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Public Money for Public Software

The battle for Linux in Munich

ROSA LUXEMBURG STIFTUNG

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1 INTRODUCTION

In 2003, the City of Munich began to change over its administrative software from Microsoft to open source software, completed the changeover in 2013, and then decided at the end of 2017 to return to Microsoft. The changeover of the administration of a major Western European city from Microsoft to Linux was the largest public sector open source project in Europe.

Open source or Free Software[1] is quite deliberately used by a few people, but to the vast majority of people – also among left-leaning people – it continues to appear to be an area for techno-geeks, freaky programmers, and pirates at best. In this case Linux – an operating system using open source – is so widespread in 2016 for example that practically everyone is using it, for personal as well as professional use, as the specialist magazine *c't. Magazin für Computer und Technik* emphasized on the occasion of Linux's 25th birthday.[2]

Correspondingly, the Linux in Munich project is also not a passing phase. Instead, those who are in the know about technology policy have been involved in trench warfare with the representatives of this large corporation for more than 15 years. As proponents of the "Free Software" principle and as such the digital common land, they oppose the representatives of the exclusive digital capitalism that is oriented to maximizing profit. For both camps, Munich's software procurement embodies *the* symbol for each other's superiority. Ostensibly for both it has to do with the common good: the software is to be cheaper, better, more compatible, and more secure. But essentially this unequal battle revolves around the privatization of non-material administrative infrastructure and administrative knowledge because the competitors Microsoft and Linux are not of equal standing. It has to do with systems from two completely different worlds regarding the way in which the software is produced. The example of Munich highlights what we are dealing with when it comes to procuring software for public sector facilities and just how far-reaching the implications are.

1 The terms "Open Source" and "Free Software" are not synonymous: Free Software is the stricter, less popular concept that values the fact that not only the source code has to be accessible, but also that additional freedoms when handling the source code are guaranteed: its free use, modification, and transfer, for instance. In more detail: Lutterbeck, Bernd/Bärwolff, Matthias/Gehring, Robert A. (eds.): Open Source Jahrbuch 2007, Berlin 2007, www.opensourcejahrbuch.de, p. 1 ff. The Open Source Jahrbuch, to which I refer in detail regarding various relevant articles published in it between 2003 and 2007, was a comprehensive scientific compendium on the subject of open source and was produced by the Informatics and Society department at the Technische Universität Berlin, which has also been closed down in the meantime.

2 Cf. "Weltherrscher – fast überall. 25 Jahre Linux: vom Nerd-Spielzeug zum Allround- Betriebssystem", in: c't 18/2016, S. 48, http://vbly.us/37i6. I am using link shortcuts for longer links, although there are good reasons for not doing so (cf. for example the blog by Bruce Schneier, April 18, 2016, http://vbly.us/schneier), so that it remains feasible to follow links also by copying them from the paper version of this text. The vbly.us service uses the Free Software yourls and is obligated through its history to the Free Speech Movement.

2 UNBOXING OPEN SOURCE

In everyday life, most users of electronic devices are not aware that they are using open source software. For example, when they make a call with their android Smartphone or use other functions, when they manage the internet connection with the configuration interface of the router[3], when they write their WordPress-based blog or are surfing the internet with Firefox or Chrome. The ownership rights to the digital property that we handle day in day out are usually a mystery to us. We aren't really interested in them. But we should be. That's because we do like to know which companies make sure that drinking water comes from the faucet because we know: The private enterprise responsible for the communal water supply tends to adulterate good local water with dirty water to the point of where the threshold is *just about* complied with, and fills the unadulterated remainder into bottles to sell it to us for a multiple of the amount. The software with which we work, we manage our lives, and organize our production is just as essential – even the very material kind. Strictly speaking, these IT systems are *critical* infrastructures, without which we cannot live or fight for a better life. In this case, we should also be interested in what is "inside". The fact that the power to control and command encoded into the ownership rights to such infrastructures has generally been declared to be a techno nerd topic, and consequently been reduced and side-lined as a black box (instead of being overturned), is an expression and success of the exercise of rule through social division of labor and robs us of our sovereignty in the life and working areas concerned. How did we get to this?

3 Cf. Linux in electronic small devices, *'embedded systems'*, Henkel, Joachi. m/Tins, Mark: "Die industrielle Nutzung und Entwicklung von Open-Source-Software: Embedded Linux", in: Lutterbeck, Bernd/Bärwolff, Matthias/Gehring, Robert A. (eds.): Open Source Jahrbuch 2005, Berlin 2005, www.opensourcejahrbuch.de/download/jb2005/index.html, p. 123 ff.

3 THE HISTORY OF GNU/LINUX: FREE SOFTWARE FOR ALL

3.1 Hippies and mainframe computers

There was once a time when there were very few computers. They were large and heavy, were in universities, major tech corporations and military research departments and could do virtually nothing. According to the justified criticism, the predominantly male[4] heroes of this era were the programmers who wrote programs for these computers, so they were actually doing something: from an input after the program-controlled processing, an output. Originally punched cards were used for input and output, then magnetic tapes, key boards and monitors, diskettes, and at some point the storage media that we still know today: laser-marked plastic discs (CDs, DVDs, etc.) and mobile SSD memory packs (USB sticks). The programmers programmed operating programs for their computers and therefore had them make calculations for their respective purposes: scientific simulations, business calculations, and missile flight paths. They called these programs operating systems.

The operating system Unix is important to our story.[5] It was written in 1969 on the US East Coast at Bell Laboratories, the Research Department of Western Electric and AT&T, two electronics and telecommunications corporations, and was to simplify the development of task-specific application programs. Unix was a program for simplifying the development of programs. As such, it was very popular within the programming community from the outset. Coincidentally, it was during the wild period around 1968 when Unix came into existence, so the programmers did not emerge unscathed from rampant hippiedom. Also as they did not always want to keep starting their work from the very beginning again and because they all knew each other (whether they worked within academia, the corporations, or the military), they exchanged their operating systems with each other and used their colleagues' most successful parts in order to learn from them themselves and to improve their own code. The concept of "intellectual property" in program source texts, or "code", would not have occurred to them, they would presumably not have understood in the beginning, and then dismissed it in a highly irritated manner: How are you to work in this area in future, if you cannot quickly pass on your program code, and involve third parties because the code snippets belong to the companies? Absurd.

