chairman Nicholas Negroponte. The second is educational empowerment in relation to problem solving and critical thinking. This is presented through the works of Paulo Freire and Seymour Papert. OLPC is rich with debate over whether digital technology can truly empower the poor and marginalised and in which ways. The chapter introduces these debates and positions the thesis in relation to them. In the end, it is argued that while OLPC indeed is based on some problematic assumptions these may have helped the initiative gather support.

The second chapter describes ANT as vocabulary and ontology for the study of development encounters. It positions development within a symmetrical and irreducible metaphysics of actor-networks and contrasts this to Cartesian dualism and Marxist dialectics. On this backdrop, the chapter argues that development encounters proceed through translations in a drift of construction and composition, that they bring into being novel compositions rather than introducing already established ones. Finally, the criticisms of ANT is investigated as
well as ANT's potential for being critical itself.

The third chapter describes methodology and associated philosophy of science. It describes the background for the thesis and how a multi-sited fieldwork was conducted in Denmark and Nigeria, who and how I interviewed, where I did observations, and so forth. It also argues that the thesis is actively performing a special kind of academic laptop different from the one in Nigeria and the one advertised by OLPC. That the study is valid only in recognising its hybrid origin and agency, and reliable only to the extent that it opens up new possibilities for those considering it.

The fourth chapter investigates the transfer of laptops to Akila's school. It describes how theories of technology transfer are known for a producer bias, which attributes movement to technological superiority, and lack of movement to social or cultural resistance. The bias furthermore suggests that invention is kept within a certain perimeter reducing those outside to the role of adopters or users. The chapter then proposes an alternative understanding of technology transfer based on the notion of translation. It investigates how the OLPC laptops moved from the assembly line in Taiwan to the school in Nigeria by way of a multitude of translations between OLPC, the digital divide, Danish researchers and missionaries, a Nigerian church and their school, Chinese solar panels and orbiting satellites. The argument being that all these movements constituted a process of becoming that not only got the laptops to Nigeria, but also made them what they are in the process.

The fifth chapter describes how the laptops at Akila's school ended up being multiple. One laptop is backing a pedagogical transformation, another is upholding discipline amongst students, there is one bridging the digital divide while providing IT-literacy, one is a Bible and yet another is used by children to play around and have fun. These are investigated as enactments made by the partially connected actor-networks of Danes, Nigerians, internet and Christianity. Enactments are not just social perspectives or interpretations, they are intimately part of the object, they run through the laptops and bring them into being. The argument being that Akila's laptop is, in the full ontological sense, more than one thing, it is multiple.
The sixth chapter investigates how the project, and with it the laptop, has ended up in a kind of impasse described as *limbo*. Limbo is an ontological instability of not only what the laptops are, but also what they may hope to become. Limbo is suggested to extend the ANT genesis with a mode of existence full of despair, frustration and unravelling translations. But also with defiance, metamorphosis and lines of flight. A genesis riddled with exodus. The chapter describes how laptops were difficult to use within the classroom situation, how teachers lost motivation, how the electrical installation became crippled and the internet too expensive, and how Danes lost faith that the project could develop Nigerian pedagogy. All these failing translations have caused the limbo. But there is also hope as lines of flight point to possible revival for the laptops as part of an afternoon cybercafé.

The seventh chapter is a reflection chapter. The chapter introduces Michel Foucault’s concept of *apparatus* and its use in critiques of development. It then argues for an alternative reading of the apparatus as a multilinear tangle based on Gilles Deleuze and Foucault himself. Using this Deleuzian apparatus, the lines of Akila’s laptop are identified and investigated for their role in the travelogue. These include rigid lines from the archive of technology in development, supple ones intersecting these at Akila’s school, pedagogical ones in mutual opposition and some that marginalised the poorest children. In the end, the chapter turns critical in discussing why the investigated lines are problematic in relation to each other.

Finally, a short conclusion summarises important arguments and offer three insights to the field of practice: that transferring technology is to engage in multilinear encounters, that impacts are evasive and that moving technology is to engage in ontological politics.

**English lead paragraph**

Can laptops save the world's poor?

Information technologies are intrinsic to all types of activity in the world's developed regions. But citizens in the world's impoverished regions have limited, if any, contact with these technologies. Tying technological disparity with social and economic disparity, recent years have seen a range of initiatives meant
to bridge the digital divide and foster renewed development through information technology.

One of the most famous of these is the American One Laptop per Child initiative (OLPC) aimed at distributing millions of cheap and rugged laptops to the world's impoverished children.

This thesis follows 100 laptops from OLPC going to a school in Nigeria. It describes how they are transformed and translated in the process and end up becoming a whole range of other things than those envisioned by OLPC.

The travelogue is based on a multi-sited qualitative study in Denmark and Nigeria, and tie into themes of technological agency, development, actor-network theory and post-colonialism.
Informationsteknologien har bredt sig til alle typer af aktivitet i verdens udviklede regioner. Men de, der bor i fattige og underudviklede regioner, har kun en begrænset berøringsflade til den teknologiske udvikling. Samtidigt må skolesystemerne i disse områder kæmpe for at forberede deres studerende på en stadig mere globaliseret økonomi.

Den amerikanske organisation *One Laptop per Child* (OLPC) forsøger at udbedre disse skel ved massive uddelinger af bærbare computere beregnet på læring og uddannelse.

Denne afhandling er en rejseberetning over 100 bærbare computere fra OLPC, der endte på en lille skole i Nigeria. Jeg kalder denne skole for Akilas skole og de bærbare computere for Akilas bærbare efter en 5. classes elev ved navn Akila, som skiftede skole netop på grund af computerne.


