

Pan-hacker culture and unconventional software innovation: exploring the socio-economic dimensions of Linux

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Abstract:

Hacking as an activity of problems resolution with a full understanding of the technology, has developed into a category of 'hacker-ship' in the software industry. It is the practices of hacker-ship shape the development of computer industry most. This paper proposes an idea of 'pan-hacker culture' in the Linux community where hacking origins from a spirit of problem resolution and evolved to an unconventional way of living. New issues such as free speech and free software are introduced in the pan-hacker culture. Pan-hacker culture also influences the software innovation process because the phenomenon indicates the Linux users to play a different role in the production process. Software is no longer an economical goods but a language for the users and the developers to communicate with each other. Because of the capability of software language, the interactions between users and developers influence their identity and permit a mobile and hybrid identity for Linux members. In addition, rising up from an informal group on the internet, the development of Linux community is different from other formal user groups. This paper also investigates the evolution of Linux community beginning with an informal group and being developed into an institutionalized community. In this process, the involvement of informal actors in the dynamic innovation process is focused as well.

Hackers, Hacking Practices, and Hacker-ship

In 1984, Steven Levy published a path-breaking book entitled 'hackers: Heroes of the computer revolution' that described the hacker culture. This book revealed an unknown world where technical innovation was developing at a high speed. Members of this world tried to mobilise the power of computing in entirely novel ways. They communicated with each other through the Net in a binary-coded language. Because this world was so different from wider social life, its members were regarded with suspicion and often seen as deviant. However, Levy's book in 1984 decriminalized hackers, as readers learned that the era of hacking had commenced in the 1960s in university computer science departments where highly skilled students worked and shared information on the Net. Not surprisingly, perhaps, during the following decade hackers gained great success in computer businesses such as Apple and HP. It seemed that their business success was so marked that their identity as 'hackers' per se was downplayed. Then there came the software hackers of the early 1980s who created the application, education and entertainment programs for personal computers. Bill Gate's Microsoft was started at this time. With the growth of internet, the contemporary hacker generation is engaging with new '.net' issues such as

licensing, patents, security and privacy, all key to the development of the software industry. In addition to developing software technology, hackers in this generation also have to deal with more social and political issues than before.

Reviewing the history of hackers, an evolution comparable to the history of computers can be observed. However, the definition of 'hacker' remains obscure. Though there is a Hacker Dictionary and a code of hacker (Hacker Ethics), a single and stable definition of the 'hacker' is hard to give. While the majority of the public still regards hackers as hostile, for insiders¹ in the hacker communities, being a hacker does not mean being exactly good or bad; rather, being a hacker means being creative and innovative.

In fact, rather than seek a single definition of 'the hacker' it is more appropriate to examine hacking-type practices as they are found within and outside of the conventional world of computing. Perhaps not every insider in the computer industry would call himself/herself a hacker, but we can observe hacker practices being followed there. The practices include² :

1. Interest in tackling software problems and resolving them.
2. Writing challenging scripts to explore software vulnerabilities.
3. A strong interest in decryption, code-breaking.
4. Writing creative scripts and sharing them.
5. Developing novel hardware and sharing the proprietary information on which it is based.

The first point is the classical meaning of hacking in computing. The second point specifies hacking in computer security as the third point is extended hacking to the challenge in cryptography. The fourth and fifth point are more about free computing (hardware or software). The order of the list also implies the timeline evolution of hacking from technological problem resolution in student circle to a wide range of practitioners including computer professionals.

What is interesting is that such practices are not peculiar or specific to the activities typically ascribed to hackers, but might be said to characterise computer innovation more generally. In this way such a constellation of practices may not provide quantitative indicators to measure the degree to which hackers influence the development of software, but they do allow us to map the pattern of activities that have played a central role in the ongoing development of innovative software (and indeed operating systems), and where and when these activities are found within and outside of conventional, mainstream computing. Because these practices can be readily found among the majority of insiders in the computer world, this might give us a chance to observe what I would like to call 'hacker-ship'³, an activity that is much more extensive than conventionally assumed, and suggests points of contiguity and overlap between mainstream and 'outsider'⁴ innovation. This overlap has, in fact, been increasingly seen to be important in a number of areas where new technologies are involved, notably in the case of innovative health technologies. It is this phenomenon I want to explore in this paper, and do so through the development of Linux as a system that occupies a dual site within and outside mainstream computing.

The development and operation of Linux has its historical roots in hacking culture. Actually, several open source programmers such as Eric Raymond, Richard Stallman

and Linus Torvalds have declared themselves to be pioneering 'hackers' in their publications 5. Linux is a good example of hacking evolution. Linus Torvalds began Linux as a hack; he wanted to play with Minix with a new hardware platform previously unknown by Minix. So, Linus wrote his own version of Minix. It was in 1991. Then, he put it free on the Internet and a lot of people put things in it, and resolved some problems. Linux is the product of hacker team-work. Being a Linux user is similar to being a hacker: the user is willing to write creative programmes and to share information (source code). I would like to call this phenomenon a 'pan-hacker' phenomenon. Users in the Linux community have been living with the pan-hacker culture since the very beginning of Linux. I want to argue that this pan-hacker culture has played an important role in shaping innovation in the software industry.