3.2 The PC as a technological expression of the neoliberal response

In the 1980s, the tide turned. The neoliberals were on the path to global domination, all that was left from the hippies was a trend on the market of identities and software was appropriated and stonewalled from above, by the management. The so called "Unix Wars" took place among copyright fortresses erected by the management teams of corporations: Every company attempted to redesign their own Unix variation into a product and to establish it using their own secret interfaces and formats as standard on the market. This is when Richard Stallman – a university programmer, irritated about this proprietarization[6] of Unix – started with the work on a separate, Unix-like operating system and entrenched the freedom to exchange the code and use it again in a manifesto. He called his Unix GNU, Gnu is Not Unix. With the help of a lawyer GNU GPL, the GNU General Public License, a copyright license, later emerged from the manifesto, which was to protect this freedom from appropriation by the proponents of exclusive intellectual property rights through legal means. The GPL has protected this freedom to date in many lawsuits. It forms an oblique anomaly in the civic property regime: It protects non-property with the legal means of civil law that actually emerged historically for, and has as its purpose, the enforcement (not prevention) of individual private property. To date, Stallman is the evangelist to the Free Software movement; the GNU manifesto and the GPL are its canons of scripture.

While the permanently employed programmers at universities, corporations, and the military quarreled about who could use which Unix on which mainframe computer, former garage enthusiasts from the West Coast of the US were readying their personal computers (PCs) for the market and began to create a mass market. For Apple and Microsoft the issue of a license was not an issue. They invested time in the development of hardware and software and primarily wanted to earn money through selling their devices (and not solve scientific questions, develop their *actual* products, or control rockets). Apple focused on the sale of its hardware and was already stonewalling in regard to proprietorship at this level: Only Apple manufactured Apple computers, the software was pre-loaded and could be purchased as a bundle with the hardware. Microsoft gained the crucial competitive edge in this market through an ingenious idea: It disclosed the hardware specifications

4 Cf. for example Meyer, Silke: "Free Software, Free Society? Über die Reproduktion von Differenz in der Praxis von Free/Libre Open Source Software-Communities", Diss. FU Berlin 2013

5 Cf. on the history of the Internet, abbreviated, well-informed, and well-structured: Lang, Susanne: "Eine kurze Geschichte des Internets. Die Inkorporation des Internets in kapitalistische Verhältnisse ist keinesfalls abgeschlossen und noch immer umkämpft", in: *Prokla* 186, 2017, p. 7 ff.

6 Proprietary software (from Latin proprie: proprietary, owned, exclusive) describes software that vigorously limits the right and the possibilities for modifications and adaptations by users and third parties. There are a few mechanisms that make and can keep software proprietary: Software patents, copyright law, license terms (EULAs), the creation of the software based on manufacturer-specific, undisclosed standards, and the treatment of the source text as a company secret *(closed source)*.

for the replication of compatible computers, which meant that every hardware manufacturer could build a Microsoft PC. They would only have to buy a manufacturer's license for the software (the operating system and the central programs such as Office) from Microsoft and could pass on these costs to their end-customers. As a result PCs could be produced increasingly cheaply and a Finnish informatics student by the name of Linus Torvalds could afford to pay for a PC at the beginning of the 1990s.

3.3 GNU/Linux, the anomaly in the regime of intellectual property

Neither the Microsoft DOS operating system included nor the practice Unix by the name of Minix that he had received with a specialist book enclosed with a free license used in his lecture were enough for Torvalds. To supplement his lectures, he expanded Minix with the elements that he needed for his purposes in order to connect to the university network, to read e-mails, and to upload and download files. As he exchanged questions and answers using the Minix mailing list, others noticed that Torvalds was producing his own operating system core in principle – precisely what was still missing as a core element in the GNU project at that time: A kernel is the key element to an operating system. It forms the foundation for the process and data organization with which all other operating system elements and the program applications can work. The kernel forms the undermost software layer and has direct access to the hardware: Input and output devices, main memory (RAM), and processing unit (processors, CPU). Some of the people who had heard about Torvalds' project via the mailing list paid for the last few installments of his new PC and organized online storage space for him for the public further development of his kernel so that people all over the world were able to follow his work and soon created a separate mailing list on kernel development. Almost exactly a year after Torvalds had paid the first installment for his PC, he put the Linux kernel under the GPL license. In doing so, GNU/Linux was complete as a free Unix-like operating system. With increasing mass ownership of PCs throughout the decade, GNU/Linux spread increasingly more widely – not only but also among computer users who tended to be politically more progressive and who had very vehemently opposed the new technology provided by the corporations until then. Almost ten years later, at the start of the 21st century, there were tried and tested pre-packaged installation packages (distributions) for GNU/Linux available on CD or DVD, or to download from the internet, high-performance platforms for de-central, non-linear further development of GNU/Linux itself[7], and an eco-system of smaller service companies for PC and network operations using GNU/Linux. This operating system was therefore also to become an option to be taken seriously for advanced home users and progressive decision-makers in administrative jobs and business over and above the commercial offering from the major IT corporations – at that time Microsoft Windows was ahead. Against this backdrop, the city of Munich, which needed to run a costly and labor-intensive update in 2003, decided to change its administrative systems over to a GNU/Linux system customized to its particular needs. At the time, this strategic decision was most euphorically received by many large sections of the Free Software movement. The Munich Linux project named LiMux was hailed as a beacon for using Free Software.[8]

In the wars of religion between the advocates of one and those of the other operating system, the Munich LiMux has since been put forward as "proof" again and again that you can or cannot operate public sector administration using Free Software. A closer look at the specific case of Munich actually shed light on only one thing: the fact that within the existing conditions of power the question about the operating system cannot be decided based on the technology. The efficiency of the (Free) software used in the arguments of the various stakeholders and lobbyists behind it is always simply a means of achieving their own aims. It's not about the matter itself. Taking a closer look at the Munich example, I will attempt below to show the fact that it is not about the public interest, but that the latter tends to present the ideological terrain on which the conflict of interests is borne out.[9]

7 Git is one such paradigmatic platform. The theorization of the way of working and collaborating on systems such as Git brought about the concept of "commons-based peer production" and is occasionally discussed as a "seed form" of a new means of production that emerged still in the bosom of the old ones, but has the potential to develop itself and the emerging new society from this idea and beyond it: http://vbly.us/keime

