

The Keys to Succeed in Building A Free/Open Source Community for Software Development: A study on China, Hong Kong and Taiwan

Haggen So, Nigel Thomas and Hossein Zadeh

School of Business Information Technology, RMIT Business, Royal Melbourne Institute of Technology,
239 Bourke Street, Melbourne 3000, Australia,

Email: haggen@seven.bf.rmit.edu.au, hossein@bf.rmit.edu.au, nigt@rmit.edu.au

Abstract-Free/Open Source software has recently attracted much attention in Taiwan as well as in Mainland China. A model of individual participation in a Free/Open Source community (which was arguably more comprehensive than the commonly used Bazaar model suggested by Eric Raymond) was employed for preliminary analysis of the three regions. This model includes a four-layer (4C) model of the Free/Open Source community, the motivations and barriers when a developer decides to join a Free/Open Source community, the positive and negative results which occur after interaction with a Free/Open Source community. The potential of Mainland China, Taiwan and Hong Kong to build Free/Open Source communities is preliminarily analysed by considering three important social factors extracted from the model, namely government funding and willingness to share, democracy and openness, and lastly, culture barriers. Taiwan was found to have several advantages in the area of government funding and willingness to share, democracy and openness. Taiwan developers will probably have a better potential to cross the culture barrier than Mainland developers will. The limitations of the analysis and further research directions are discussed.

Keywords-Free Software, Open Source, Virtual Communities, Mainland China, Taiwan, Hong Kong

1. Introduction

Taiwan government announced a plan for promoting Free/Open Source software by setting up six educational centers, which are predicted to train 120,000 basic users and 9,600 advanced users in three years [18]. The Beijing government also chose Red Flag, a local Chinese Linux distribution, over Microsoft solutions [7, 41]. It is obvious that Free/Open Source software has recently attracted considerable attention.

A report released by IBM [8] pointed out that although Linux was already quite easy to use and there were many applications available on this platform, improvements still need to be made in order for a home and home office users to comfortably employ Linux. Moreover, for Linux to be useful by Chinese users, the burden of software development for localised features will probably fall on the Chinese community itself. Therefore, the prosperity of active software development communities are important because quality of Free/Open Source software is one of the most significant factors for adoption. Indeed, adopting Free/Open Source software reduces the cost of acquisition and gives users freedom to modify the software but the communities need to acquire the skill to exercise that freedom by fostering communities for software development.

In this paper, conditions of fostering active software development communities will be presented by examining important features in a model of individual participation in a Free/Open Source community suggested by So, Thomas and Zadeh [37]. Based on these features, a preliminary comparison between the condition of Taiwan, China and Hong Kong and suggestion to further research direction will be discussed.

2. A Model of Individual Participation in a Free/Open Source Community

In analysing a Free/Open Source community, the Bazaar model [34] was the most frequently used metaphor. However, So, Thomas and Zadeh [37] suggested an alternative model which is arguably more comprehensive than the Bazaar metaphor. This is called a model of individual participation in a Free/Open Source community and this model will serve as the basis of subsequent analysis of developing Free/Open Source communities.

2.1. Four-Layer Model on a Free/Open Source Community

The best way to understand a model of individual participation in a Free/Open Source community is to start from the centre – a model of a Free/Open Source community (Figure 1). This model is comprised of four layers, namely communication, contributions, co-ordination and culture (Figure 1) and it will be referred to as the '4C model'.

The communication media is the basic infrastructure for any interaction. Contributions referred to the different pieces of assistance given by individual developers via the communication medium. Co-ordination is the process of organising fragments of contributions into usable products and the culture of the community in turn governs the rules in co-ordination.