Pan-hacker culture

As mentioned above, a hacker can be explained broadly or narrowly, inclusively and exclusively. According to most of the insiders in the hacker communities, a hacker is the one who writes programmes using unconventional software engineering methods, improving the efficiency and speed of already-existing programs, and who regards programming as a form of fun or entertainment.

Linux originates from the idea of open source and gain collective efforts from diverse hacker users. Programming for the Linux developers was a hobby 6. Linux was created on their leisure time. For these experts, they are hackers without doubt. But I would like to argue that, Linux end-users, from the broad meaning of hacker, can be called 'hackers' as well.

Being a hacker, you have to be akin at learning new knowledge and embracing new technology 7. When Linux appeared to be an unconventional operating system in the very beginning, general users tended to stick on the original system that they were familiar with, such as Microsoft. Surely this is from the very human nature to be stable. However, curiosity is another human nature. Some people prefer adventure to sweet home life. They take the first step and try Linux. To be a Linux user, one has to know the basic program knowledge because the UNIX-type system all relied very much on language command input rather than mouse-click input. Therefore, to meet the requirements, an outsider of the computer science must learn programming. In addition, Linux is a new system; new program and new application are renewing and adding quickly. To catch on the innovative pace, one must update his/her knowledge very often. Moreover, because of the open source trait, Linux contributors get information and add information almost limitlessly. More information is generated on the Linux engineering process. Linux users must work hard enough to operate Linux adequately. Well, if one just takes Linux as a hard work on software learning, he/she would get frustrated easily and drop out of the group straightforwardly. Being a member in the Linux community must be a joy so that one can have sufficient motives keeping enthusiastic at Linux process. These are the reasons why an general Linux user is a hacker.

As a whole, the Linux community is constructed as a pan-hacker culture by its developers and end-users.

The hybrid identity

Generally speaking, both developers/innovators and end-users belong to the user category. However, in Linux community, the boundary between developers/innovators and users are finer than others. In fact, a Linux user can have a hybrid identity as both an end-user and a developer. In an open source community, information is distributed freely. Therefore, one can be both an information-receiver and a contributor; one can be an end-user of other people's program, and contribute to modify the program then re-distribute it again. The Linux users are 'perpetual novice' 8, and also experts/insiders. This cycle is processing through the on-line communication in newsgroups, mailing lists, chat rooms or even ICQ. The idea of open source enables the users to have a hybrid identity, and this ability to be both developers and users promises Linux to be a dynamic and creative operating system.

Unconventional software innovation process

The 'user' is the most crucial factor in the innovation process. Because of the users' hacker traits, the Linux is turning out to illustrate an unconventional software innovation. While more Linux users gather to form a community, the diffusion of innovation has been happening. Diffusion is a communication process in which new ideas, opinions or products are adopted throughout a society. 'Diffusion is the process by which an innovation is communicated through certain channels over the members of a social system' 9. According to Rogers (ibid.), a technological innovation is adopted following with five stages: knowledge, persuasion, decision, implementation and confirmation. He also distinguishes five groups of users: innovators, early adopters, early majority, late majority and laggards. Linux has been developed by innovators and adopted by early adopters. Now there has been a majority of early users. In the process of Linux diffusion, there are several innovational facts can be observed. Some of them are followed the traditional innovation rules, but some of them are unconventional.

The process of Linux diffusion followed the procedure that from innovators, early adopters, early majority, late majority and laggards (maybe soon in the future). The early adopters had a low resistance (the hacker trait) therefore the diffusion rate on them was faster. Via the support of these early adopters, the critical mass was formed (Linux community) to facilitate the diffusion process. The fact 're-invention' also appeared in the development of Linux that kernel and peripheral programs are changed and modified by users in the process of its adoption and implementation. Linux community is constructed to fulfill the corresponding uses as 'a source of novel product concepts' made by lead users. The development of Linux community is exactly a socio-technical constructed model. To analyze the socio-political changes in Linux innovation process, views on the 'user representation' are employed since 'user' is the most important factor in the Linux innovation process.

Vedel 10 argued that the politics of technological innovation is based on the notion of the 'socio-politics of usages' 11. He suggested to analyze the intersection of four determinant factors while studying technology innovation. The four factors are technical and social logics, which group together into the concept of socio-technical configuration, and production and use logics, which together form the concept of user representation. Vedel mentioned that although the social dynamics of technological

innovations develop through the process of socio-technical configuration, the politics of innovations is forged through the process of representation. However, the antagonists of Vedel disagreed with him and asserted that users have difficulties in organizing themselves as pressure or lobbying groups because of 'aggregation of dispersed interests', which are sometimes conflicting if not contradictory. Pierre Chambat 12 actually said, in front of a highly fragmented and specialized technology, users tend to become rather 'atomized' and individualized without common identity and, hence, incapable to mobilize collective action. Vedel's antagonists considered users as lack of technical expertise, so they thought a number of experts and spokespersons of users are emerging, who are often poorly representing their whole group. Consequently, Chambat remarked, one attends 'an assimilation of market to democracy, of users to consumers or clients and of liberty to choice'. Moreover, he highlights that 'the privatization of telecommunication companies, the deregulation of the sector and the marginalization of public services push towards the direction, on the one hand, of a debilitation of the institutionalized representation of users and, on the other hand, of a reinforcement of the image of the user as a consumer'.