8 Incidentally, the first attempt at a Linux migration failed in 2006 in Berlin during the Social Democratic/Socialist Senate coalition. The migration request by the main committee of the House of Representatives (Berlin) was buried in the respective specialist committee. A successful feasibility study from Tempelhof/Schöneberg (borough of Berlin) was ignored and infamously the procurement right to do so: As if Linux could be more exclusive than Windows and not the other way around. In the end, the state secretary responsible rounded off the debate with a downright lie by referring to the failure of the migration in Munich as an argument – at a point in time when this had just started in a serious way. The episode is very well described in Open Source Jahrbuch 2007, p. 234 ff. The pertinent documents about the matter at the time were leaked on netzpolitik.org: http://vbly.us/berlinux

9 Cf. the overview article about this subject on heise.de: Krempl, Stefan: "LiMux-Aus in München: Opposition wettert gegen 'katastrophale Fehlentscheidung'", February 12, 2017, http://vbly.us/37ia

4 CAUSE AND MOTIVATIONS FOR THE CHANGE TO A LINUX-BASED SYSTEM

Cause for the migration in Munich was that Microsoft was putting an end to support for Windows NT 4 at the end of 2003. As a result, a solution to the proprietary operating system version in use up to then was needed. The automatic solution would have been the upgrade to a newer version of Windows, which would have entailed a considerable amount of customization work. In this situation, the then Lord Mayor Christian Ude (SPD) demonstrated openness for sensible suggestions and allowed a consideration which seemed to be daring at first glance, but was self-evident on closer inspection when it comes to awarding public monies: As we are in any case faced with a larger IT rebuild, why don't we go about it in a systematic way and consider other systems/providers as well and check their usability? Set against this backdrop, in a preliminary study the city of Munich investigated five possible configurations to the administrative desktops from three perspectives (economic efficiency, technical feasibility, and strategy), from pure Microsoft-based solutions through to pure open source solutions. In the end, the study revealed a tie between two alternatives.[10]
Ultimately the *political* aspects to the decision were the pivotal ones: The majority of Munich city councilors voted for the solution that appeared to be the more advantageous within "Strategy" in order to support the city's administrative IT strategy, which was designed to be manufacturer-independent and in order to be able to determine the outflow of funds in the long term themselves (= cost savings). The *reason* for the Munich migration existed therefore in a shift towards municipal sovereignty with regard to the setup and the costs of its IT infrastructures. The Munich City Council's decision meant a de facto re-municipalization and was therefore considered as such.
The decision did not imply that *only* open source software was to be used from then on, only that this was *preferred* for use. As an essential point, the decision contains the stipulation that specialized procedures to be developed in future or to be put out to public tender are to be implemented *in a web-based way.* This was supposed to prevent an excessive coupling of operating system, Office suite – that is application programs such as e-mail, calendar, word processing, spreadsheet, or presentation programs – and specialist software.[11]
The catchphrase was "Avoiding lock-in" and refers to factual constraints in procurement policies, which result from the fact that an initial investment reduces or even removes the business management and technical scope for decision-making for subsequent investments that perhaps factually have nothing at all to do with the initial investment.[12]

4.1 Infrastructure sovereignty: Avoiding lock-ins

Through its operating system, Microsoft tries to determine which application programs are used on computers and in what direction further license payments flow. Apple controls its customers' devices and ways of working using its application download function (App Store). Facebook pro-actively follows the strategy in the medium term of closing off the Internet outside its own web offer.[13] Corporations put forward the view that lock-in constellations are justifiable for reasons of security and comfort. Facebook boss Mark Zuckerberg argues along the lines of: "...it is always better to have some access than none at all."
The lock-in issue has now become a widely discussed topic. In April 2017, for instance, the Berlin daily newspaper *Der Tagesspiegel* headlined with "Europe's fatal dependency on Microsoft".[14] In the article, Dietmar Harhoff, Director of the Max Planck Institute for Innovation and Competition in Munich, cautions about the fact that countries would be left behind due to the lock-in with Microsoft: "It has not yet been proven in empirical terms but it is to be assumed in logical terms that the dependency on the one (exclusive) supplier slows down technical progress in the public sector." However, if the municipalities got together and developed their specialist programs together using open source, it would mean that not only patches, updates, and upgrades could immediately be used by all other municipalities, but that no additional costs would arise. "The potential for the public sector is huge", says Harhoff.

10 The technical quality of various software approaches can be weighed up against each other using a series of "hard" criteria. It's about reliability, maintainability, user-friendliness, security, and flexibility. Before weighing them up, you need to be clear about which role the respective criteria play for the separate needs and application scenarios. In general terms and therefore still valid today, a contribution in the Open Source Jahrbuch 2007 explains this by using the example of the respective advantages of Windows and Linux, cf. Open Source Jahrbuch 2007, p. 217 ff.
11 At this point, Steve Ballmer, CEO of Microsoft travelled in the winter of 2003 to Munich in order to discuss his company's offer to the tune of USD 36.6 million with the Lord Mayor, Christian Ude, and the disadvantages of leaving Microsoft's operating system. He lowered the price initially to USD 31.9 (m) and then to USD 23.7 million – his offer was nevertheless rejected; details about this are in: Open Source Jahrbuch 2007, p. 226 ff.
12 Cf. on this point the official, unofficial Microsoft business strategy entitled "Embrace, Extend, and Exterminate" according to the US Department of Justice. US farmers consider themselves to be under threat from quite a similar restriction: The terms and conditions of the agricultural machinery manufacturers make them into illegal hackers if they work on their own tractors with their own tools. Therefore, they have to fight for a "Right to repair": http://vbly.us/r2repair
13 Cf. the Facebook offer "Internet.org", which was still banned after protest in India: http://vbly.us/conq
14 Schumann, Harald/Simantke, Elisa: "Europas fatale Abhängigkeit von Microsoft", in: *Der Tagesspiegel,* May 13, 2017, http://vbly.us/lockin

4.2 Stability and security

However, the trailblazing decision in favor of open source/Linux was not only worthwhile because of costs and innovation: Unix-like operating systems are also secure comparatively speaking. This system security with Linux and similar systems is built into the architecture and does not need to be created later on using special programs (antivirus software and firewalls). A fundamental architecture principle is the consistent separation of user and administrator accounts *(root, sudo).* A second is the modularity of the code based on publicly recorded internal interfaces: This means that parts of the code can be autonomously maintained, further developed, removed, or added separately from the rest, and with allocated responsibilities. What is crucial here is the concept of open source: Everyone can study, examine, and adapt the program code. This gives rise to that fact that the documentation and notification of errors and crashes is worthwhile among other things: Documented problems lead to collective troubleshooting of the accessible code meaning that errors can be caught earlier, patches can be released with a tutorial and integrated in the next update package. This process potentially runs (be it due to security interests of an institution or due to a company or "personal" user interest) where considerably more people are involved than can be the case for proprietary programs, where ultimately only selected employees can have a glimpse of the code. In profit-oriented companies, the resources for error correction and security patches, once the product is sold, are limited to certain personnel and time-restricted in version cycles randomly determined by the companies. By contrast, security gaps not only come to light more swiftly in the open source cosmos, they are generally remedied more swiftly and smoothly.