An important enabling factor for Free/Open Source communities to exist is a medium for communication. In most cases, the Internet is the most frequently used communication medium for Free/Open Source communities. Many [6, 30, 34] recognized the Internet as an important factor for the Linux project to start. Kollock [20] suggested that the Internet lower the cost of collaboration. On the other hand, Ghosh [15] used a cooking-pot as a metaphor to describe collaboration on the Internet. In the case of a physical cooking-pot, when everyone put in some ingredients to boil a tasty broth, one can only take a small portion of the broth, more or less the same as what one has put in. In the case of the Internet, the digital cooking-pot, which is an efficient cloning machine, everyone who contributes can also get complete copies what others have contributed.

A Free/Open Source project is built upon contributions from individual developers. These contributions included source code, suggested features (wish list), comments on project, bug reports and patches and also documentations. Source code is the basis of any program and thus any software project. When a project starts, the existence of a executable program with source code attracts more developers to participate [13, 34]. After using the program, developers or users may have suggestions on new features to add to the program. Comments may also be made on the direction of the project as well as the details of the source code. Zawinski [45] pointed out that the contribution of quality comments could even worth more than source code. Bug reports and patches with source code are also welcomed to improve the stability of the program. Finally, a program cannot be used and a project cannot be maintained without documentations, and thus contributions to documentation are also important. With a proper communication media, all these contributions can be collected.

Co-ordination is required to package all these different contributions collected via the communication media into a piece of stable software. One of the most important management issues at the beginning of the project is promotion [13, 34]. It is important to build a community of developers and users for the project to proceed. Licensing, which legislates what kind of freedom is placed on the distribution of the source code, is another significant management issue, which must be taken into consideration from the start.