Det overordnede anliggende for afhandlingen er at undersøge temaer relateret til teknologi og udvikling gennem studiet af bærbare computere på Akilas skole.

I indledningen bliver dette overordnede anliggende til fem specifikke agendae:

1. Ud fra kritik af teknologisk determinisme hos initiativer som OLPC undersøges de teorier, hvorpå OLPC baserer sig samt hvilken empirisk agens, disse teorier har.
2. Ud fra en post-kolonial kritik af udvikling undersøges ANT som metafy-
sik og analytisk vokabular for analyse af udvikling.

3. Ud fra en observation i transfer- og diffusionsteori om, at teknologi ikke udbredes ved nødvendighed undersøges den proces, som resulterede i at der nu befinder sig computere på Akilas skole.

4. Eftersom deltagere i teknologioverførsel transformerer og genopfinder det de overfører, undersøges afvigelser og multiplicitet i og omkring Akilas computer.

5. Ud fra problemer med hvide elefanter og utilsigtede konsekvenser i udviklingshistorien undersøges det hvorfor også projektet på Akilas skole er endt i limbo.

Disse agendaer undersøges i syv kapitler.

Det første kapitel indeholder en dybdegående undersøgelse af OLPC og de teorier, organisationen beror på. OLPC søger massiv fordeling af bærbare computere til verdens fattige børn i det håb, at børnene kan løftes på to områder: For det første; at de kan inkluderes i et stadigt mere globaliseret informationssamfund. Denne dimension undersøges gennem arbejder fra formanden for OLPC, Nicholas Negroponte. For det andet; at computere kan give et uddannelsesmæssigt løft. Denne dimension undersøges gennem arbejder af Paulo Freire og Seymour Papert. OLPC er centralt placeret i den principielle debat om, hvorvidt digitale teknologier kan skabe fornyet udvikling. Kapitlet introducerer positioner i denne debat og relaterer afhandlingen til disse. Afslutningsvist argumenteres der for, at selv om OLPC er baseret på problematiske antagelser, har disse hjulpet organisationen med at få omtale og finde støtte.

Det andet kapitel beskriver ANT som vokabular og ontologi for studiet af udviklingsmøder. Kapitlet positionerer udvikling i en symmetrisk og ikke-reducerbar metafysik og sætter denne i kontrast til cartesiansk dualisme og marxistisk dialektik. Fra dette udgangspunkt argumenteres der endvidere for, at udviklingsmøder forløber gennem translationer i en proces af konstruktion og komposition. At nye kompositioner etableres frem for at allerede eksisterende indføres. Afslutningsvis redegøres for den kritik, ANT har modtaget samt hvilket potentielle, ANT selv har for at være kritisk.
Det tredje kapitel beskriver metode og tilhørende videnskabsfilosofi. Kapitlet beskriver hvordan afhandlingen kom i stand samt det flerstedede feltarbejde, der ligger til grund for de fremsatte analyser. Det bescribes hvem der er interviewet, og med hvilke metoder, samt hvor og hvornår, der er foretaget deltager-observation. Der argumenteres endvidere for, at afhandlingen performer en særlig akademisk computer, som ikke nødvendigvis er identisk med Akilas computer; at afhandlingen derfor er metodisk valid, idet den anerkender sin egen agens og hybride oprindelse, samt at den er pålidelig i den udstrækning, at den åbner nye muligheder for de, der medtager den i deres praksis.


Det sjette kapitel undersøger, hvordan projektet i Nigeria, og dermed også

Det syvende og sidste kapitel består i en refleksion. Kapitlet introducerer Michel Foucaults begreb *apparatus* og dets brug i kritiske studier af udvikling. Der argumenteres for en alternativ læsning af apparaturet baseret på Gilles Deleuze og Foucault selv. Dette alternative apparatus spores på Akilas skole, hvor der redegøres for linjer af forskellig natur. Der er rigide linjer fra udviklingshistorien; der er smidige linjer der krydser disse; der er rigide linjer om pædagogik i gensidig opposition; og for de fattigste børn er der marginaliserende linjer. Afslutningsvis kritiseres linjerne i Akilas projekt for at være problematiske i relation til hinanden.

Endelig opsummerer en kort konklusion væsentlige argumenter og skitserer tre indsigter for de, der ønsker at skabe social forandring gennem teknologi: at indføre teknologi er at begive sig ud i et multi-lineært møde, at den efterfølgende virkning må forventes at undvige det forestillede, og at et udviklingsmøde involverer ontologisk politik.

**Dansk manchet**

Kan bærbare computere redde verdens fattige?

Informationsteknologien har bredt sig til alle typer af aktivitet i verdens udviklede regioner. Men de, der bor i fattige og underudviklede regioner, har kun begrænset berøring med denne udvikling. Teknologisk ulighed bliver koblet med social og økonomisk ulighed, og der er de senere år opstået en serie initiativer, der søger at bygge bro og skabe socio-økonomisk udvikling gennem informa-
tionsteknologi.

Ét af de mest berømte initiativer er det amerikanske One Laptop per Child (OLPC), der søger at formidle millioner af bærbare computere til verdens fattige børn.

Denne afhandling følger 100 computere fra OLPC på deres vej til en skole i Nigeria. Den beskriver, hvordan computerne transformeres undervejs og ankommer som en række andre ting, end hvad OLPC havde forventet.

Rejseberetningen er baseret på flerstedet kvalitativ feltarbejde i Danmark og Nigeria og undersøger temaer såsom teknologisk agens, udvikling, aktør-netværks teori og post-kolonialisme.