An additional Linux fundamental architecture principle is at play here: The free nature of Linux systems in conjunction with the modularity facilitates a more intelligent updating system that is *uniform* for all operating systems and program components and *module-based* at the same time. In addition to the system components, "package management"[15] automatically keeps the programs installed up-to-date. Furthermore, the package management uses encryption to guarantee the integrity of the installation sources on the Internet and the compatibility with all packages installed with each other, which has a very positive effect on the stability of the entire system: Operating system crashes based on erroneous or incompatible drivers or applications hardly ever happen. There is no such thing as a "cold start" as a troubleshooting strategy when there's a "system freeze". And instead of using an antivirus program to search for malware that uses known security gaps in system components or in programs installed, such gaps are already closed off through security updates.[16] The updates are free of charge. Also (where applicable) the change aspired to a newer version of the respective Linux version has been taking place in the larger distributions for several years as far as possible automatically and free of charge. Although comparable update functions also exist for other common operating systems, they do not however include the whole piece of software made available, they do not work entirely automatically, or they are not free of charge. These benefits are also not seriously called into question when weighing up Linux and proprietary systems; on the contrary they tend to form the pre-condition for seriously considering complete LINUX migrations and for Linux systems even setting the standard for servers.

The advantages emerging from these architecture principles, which Linux also demonstrates with regard to data security (transportation and file encryption, scope for anonymization, backup applications, and backdoor absence) and data economy, only played a subordinate role in 2003 prior to Snowden's revelations about the NSA and WikiLeaks about the CIA. In the current discussion[17] they have moved into the focus of attention because it is clear that not only Microsoft itself, but also the US government, can get access to any data at any time not originating from US citizens: on January 25, 2017, the newly elected US President signed an order, according to which the validity of the Privacy Act is excluded for persons with no US citizenship or who are not permanent lawful residents in the US.[18] In so doing, he was also invalidating the pro-forma protection of the current data protection deal by the name of Privacy Shield and is making clear that an "appropriate data protection level" for EU citizens in a business or service relationship with a company based in the US can no longer be assumed. In 2012 Federico Heinz, a Latin-American programmer and software activist declared: "A public administration, however, which is obligated to all of society, cannot afford to leave the control of its infrastructure to individual persons or organizations which represent other interests. It administers data whose security (that is, reliability and availability) influences the life of every citizen to a considerable degree. Therefore, it is irresponsible to process these data with software for which only a limited user permission can be purchased under restrictive conditions from the manufacturers."[19]

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15 The operating system and its required and optional elements themselves and all programs are organized in packages and can also mutually access each other and other packages that are mutually required.

16 The existing antivirus programs for Linux therefore serve the purpose of scanning file and e-mail servers for viruses for *other* operating systems.

17 The new directional focus in the spring of 2017 is well illustrated, for example by a piece of background research by the group of journalists called Investigate Europe, www.investigate-europe.eu

18 Cf. Executive Order: Enhancing Public Safety in the Interior of the United States, in: whitehouse.gov. January 25, 2017, http://vbly.us/exorder

19 Heinz, Federico: "Öffentliche Verwaltung braucht freie Software", in: Helfrich, Silke/Heinrich-Böll-Stiftung (eds.): *COMMONS – Für eine neue Politik jenseits von Markt und Staat*, Bielefeld 2012, p. 372, http://vbly.us/heinz

In 2015, the European Court of Justice (ECJ) set out[20] criteria for data protection in transatlantic business relationships in the "Safe Harbor Judgment". The ECJ is not alone in its concerns about data security: At the beginning of 2014, the Chinese government officially announced that they were going to migrate 200 million Windows XP computers to Ubuntu Kylin,[21] the Linux-based operating system. For reasons of security a migration to Windows 8 was even immediately completely prohibited.[22]

20 http://vbly.us/safe
21 Cf. the Wikipedia entry of the same name: https://de.wikipedia.org/wiki/Ubuntu#Ubuntu_Kylin
22 Cf. "China excludes Windows 8 from government computers", in: Xinhua, May 20, 2014, http://vbly.us/xinhua

5 USER-FRIENDLINESS AND COMPATIBILITY: WEAK POINTS TO DO WITH THE SYSTEM CHANGE IN MUNICH

In May 2013, around ten years after the project began, the LiMux project head declared the project was complete.[23] What were the actual problems with LiMux that only four years later led to the decision to reverse the migration?[24]

5.1 User sensitivities

A motion by two CSU-run councils (Christian Social Union in Bavaria) exemplifies the way in which Linux was completely discredited in Munich[25]. At the end of 2015, they criticized the lack of everyday suitability for the municipal councils of the newly procured notebooks with pre-installed Limux in 2014: Awkward to use, incompatibilities, and a lack of user rights were the reason why this was only useable on a very limited basis. They specifically complained that programs such as Skype could not be installed themselves, which prevented "normal use", the reason why a large portion of the devices acquired would grow obsolete "unused". The two municipal councils requested Windows licenses and Office packages for the notebooks and "to also equip the municipal councils with the necessary user rights".