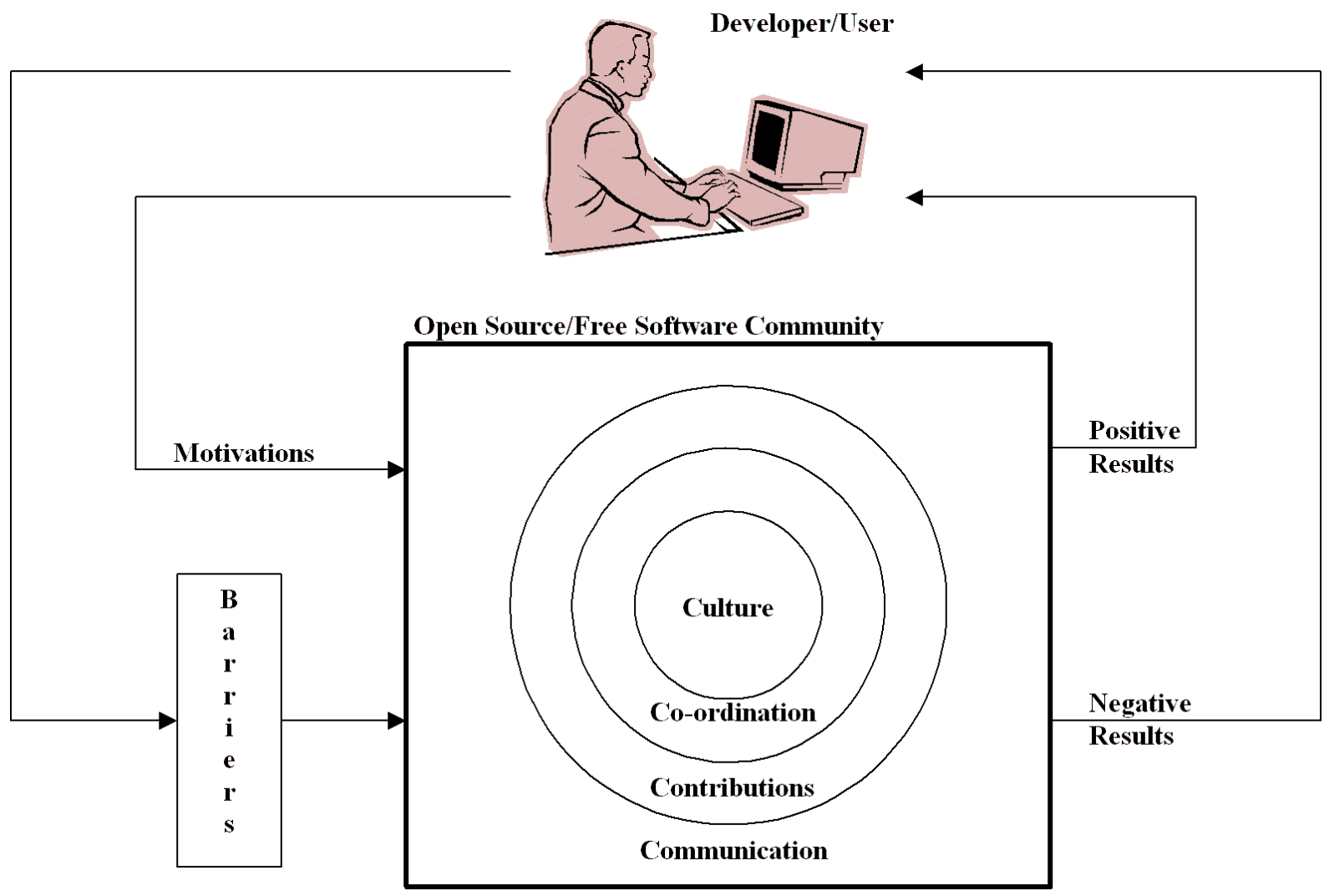


Figure 1: A Model on individual participation in a Free/Open Source Community

A mechanism to judge which piece of contribution to be accepted or rejected has to be established. The social structure of Free/Open Source community for individual rights and responsibilities can be summarised in a diagram suggested by Lawrie, Arief and Gacek [22, p. 77] and modified by the authors in Figure 2. The core developers are the most senior group and they had the final said. In the benevolent dictator [13, 33] system is adopted, a maintainer is that person who makes final judgements on decisions of the project. If an autocratic [13, 33] system is adopted, a membership system has to be setup to identify between developers and non-developers and it may also involve a voting system for decision-making.