The formation of Linux community proves that Vedel's argument makes sense in the user-representation in the process of technological innovation. Because what Vedel's antagonists said 'users lack technical expertise' is not true among Linux users. As mentioned above, as a Linux user, one has to have hacker-ship, to be akin on learning, to be positively participate the innovation rather than passively accept the changes. Therefore, the Linux users definitely are characters of Linux community and can be the perfect representation of Linux community.

Nevertheless, Vedel's second argument in his 1994 publication is not the case of Linux community. From the view of science and technology studies (STS), not only the way users think of a technology and its potential uses is a result of a multiplicity of social, economical and cultural factors, but the technology is also shaped by users themselves as well. Vedel therefore said 'it is interesting to study how the producers of technology try hard to intervene on the representations of technology that the users form so as to attempt to direct the users of technology towards their own objectives'. Nevertheless, in the innovation of Linux, users can participate in the innovation process constantly due to the open source traits. The identity of users and innovators/developers are overlapped with each other and form the hybrid identity. The hybrid identity enables users to have their own space in the innovation field and broaden the meaning of a user. The boundary between innovator/developer and user (especially end-user) is getting blurred and soft. As long as one is competent, one can shift his identity from an user to an innovator. This mutual and active mechanism indicates a dynamic innovation system and provides the prosperous Linux community.

From a chronic view, the diffusion of Linux is still complying with other traditional technological innovations. Linux usage is stepping into the stage of late majority. Because of the reliability and efficiency of Linux, more end-users such as companies or governmental organizations choose to use Linux rather than other commercial software. This is not as of the effect of vendors/distributors' advertisements nor of the apparently cheaper price (or free price). The most important factor influencing the development of Linux is the collective hacker-ship (practices) and intense virtual communication among users in the Linux community. The spirit of information sharing brings Linux community more users. And the truth is while more users can

access to the original innovation materials such as kernel programs, they do have the more motives to renovate and the products will improve quickly diversely.

Institutionalized Linux

However, to allow a bigger market, to allow the laggards who lack of hacker-ship to adopt Linux, the system has to be designed more user-friendly (and still keep its reliability). In addition, to get more users and gain market power, the Linux community has to be institutionalized with licenses and vendors (this fact is happening). In doing so, an informal community of practices on Linux and hacker-ship gradually gets integrated and institutionalized. Actually, open source software market is still decentered and not like the case of Microsoft. Although there must be peripheral companies to help end-users with the maintain or update matters, the software market will not be dominated by Linux or a single company. Not only because there are different open source software and a lot of distributors, what distinguishes Linux from Microsoft is the diverse innovators who own a hybrid identity as both user and developer, and a core community epidemic with pan-hacker culture. The informal actors still play critical roles in the software innovation system and shape the dynamics of software innovation. We should keep observing the development of Linux especially the effect of the institutionalized and commercialized market.

Talking about hacker again...

This paper is not suggesting that 'hackers = Linux users'. Actually, an 'identikit portrait' of hacker is not pragmatic because in reality there is no a firm sociological 'photokit' of hacker. The identity of hacker is fluid and the boundary of hacker social world is soft and flexible based on a range of practices. 'Hacker' is a loose notion; it is only a metaphor which acquired a plurality of meaning in sociological discourse, and the media's borrowing of the term has increased the problem of definition. I suggest not to review on the essential position of hackers but a range of collective practices influencing software technology. This will provide us a view on how things come together in different social worlds. Linux users fosters powerful hacking culture, and the ways of hacking practices are deployed to lead the Linux community into a more institutionalized formal organization. The pan-hacker phenomenon has made a 'co-fabrication of knowledge and identities' possible. It proves that experts can learn from users in the wild. Users get involved in and contribute to the technology innovation. It is even more powerful in Linux innovation because users and experts are so close and mutual. Subsequently, no matter one is an user, an expert, or a hacker, one's contribution to the technological system does not depend on one's identity, but one's practices.

Notes

1. In this paper, the definition of 'insiders' is a person with a competent knowledge of programming and computing. In analogy, an outsider is a person who is unfamiliar with the knowledge.
2. These practices were observed among actors in many fields such as 2600 London meeting, 2600 Leeds meeting, HAL 2001 conference.
3. The term 'hacker-ship' is in the light of the word 'craft-ship'.
4. Here the term 'outsider' means 'unconventional' and 'unorthodox'.

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