In the media, figures were going round about the excesses of the digitalized administration system: The talk was regularly about 10,000 templates and 130 macros but they have never been mentioned anywhere as a seriously substantiated problem. For the administration of a city the size of Munich, it seems to be about normal dimensions of the differentiation of bureaucratic depiction of daily life. On the supply side, the head of the internal IT service provider it@M was already able to state in 2014 on the occasion of a debate about LiMux in conjunction with the then Munich local council election campaign that he was not aware of any complaints or disruptions in excess of what would be expected in an administration of this size.[26] He was still of this view even in 2017 in light of the decision to move away from Linux.[27]

In general, it needs to be emphasized that with Linux a very wide-ranging adaptation of user interface and computer environment to individual needs is possible because the setup options are comprehensive and filed in an accessible and editable way in human-readable files. Therefore at the moment GNU/Linux is particularly popular in smaller language groups, for whom a special language version is not profitable for the commercial software manufacturers. The specific language group can meet their requirements themselves and adjust the localization of the operating system and the programs in such a way that it becomes possible to work in the mother tongue. For the operation of German administrations, the common Linux applications and interfaces can be configured in such a way that they work like and look like Windows, which makes a system changeover easier for users. And as the technologies for graphical user interfaces are becoming more and more mature, revolutionary new features, such as windows and the mouse pointer once were, are becoming increasingly rarer. As a consequence, the look and feel on the various platforms now tends to become more similar to one another in any case and is going through a similarly directed maturation process.

5.2 Strategic and tactical problems

A critical error at strategic level when introducing Linux in Munich in the early 2000s was intended to clean up the uncontrolled growth in departments and applications in one go, and at the same time migrate to a new technical system. The introduction of Linux was also advocated by several proponents as a possibility for rationalizing work processes, that is, like an administrative reform process so to speak. Up to the present day, one reason for defensive attitudes on the part of users is not the migration to Linux as such but the fact that, in the course of the migration, the access administration had also been cleaned up, access rights had been allocated based on requirements, and an abandoning of DIY Officemacros and other uncontrolled growth in administrative practice had taken place. As everything happened at the same time, "Linux was to blame" for every problem in the minds of the users. In hindsight, although the attempt to kill two birds with one stone was the right decision, because the alternative would have been to get rid of the uncontrolled growth first, then to change Office and the other applications, and finally to start everything using Linux. However, this would not

23 Feilner, Markus: "Auf den Punkt 10 Jahre: Limux 'ist fertig'", in: linux-magazin.de, May 28, 2013, http://vbly.us/feilner

24 Dieter Reiter (SPD) succeeded the Linux proponent, Christian Ude, (also SPD) as Lord Mayor in 2014. Reiter had in the past endeavored in his capacity as head of the department for the economy (*Wirtschaftsreferent*) to get Microsoft Germany's headquarters from Unterschleißheim moved into his "own tax collection area", to Munich. And this move did in fact take place in 2016.

25 Stadträtin Sabine Pfeiler/Stadtrat Otto Seidl: "Notebooks und Tablets für den alltäglichen Gebrauch tauglich machen!" (pdf), in: CSU. RIS Munich, July 28, 2015, http://vbly.us/stadtrat

26 Cf. Krempl, Stefan: "LiMux: Linux in München unter politischem Beschuss, in: Heise Online, July 15, 2014, www.heise.de/-2260806

27 Cf. Krempl, Stefan: "Münchner IT-Leiter zu LiMux: "'Es gibt keine größeren technischen Probleme'", in: Heise Online, March 6, 2017, www.heise.de/-3644868

only have taken ten years longer but would have also cost a lot more money. In addition, the argument was far too tempting for the Linux proponents: We will solve your administrative problems with Linux at the same time. An own goal in the long term as is now evident.
There were also errors at "tactical" level in the execution: Creating a proprietary, private distribution should be seen as one of them. Supporting the migration was not achieved (nor was it even attempted) through cooperation with other cities. In this way, the benefits of Free Software cannot be exhausted, development results not shared, and synergies not used. It is already becoming expensive and time-consuming to maintain the basic system. There is hardly any time left to carry out own developments. The developer community has hardly any growth perspectives. There was a lack of marketing and willingness on the part of the administration's leadership to promote their decision in a systematic and pro-active way beyond their own boundaries within the framework of "cross-municipal collaboration". Not to mention those municipalities that have already had outsourcing contracts with private companies in place for many years and don't have any own IT strategists left in their staffing plan to participate in such a process. And those municipal IT people in place have their hands tied, as reported by some of those involved: "This is difficult in principle. It's not part of the job of an administration to be active in the market "in an entrepreneurial way". If a municipal company does this, then it is immediately caught in the legal cross-fire because it competes with private enterprise in an entrepreneurial way, subsidized by taxpayers' money. We [IT department, also in a municipal company of a district-free city] are, for example, not allowed to do any pro-active marketing. Then we immediately receive a letter from the supervisory authority saying that we are overstepping our competences."[28] If seen this way, the issue of compatibility loses its purely technical character (which format is the best and the most widespread?) and becomes a matter of social relevance that can be blocked politically, but can also be *shaped*. If both parties to a communication or data exchange relationship agreed with each other not only regarding the content of their exchange, but also regarding the format, then the question of compatibility loses its character of inherent necessity and network or platform impacts[29] can be reduced or avoided. Compatibility is not a feature of the individual thing, but a correlation between two or more things. Between public administrations of various regions or hierarchies, open protocols, interface standards, and file formats should be a matter of course as an *option* for the exchange for reasons of security and sovereignty alone. This was precisely the argument made by the Mecklenburg-Western Pomerania Court of Audit in an exemplary way in its 2015 annual report – they themselves migrated to open source in the early 2000s.[30]

5.3 The discussion: LiMux as a whipping boy for all administrative blips

The problems encountered during the changeover in Munich were exacerbated by a basic mechanism of the digitalization of administration processes. With the help of computers, bureaucracies are getting the computing power to even carry out extremely inefficient, inadequately thought out, or even contradictory processes right through to a very substantial degree of implementation. On paper such processes are not a problem because you can quickly speak to one another in order to understand discrepancies and to clear them up immediately. However, if such processes are mapped and automated within a computer environment, the possibility of errors in the implementation rises with increasing over-differentiation, which can then only be corrected by specialist technical personnel. At the same time, the performance expectations from an IT supported system are greater, which means that staff are cut back rather than recruited. If a technical change is linked with hopes of a qualitative improvement of administrative work (for employees *and* customers) and this expectation is not met because the computerization does not improve the bureaucratic processes *per se,* but instead tends to increase existing inefficiencies, there will be *more* dissatisfaction than when a familiar system with its inefficiencies is simply continued to be used.[31] Therefore the mood pendulum is now moving with all the full pelt of the frustrated administration staff affected towards Microsoft along the lines of "everything will be again as it was before". The populist and opportunist politicians of the grand coalition are deriving their new IT policy from this mood. It could be said that Munich executed LiMux like a standard, internal IT project, exactly like an upgrade to the newest version of Windows or an SAP introduction, for instance. However, Free and Open Source Software (FOSS) is based on the community principle. Therefore, it would have been better