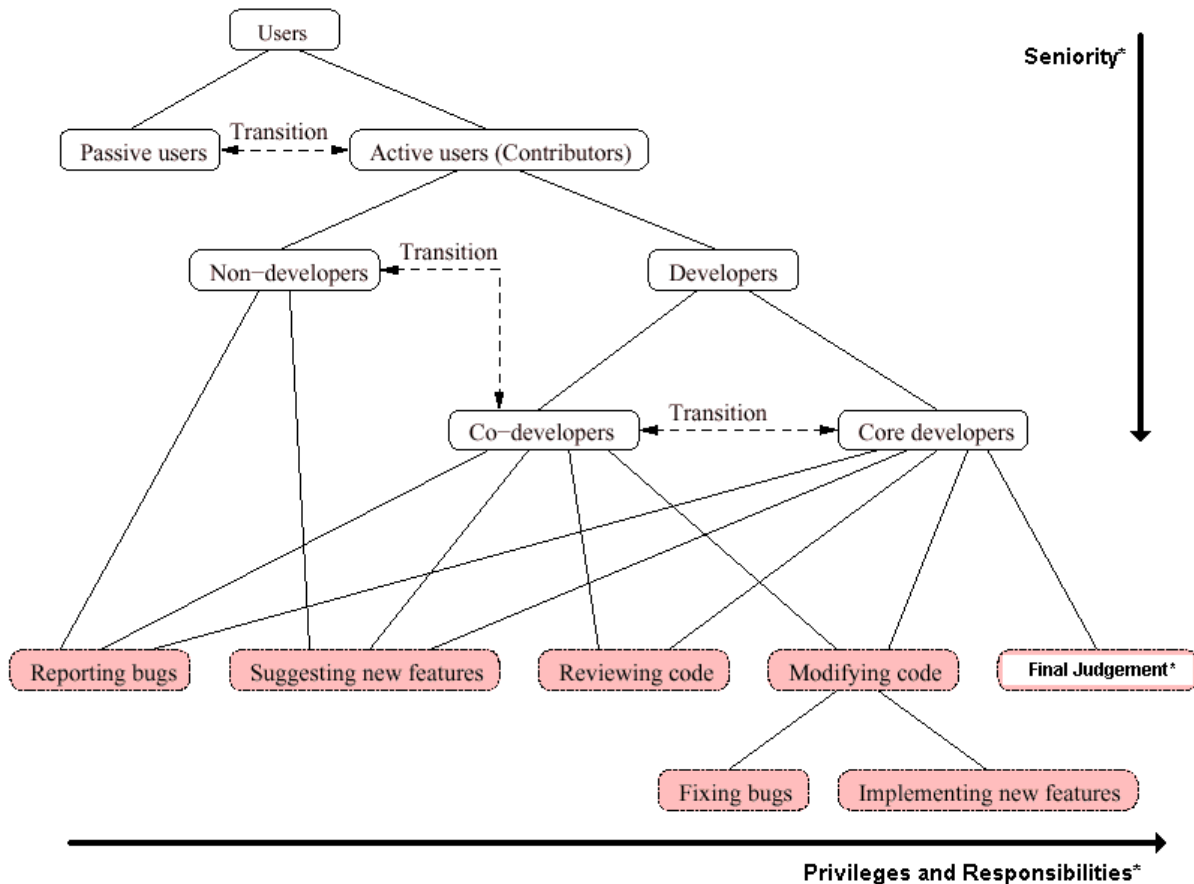


Figure 3: A Model of the Social Structure of Free/Open Source Community [22, p. 77] modified by the authors (* denotes the modification)

It seems that the core developers are the most powerful class in the structure but it can be argued that all the classes of people in this social structure are inter-dependent and a stable balance of power can be achieved. Users, who seem to be dependent on the developer community for bug fix and implementation of new features, are actually very important to the developers. The popularity of the software is itself a measure of the success of a project [1] because adoption of a piece of software itself is a compliment. Bugs will be more readily discovered and the potential of recruiting developers with a larger user base. Therefore, Raymond's advice [34] on respecting users is sensible in this social structure. Co-developers and core developers are also inter-dependent, as the core needs contribution when the co-developers can have another parties to carry the burden of co-ordination. If some of the core developers do not listen to the community, other members of the

community can take over the source code and run the project separately and this is called forking [13, 33]. Due to its disruptive nature, forking does not occur very often but the knowledge of its possibility is yet another force to promote the balance of power.

The culture of a Free/Open Source community shapes the rules in co-ordination of Free/Open Source projects. Culture is defined as "the collective programming of the mind which distinguishes the members of one group or category of people from another." [17, p. 5] and the community of Free Software and Open Source movements can be argued to have enough affinity to be called a culture. First of all, most of the members in the community are technical people [3], that value hack [24, 42] (The word 'hack' in this paper does not refer to breaking into computers. It refers to the ultimate standard of technical virtuosity and aesthetic in a Free/Open Source community) and technical correctness [31] and other than formal authorities. A confessed mistake is more highly valued than a beautifully crafted lie [31]. With this strict value of hack, Free/Open Source community also bred humility [33] as there will always be another person with a brighter idea and the technical correctness attitude requires admission of this fact. Secondly, Linus Torvalds, the original author of Linux, released the source code of the system on the USENET because the culture encourages sharing [16]. Thirdly, Raymond [33] also observed cultural rules in Free/Open Source communities in the transfer of maintainership and giving credits. Fourthly, being formed mostly by volunteers, the culture endorses loose charter over complicated legalisations when the community tries to put management rules in writing, as volunteers tend to cooperate and reach consensus rather than exploiting the loopholes in the system [13]. The above is a general view of the culture and each Free/Open Source community also has its own variation.

2.2 Motivations, Barriers, Positive and Negative Results

After introducing a model to a Free/Open Source community, one can consider the relationship of individual participants to the community. The model built to explain this relationship is shown in Figure 1. The model includes the mentioned 4C model, the motivations and barriers when a developer decides to join a Free/Open Source community, the positive and negative results after interaction with a Free/Open Source community.