28 "LiMux-Aus in München: Opposition wettert gegen "katastrophale Fehlentscheidung", in: *Heise-Forum Online,* February 13, 2017, http://vbly.us/drufusan
29 Network or platform effect: the individual subject thinks and has to think: The overwhelming majority is here so I have to be there too, have absolutely no choice, because anywhere else I would be alone.
30 Cf. "Feststellungen und Empfehlungen des Landesrechnungshofes", in: Landesrechnungshof Mecklenburg-Vorpommern: Jahresbericht 2015, Schwerin 2016, http://vbly.us/lrhmv, p. 63 ff., especially p. 65. Cf. also the "Migrationsbericht eines Rechnungshofmitarbeiters" in: Gehring, Robert A./Lutterbeck, Bernd (eds.): Open Source Jahrbuch 2004, Berlin 2004, http://vbly.us/mueller
31 Cf. "LiMux-Aus in München: Opposition wettert gegen "katastrophale Fehlentscheidung", in: *Heise-Forum Online,* January 23, 2009, http://vbly.us/joesi

if Munich had opened up, communicated its own difficulties and experiences more openly, or had also worked more closely together with upstream or interested parties on the distribution[32]. Then perhaps the spark of LiMux could have perhaps jumped over to other cities and municipalities.
A person from a municipal archives commented on the decision to move away from LiMux in precisely this way: "It was not LiMux itself that failed, but the will to implement it with enough staff and resources in such a way that the user on the client side hardly realizes that much has changed. If, however, the local service roles are chronically understaffed and instead of being able to roll out the current basis clients, they have to serve the special wishes of city councilors, then it cannot work. After IT@M finally found its structure about two years ago [2015] and workflows such as IT security are finally working, which also makes the release of required (non-Linux) software possible, I cannot express how annoyed I am that everything is now being thrown overboard again."[33]

32 "Upstream" are those people in the cosmos of the production of Free Software from whom you got your source code and to whom you play back your own code revisions or amendments ("commits") or from whom you can request support or even the implementation of feature requests, if you yourself get into an impasse.
33 "Immer diese Vorurteile gegen Archive", in: *Heise-Forum Online*, February 13, 2017, http://vbly.us/stilangel

6 WHAT CAN BE DONE? HOW CAN IT BE HELPED?

6.1 Expanding the menu

Where is the need for development? And how can this development be supported over and above the Munich administration and outside the technical sphere? Not even the global management consultancy and outsourcing corporation Accenture can offer any advice in its report regarding the complete move away from LiMux – even if it is spread around as such by almost everyone.[34] This report was commissioned by the Munich Grand Coalition and paid for by public monies but not published[35] as yet. Also the costs of having decided to return to monopolistic software at the end of 2017 were to remain a secret in the beginning.[36]

The Accenture report instead recommended moving to an *expanded menu,* according to heise.de: "The departments and separate businesses should have the choice as to which operating system and which office communication is 'suitable for use in their area'." Each larger administration unit could therefore decide for themselves whether they would like to use Microsoft or open source products. "Depending on the development of the spread of the client versions, 'it should be checked at a later point in time according to the experts,' whether using Linux as a client operating system continues to make economic sense'."[37]

According to a survey by the University of Maastricht in 2005[38] almost half of all public administrations in Europe work with Free Software; however mostly to a smaller extent, and in part, without being aware of it, for example on their Apache web servers with content management systems such as typo3 or WordPress. An IT strategy that is not based on demonizing the one or other but aimed at expanding the menu would therefore be useful, so that the freedom of choice according to purpose of use and inter-operability between different setups is secured. In any case, the climate for this is probably poisoned in Munich; the assessment of a heise.de forum user makes a good point point: "It's not only that admin staff and developers get good jobs, they are hardly going to wait around up to the last moment until they look for new employment. [...] Looking for a new job without having been given notice is simply more relaxed, in particular if you know very well that your job can't continue in this way for much longer anyway. Who is that stupid and hangs around waiting to get fired? Accordingly it can easily happen to them [the city of Munich administration] that in a few months their IT team will shrink massively and only an emergency service can still be maintained. And to then manage a migration on top of it when those who are familiar with the processes and their organization at IT level are all gone will be enormous fun. Then you have to start all over again right from the beginning [...] that ties up resources right across all departments. But oh well, in hindsight it's the fault of Linux again."[39]

A pilot project in Rhineland-Palatinate aimed at this type of menu expansion: From 2009 11 primary schools migrated to Skolelinux/EduLinux, a Linux version based on the Debian distribution, optimized for use by schools. The aim of the pilot project was to be able to let the schools choose later between MNS+, a Windows-based solution, and a Linux environment.[40] Open Source Jahrbuch 2007 reports about the predominantly positive experiences with the two-track operation in Austria's schools.[41]

6.2 Making positive impacts visible and factoring them in

The traditional industrial smokestack externalizes negative effects: Neither the general health of the population ruined by air pollution nor the costs for cleaning up the air (maintenance of parks and woods) have to be accounted for by the operator of the smokestack. If they themselves find the air gets too thick, they build themselves an even higher smokestack. The fundamental experience of working with Free Software is to the contrary: Code snippets, or whole programs that are released on cooperation platforms such as Github, are becoming part of a digital common land. They are available to all interested parties for use and further development.

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34 At this point one should bring to mind the fact that Microsoft and training companies licensed by Microsoft put millions into promoting their system administration courses, which not only address online editors, but importantly also those specialist magazines that report in more detail about the topic. But as we all know the advertising section and the editorial section operate under the given conditions of "Concentration and Homogenization" – the headline of the relevant chapter in Thomas Schuster's Staat und Medien. Über die elektronische Konditionierung der Wirklichkeit, Frankfurt (Main) 1995 (generally known to be completely independent of each other). Cf. also Chomsky, Noam: Manufacturing Consent, documentary film 1992. At this point in the sentence, the punctuation indicator for irony/sarcasm was unfortunately missing.