There are a number of motivations for a user or a developer to join a Free/Open Source Software community. A user or developer may see that joining a Free/Open Source Software community as a good solution to solve his or her need on a piece of software [12, 13, 21, 34] or to reduce cost of ownership [11]. Patriotism and anti-Microsoft sentiment also plays a part in countries outside the United States [25]. Moreover, social factors such as reciprocal behaviour [20, 44], reputation [13, 15, 20, 21, 33] and attraction to community [14, 20] may play a part. Availability of funding also enables members of Free/Open Source community to work on project devotedly such as support in BSD by DARPA [27] and Linux by University of Helsinki [6, 29]. Lastly, altruism or idealism [20] may also motivate developers to contribute.

Although there are a number of motivations for developers to join a Free/Open Source community, barriers also exist to deter them, as in any virtual communities [35]. Technically, Free/Open Source communities only accept developers who attain a high degree of competence [34]. The complexity of source code also created a barrier for contribution [45]. On the other hand, software with poor design and inadequate documentation may deter contribution [28]. Another barrier is that the original developer may not be willing to share his or her own code. Cultural barriers also exist. Firstly, language can be a barrier because person from certain backgrounds in some part of the world may find it hard to join a Free/Open Source community with English as

the common language of communication [13]. Cultural mysteries also exist and they have to be solved before a member could be accepted by certain Free/Open Source communities [33]. The last but obvious reason is that a developer cannot afford the time for one's involvement in a Free/Open Source community [4].

There are several positive outcomes as a result of joining a Free/Open Source community. A developer may have one own itch scratched [34] and found that one enjoyed programming in collaboration [13, 33]. He or she may learn more skills [13] and build up one's own reputation [13, 15, 20, 21, 33] in the community as well.

Negative results from participation in a Free/Open Source community include lack of interest on one's project [13, 34], rejection from others [26, 32], hurts in management issues [4,33] and burn-out [4, 5].

3. How to foster a Free/Open Source Software Community

According to the above model, in order to start a Free/Open Source software community, there needs to be a communication layer, the base of the 4C model. Considering how Linus Torvalds started Linux in the Minix newsgroup [6], the most basic requirement for communication can be just a mailing list. However, decent projects are usually hosted by a versioning system such as CVS and promoted on a web site [2]. Additional communication tools such as bug and issue tracking [2] or even WikiWikiWeb [10] can be employed. A collection of these tools are freely available on the Internet on web sites such as Sourceforge [39] and Savannah [36]. Therefore, the communication layer is not a significant obstacle to building a community

In order to build the next three layers in the 4C model, namely contributions, co-ordination and culture, there need to be participations in the community. Deduced from the above model, more participants can be recruited by increasing motivations and lowering the barriers as well as maximising positive outcomes and minimising negative outcomes. Building a development community is no easy task as there were a considerable number of one-person only projects that did not leave the planning stage in Sourceforge, the largest Open Source project hosting site [19].

One of the requirements for participants in a development community is the technical barrier. Any participant must first understand the direction of the project and code technically. Other skills include design for evolution, good coding style and documentation [13]. Readers who are interested on these topics can refer to the reference.

Another group of important factors for building community are social. Three factors under this category, namely, government funding and willingness to share, democracy and openness, and lastly, culture barriers, are explored in this paper. Also, a preliminary examination on the potential of developing Free/Open Source communities in Mainland China, Taiwan and Hong Kong will be presented for each of these factors.

4. A Preliminary Comparison between Mainland China, Taiwan and Hong Kong

To build a Free/Open Source community, the instigators sometimes had to invest substantially before a community could be built. Richard Stallman started the GNU project in 1984 [40] and it was not until recent years that his vision of a free Unix system started to materialise. Altruism, patriotism and willingness to collaborate all play a part in the community. On the other hand, as argued above, government funding is also important. For example, Linus Torvalds was supported by the University of Helsinki for a certain period in the early days of Linux development [6, 29].