35 Only a 129-page paper by one of the specialist departments at the Munich city administration is publicly available, not however the 450-page report itself: http://vbly.us/mucpap

36 The opposition parties within the relevant council committee at least pushed for the release of the rough estimate. Over the next six years, EUR 86.1 million should initially be transferred. Of those EUR 49.3 million alone is due to the IT work place with Microsoft Windows; cf. Krempl, Stefan: "Endgültiges Aus für LiMux: Münchener Stadtrat setzt den Pinguin vor die Tür", in: Heise Online, November 23, 2017, https://heise.de/-3900439

37 Krempl, Stefan: "Linux in München: Berater empfehlen Ausstieg aus LiMux auf Raten", in: Heise Online, November 10, 2016, https://heise.de/-3463100

38 Lindner, Mirko: "Die Hälfte der EU-Ämter arbeitet mit freier Software", in: pro-linux. de, October 25, 2005, http://vbly.us/lindner

39 "Um die Entwickler braucht man sich keine Sorgen zu machen", in: *Heise-Forum Online,* February 12, 2017, http://vbly.us/frosch

40 Böttger, Christian: "Skolelinux für Schulen in Rheinland-Pfalz", in: iX, March 16, 2009, https://heise.de/-206955

41 Open Source Jahrbuch 2007, p. 365 ff, http://vbly.us/schule

Public money that is used for the production of Free Software is not only for the benefit of the immediate application context for which it was budgeted but also for every identical or related project somewhere else and/or in the future: The cooperative peer-production of Free Software externalizes *positive* effects.
The LiMux project initially cost a great deal of money: the figure of EUR 14 million over the course of 13 years was frequently mentioned versus EUR 11 million, which it would have cost with Microsoft. The only official figures originate from 2012 – one year before the completion of the migration – and show the ratio the other way around: "The current costs affecting the budget for the LiMux project amount to EUR 11.7 million (as at the end of December 2011). In the decision of the Munich Administrative and Human Resources Committee (Verwaltungs- und Personalausschuss, "VPA") dated June 16, 2010 (reference no. 08-14/V 04284) an alternative costing is set out for the expenditure of maintaining the operation of Windows systems comparable to the scope of performance for the LiMux project at the time. [...] An expansion based on Windows comparable to the scope of performance of the LiMux project would have therefore created calculated costs up to that point of a minimum of EUR 15.52 million."[42]
Regardless of the fact that it remains unclear what the respective calculations are exactly based on and what not, additional costs of three million euros (or significantly less than 30%) could have been substantiated, if they are justified through what had been achieved, for instance a Linux distribution optimized for the authorities. The expenditure for further development and maintenance is usually lower than the recurring licensing costs for a proprietary operating system and – recently – the subscription costs for a proprietary Office package. Products from within Free Software are available without any further licensing costs to other public administrations who perhaps first observed the Munich experiment from the outside.
Being independent of a manufacturer opens up a great deal of other possibilities to save money in the future. Without the risk of being blackmailed, you can, for example, invest significantly more cheaply in modern cloud infrastructures. By contrast, Microsoft always pushes you toward its own Cloud offers, Office 365 and Azure, and they are all expensive. If you want or need a non-Microsoft cloud with better data protection interacting with a Windows environment, it gets *even more* expensive if it ultimately all has to fit together. With Linux you are free; you can build your own cloud or choose a local competitor, therefore you have significantly more scope with lower costs and meet stricter data protection standards. Of course not everything should be done by administration employees can meet themselves. Within the framework of a sensible FOSS strategy the public money would nevertheless go to private service providers, it tends however to go more to members of the local and regional small to medium business community – who certainly pay comparatively higher taxes than Microsoft.[43] In addition the expertise is accumulated locally.[44] From a financial point of view, a macroeconomic calculation in principle is much more suitable than the common way of business accounting. As only this way at least a part of the positive effects can be accounted for, which are effected through using and developing FOSS, but are "externalized" from a business accounting perspective.
The Green Party and Pirate Party in Munich criticize the plans to migrate away (from Linux) and refer to the 60 to 70 municipal Linux programmers, for example. Millions saved during the last few years in licensing fees went towards (paying for) the work of these people. The results of the work, in turn, are not just open to the City of Munich, but according to the principle of Free Software to all interested user groups, for example in other municipalities using Linux in their administrations, and vice versa; that's because the others have their Linux experts too, who solve problems locally and make their solutions to problems available globally again in line with the commons-based peer production way of working.[45]

6.3 Making digital administrative practice generally available, not privatizing it

Free Software Foundation Europe's Public Money/Public Software campaign (FSFE) focuses on this. If such a change in thinking within the ranks of the courts of audit led to pressure on the public administrations from this direction, then the framework conditions for concerted Linux operation across federal levels and regional borders of administrative units would suddenly be quite different. *Free Software mainstreaming* would be the appropriate political demand for parties and politicians who want to engage with this topic: "Open Source, where possible and commercial software, where necessary." Every public tender and procurement process would have to be reviewed not only for gender equality, competition, environment, and social standards but also with regard to whether there is an applicant or provider who can offer the same service, the same software,

42 Press and Information Service of the state capital of Munich: Rathausumschau, issue 54 (pdf), p. 12–13, March 19, 2012, quoted from Wikipedia, the original files is downloadable, but is "damaged" (April 11, 2017), http://vbly.us/rathaus
43 According to estimates the corporation pays only about three percent tax on its profits and in this way has "saved" around USD 45 billion since 2015; cf. "Microsoft erneut wegen Steuertricks in der Kritik", in: Wiener Zeitung Online, August 23, 2017, http://vbly.us/tricks
44 South Korea is shaping its economic development in this way: "Südkorea: Linux-Migration für die Wirtschaftlichkeit", in: FSPA-Newsletter, February 21, 2006, http://vbly.us/korea. The French Government has also chosen this path: "Frankreich: Open-Source-Einsatz in der Verwaltung nimmt zu", in: Heise Online, April 26, 2012, https://heise.de/-1545875
45 Cf. the Texts on commons-based peer production for instance on keimform.de

the same devices based on Free Hardware and Software and open technical standards.[46] In Peru, a respective law has been in force since 2005, which could serve as an example:[47]

- No state sector organization can procure hardware on which only free or only proprietary software can be run.
- Proprietary software is in no way excluded, although licenses for proprietary software can only be purchased after in-depth review, which includes a comparative analysis of the software on the market and a list of costs and benefits for the entire service period of the software.
- Training sessions are to be kept technology-neutral.