A preliminary examination of the situation in Mainland China, Taiwan and Hong Kong suggests that China and Taiwan are already taking action towards supporting Free/Open Source [7, 18, 41] but the Hong Kong government has not done much. There is also a community in Taiwan called Software Liberty who promotes not just employing Free/Open Source software but also the concept of Freedom and Openness [38]. Lee [23] commented that Hong Kong society is generally individualistic and historically the British had no intention to promote any national identity, as they saw it as just a colony. While the authors did not have much data on altruism of Mainland citizens yet, their ability in collaboration is doubtful. According to Wan [43], Mao's concept was that conflictions could never be resolved and the key is to take advantages in conflictions. It could be done by uniting players in minor conflictions (Your Own People) to fight in the major confliction (Enemy). The definition of major and minor conflictions were based on a utilitarian viewpoint and there was no place for trust and reconciliation. In short, you can be my enemy or my friend, based on what I can benefit from you. This theory was practised extensively during the culture revolution and other political conflictions and this theory was learned by many. As observed by Chin [9] on the current situation of overseas Mainland Chinese students studying in the United States, a number of the students lacked basic respect for authorities and manners for collaboration after experiencing years of political upheaval in China. The collaboration ability of Taiwan and Hong Kong students was obviously better [9]. Therefore, it can be concluded if Mainland Chinese have to struggle to collaborate on a face-to-face basis, it will be even harder for online collaboration. Therefore, Taiwan, by having government support and the motivation and ability to collaboration, is advantageous over others.

As mentioned above, for some Free/Open Source projects, decisions were made using a voting process. Even for a benevolent dictator system, balance of power can be achieved by actions such as forking. Humility and willingness to confess mistakes are also important qualities of participants. Therefore, it can be proposed that participants who lived in a more open and democratic society is more likely to appreciate these concepts and be collaborative under these ethics.

A preliminary examination of the situation in Mainland China, Taiwan and Hong Kong suggests that of the three, Taiwan is obviously the most democratic in the western sense of the word. The Legislative *Yuan* is democratically elected, as is the President, and the government generally respects the rule of Law. China, on the other hand, is unarguably the least democratic. The Beijing government is not recognising demands from the people for a more open and democratic government. This is exemplified by its failure to acknowledge calls for democracy and reconciliation with pro-democracy advocates after the June 4th (Tiananmen incident). It can then be assumed that an average Mainland Chinese citizen might not able to grasp the ethics mentioned. Hong Kong is an international city where citizens exercise a certain degree of freedom and are exposed to open and democratic practices, and in this respect are closer to Taiwan than Mainland China. To conclude, people in Taiwan and Hong Kong are more likely to understand and collaborate under the mentioned ethics.

Many Free/Open Source software useful to Chinese were not started by Chinese and to understand and collaborate with those communities, a certain degree of proficiency in English had to be attained. Moreover, those communities probably have their own culture, which are different from the mainstream [31, 33]. Therefore, there is a need for Chinese developers to cross a significant cultural barrier in order for some

communities to be built. A very preliminary observation is that, inherent in being an international city and historically a British colony, Hong Kong developers are more exposed to the western world and thus have the greatest advantage in overcoming the barrier. On the other hand, Mainland developers have the least chance as Chinese only started to adopt the open policy some thirty years ago after the Cultural Revolution. Taiwan will probably be positioned somewhere in between because it is less international than Hong Kong.

A preliminary conclusion can be drawn that Taiwan does have some competitive advantages in developing Free/Open Source community for development in terms of willingness to share, patriotism, government funding, ability to collaborate and grasp the underlining ethics in co-ordination. Hong Kong, being an international city, has the advantage in crossing cultural barriers in collaboration but unfortunately, the motivation for community building is not high. While some people in Mainland China government support Free/Open Source software, the barrier of an average Mainland Chinese to join a community is quite high. However, since the population is huge, even if a tiny fraction of the population can be a significant number.

	Mainland China	Taiwan	Hong Kong
Government funding	Exist	Exist	Not much
Sharing Culture	May have problems in sharing and collaboration	Organisations already exist to promote freedom and openness	Individualistic society
Democracy and Openness	Poor	Most Advance	Open but not as democratic as Taiwan
Culture Barrier to Collaborate Internationally	Highest	Significant	Least

Table 1: A Preliminary Comparison between Mainland China, Taiwan and Hong Kong

5. Discussion

This paper takes a relatively minor emphasis on user adoption because the topic has already attracted much attention. A user community is indeed a necessary condition for a development community to grow but it is not a sufficient condition. On the other hand, an active development community that meets the need of the users will probably attract adoption. This paper also takes a minor emphasis on technical issues because it is more effective to present a focused theme in one paper.

The reader may also wonder if Free/Open Source software will ever have any significant impact as closed source products still dominates the market. If Free/Open Source software is just passing fad then there is no reason to invest in Free/Open Source communities. This is beyond the scope of this paper to discuss in details the opportunities of Free/Open Source in the market but for those who are interested, please refer to Zymaris [46] for a preliminary discussion. Free/Open Source software [25] is also more likely to be adopted in countries beyond the United States. In short, the authors' opinion is that Free/Open Source is not a silver bullet that solves every problems but it will be adopted gradually. However, work need to be done by participating in Free/Open Source communities and this is one of the motivations behind writing this paper.

The model employed in this paper as a yardstick to project in the future has substantial western influence. This is, on the one hand, justifiable as the Free/Open Source movement started in the western world. Nevertheless, it can be argued that if a similar movement started locally, the co-ordination and cultural layer will probably be

influenced the Chinese culture. Thus, the reader can also keep in mind the possibility of exploring factors that suit local customs and cultures. One interesting possibility will be Mainland communities that may be co-ordinated in a centralised structure but the availability of source code implies the possibility of forking. It will then be interesting to see, for example, if another party took the source code Red Flag Linux (the leading Linux distribution in China partly funding by State University) as the base and developed another Linux distribution similar to what Mandrake did to RedHat.

Although the discussion in this paper is preliminary, the issues raised in this paper are probably significant and further research would be beneficial. Several research methods can be employed. Firstly, quantitative data on the web in current participation of Free/Open Source projects by Chinese speaking developers can be collected. Secondly, surveys and interviews on the perception of Free/Open Source from the public and specific groups such as business community can be conducted. Thirdly, ethnographic studies can be conducted in local Free/Open Source communities to investigate the underlying culture and work practices. Technical factors as well as social factors can be investigated using these methods.

6. Conclusion

By employing a model of individual participation in a Free/Open Source community and extracting three essential factors for building Free/Open Source communities, a preliminary examination on the potential of building such communities in Mainland China, Taiwan and Hong Kong. The findings were:

1. Taiwan may have advantages on government funding, willingness to share, democracy and openness.
2. Hong Kong may have advantages on crossing the cultural barrier.
3. Though the barrier for a Mainland Chinese developer to participate in Free/Open Source communities is high, due to its gigantic population, even if a small percentage of the population can cross the barrier can have a huge impact.