Additional costs within reasonable limits should not constitute a reason for exclusion in view of the investment's benefit to the public. There are even often savings to be made by switching to Free Software, which, in turn, could be invested in the sponsoring of public sector security and stability reviews (audits) and in rewards for finding bugs ("bug bounties"). Particularly in smaller towns such as Schwäbisch Hall,[48] Göppingen, Isernhagen, Leonberg, and Gummersbach, where even the Client WollMux developed in Munich is used, as well as from Leipzig, there are positive reports of administrative work with Free Software.[49]

In addition to the long list of successful and less successful examples of migrating to and from, beyond the example of Munich, there are already cross-sectional institutions today that work on societal on-boarding into the move away from the lock-in trap of the providers of proprietary software. Richard Stallman, inventor of the GNU license, the best-known license for Free Software, and programmer on various important projects, outlines the measures that governments can take to promote Free Software. In this sense, the European Union with the Open Source Observatory (OSOR) located at the Commission is ensuring "exchanging information, experiences, and best practices around open source solutions for use in public administrations. We help you find open source software made available by other public administrations, and solve issues related to development."[50]

At federal level, the Open Source Competence Center[51] exists and is responsible for promoting the use of open source software (OSS) in the (German) Federal Government's administration. In addition to technical comparisons and guidelines (unfortunately from 2008), a 543-page "Migration Guide" from the Federal Ministry also provides information about administrative matters with a significantly longer half-life period such as liability and procurement law. What is also still valuable, especially during the early phase of considering migration, is the nigh on 20-page summary of the migration guide in Open Source Jahrbuch 2004. The text lists the most important issues and steps when planning and implementing a migration during operations and explains them in a concise way.[52]

46 Cf. 2013 Election Manifesto of the Pirate Party (Piratenpartei Deutschland): http://vbly.us/pricom and the development process for the 2017 Manifesto: http://vbly.us/pirates
47 Cf. Peru Passes Free Software Law, September 26, 2005, https://politics.slashdot.org and the document of the law itself: http://vbly.us/bill
48 Cf. the case study in the Open Source Jahrbuch 2005, p. 37 ff.
49 Cf. the successful and less successful examples on the Wikipedia list "Open Source Software in state sector facilities": http://vbly.us/zbsp
50 OSOR Internet presence: https://joinup.ec.europa.eu/community/osor/home
51 Further information about this on p 21. of the Open Source Jahrbuch 2005.
52 cf. Ganten, Peter H.: "Erfolgsfaktoren bei der Einführung von Linux in Unternehmen", in: Open Source Jahrbuch 2004, p. 249 ff.

7 SUMMARY

The use of Linux in public administrations is not a technical issue but a political one: It's about the sovereignty of municipal data processing and therefore about tackling the waste or better put: privatization of public monies for the purpose of profit-maximization by private license-owning corporations. With Linux in public administration, public monies produce public software for the common good of the community, i.e. *common goods.* Whoever positions themselves in the question of open/Free Software or proprietary licensed products or even acts as a decision-maker, will position themselves on the one or the other side in the struggle about the privatization of public resources. If you decide to make the move toward a changeover, you are less dependent on the business strategies of a few large corporations in the future and begin to take practical problems into your own hands and solve them – in worldwide collaboration with others who are working on the same or similar problems.[53] Moral calls, however, aimed at the spread of Free Software, are more than just wasted time. They can even work in a counter-productive way, if they detract from the actual work, the development of good software that is in line with human requirements and relevant. So a few Free Software developers commented on the case of Munich in that way: Do you see, we were from the outset against the stylization of Munich as a "beacon" of the application of Free Software through a larger body. Free Software does not need any beacons. The work on the better product is happening gradually, and therefore the fruits of our labors are establishing themselves in the same way. The LiMux summary made by the president of the Free Software Foundation Europe, Matthias Kirschner, also sounded more or less that way.[54] Broadly speaking: An advancement in productive forces, which is able to revolutionize the relations of production (key word: "seed form"), neither needs beacons nor calls to assert itself. Those who assess advancements in productive forces with regard to their revolutionary[55] potential[56] more adequately than others, should stay ahead within the context of transformations catalyzed by developments of productive forces. Development of productive forces is at the same time cause, effect, and means in class struggle-type conflicts. Whoever deliberately uses the most progressive means in their own class interest, can determine the direction of the transformation – perhaps even its objective. At the moment, not only the large IT corporations but also the entire ICT industry conduct themselves as if they had understood this: They themselves manufacture to a great extent using Free Software (servers, systems for administering versions, databases, security technology, etc.), however they keep their customers dependent on their proprietary products. The public administrations (with a few exceptions) continue to collaborate in the associated private appropriation of public wealth, as long they do not feel any pressure from below or from the outside.

German version: www.rosalux.de/publikation/id/38208

53 For a series of examples, see the award-winning administrative bodies in the European Commission's competition called "Sharing & Reuse".

54 Cf. the recording of the presentation by Matthias Kirschner at the 58th evening on net politics on March 8, 2017 in Berlin: www.youtube.com/watch?v=lPd5N2Y5nuM and the interview with Matthias Kirschner on March 9, 2017, www.pietcast.com/folge-0026-limux/

55 In this context, "disruptive" innovation is increasingly mentioned. What is meant is that a new technology completely "disrupts" existing products or services, even whole sectors, and the influence of complete fractions of capital without anything changing in the societal framework, the rule of government and capital, and the capitalist means of production.

56 In his analysis "Digitalisierung, Klassenkampf, Revolution" Stephan Kaufmann captures the current rationalization step as primarily *technical,* discusses the question as to whether it is a "digital revolution", and suggests "no" as an answer (cf. Kaufmann, Stephan: "Digitalisierung, Klassenkampf, Revolution", eds. Rosa-Luxemburg-Stiftung, *Analysen* 33, Berlin 2016, p. 14 f.). By contrast, in this paper, I argue the hypothesis that the *social way,* in which Free Software is *produced*, is an advancement in productive forces with the potential to upend the relations of *property* and therefore relations of production – either from above through rationalization or from below through appropriation and socialization at least initially of the software-type means of production. The latter remains contested and forms the core of the class struggle of debates on copyright law and private copy for instance. However, the standard types of conflict in the struggle between those subjected to dependent work and those with capital remain on-going. Stephan Kaufmann presents this in detail very aptly.