List of References

- [1] Advogato 2002, 'Project Success - Measuring it/Facilitating it', <<http://www.advogato.org/article/441.html>> (Accessed 11 Jun. 02).
- [2] Behlendorf, B. 1999, 'Open Source as a Business Strategy', In Chris DiBona, Sam Ockman and Mark Stone (Eds), *Open Sources: Voices from the Open Source Revolution*, CA, Sebastopol: O'Reilly & Associates, <<http://www.oreilly.com/catalog/opensources/book/netrev.html>> (Accessed 11 Jul. 00).
- [3] Bentson, R. 2000, 'The Proper Image for Linux', <<http://www2.linuxjournal.com/lj-issues/issue57/2931.html>> (Accessed 29 Dec. 00).
- [4] Bezroukov, N. 1999a, 'Open Source Software Development as a Special Type of Academic Research (Critique of Vulgar Raymondism)', *First Monday*, vol. 4, no. 10, Oct, 1999, <http://firstmonday.org/issues/issue4_10/bezroukov/index.html> (Accessed 2 Jun. 99).
- [5] Bezroukov, N. 1999b, 'A Second Look at the Cathedral and Bazaar', *First Monday*, vol. 4, no. 12, Dec, 1999, <http://firstmonday.org/issues/issue4_12/bezroukov/index.html> (Accessed 2 Jun. 99).
- [6] Bezroukov, N. 2000, '4.1. Linus and Linux; Linus Torvalds' Short Unauthorized Biography', <http://www.softpanorama.org/People/Torvalds/Linus_Torvalds_biography.shtml>, (Accessed 3 Nov. 00).

- [7] British Broadcast Corporation 2002, 'Linux takes on MS in China', <http://news.bbc.co.uk/1/hi/english/sci/tech/newsid_1749000/1749441.stm> (Accessed 11 Jun. 2002).
- [8] Chapman, M. T. 2000, 'What Good is a Linux Client?' <<ftp://www6.software.ibm.com/software/developer/library/l-cli.pdf>> (Accessed 12 Dec. 2001).
- [9] Chin, N. 1998, *Studying in U.S.A*, Cosmos Books, Hong Kong.
錢寧 1998, 《留學美國》, 天地, 香港。
- [10] Cunningham, W. 2002, 'WikiWikiWeb', <<http://usemod.com/cgi-bin/mb.pl?WikiWikiWeb>> (Accessed 11 Jun. 02).
- [11] CyberSource 2002, 'Linux vs. Windows: Total Cost of Ownership Comparison', <http://www.cyber.com.au/cyber/about/linux_vs_windows_tco_comparison.pdf> (Accessed 2 May 02).
- [12] Evers, J. 2001, 'Users order StarOffice, protest Microsoft licensing scheme', IDG News Service, 16 Jul., <<http://www.nwfusion.com/news/2001/0716staroffice.html>> (Accessed 13 Aug. 01).
- [13] Fogel, K. 1999, *Open Source Development with CVS*, Coriolis, Arizona.
- [14] Foster, E. 1998, '1997 Product of the Year: Best Technical Support Award: Linux User Community', InfoWorld, <<http://www.infoworld.com/cgi-bin/displayTC.pl?/97poy.suppl.htm>>, (Accessed 27 Nov. 00).
- [15] Ghosh, R. A. 1998a, 'Cooking pot markets: an economic model for the trade in free goods and services on the Internet', *First Monday*, vol. 3, no. 3, Mar, 1998, <http://www.firstmonday.dk/issues/issue3_3/ghosh/index.html> (Accessed on 2 Jun. 00).
- [16] Ghosh, R. A. 1998b, 'FM Interview with Linux Torvalds: What motivates free software developers', *First Monday*, vol. 3, no. 3, Mar, 1998, <http://www.firstmonday.org/issues/issue3_3/torvalds/index.html>
- [17] Hofstede, G. H. 1997, *Cultures and Organizations*, McGraw-Hill Berkshire, England.
- [18] Kary, T. 2002, 'Taiwan opens door to open source', <<http://zdnet.com.com/2100-1104-931885.html>> (Accessed 7 Jun. 02).
- [19] Kienzle, R. 2001, 'Sourceforge Preliminary Project Analysis', <<http://www.osstrategy.com/sfreport/>> (Accessed 23 Jan. 02).
- [20] Kollock, P. 1999, 'The economies of online cooperation: gifts and public goods in cyberspace', In Smith, M. A. & Kollock, P., *Communities in Cyberspace*, Routledge, London, pp.220-242.
- [21] Kuwabara, K. 2000, 'Linux: A Bazaar at the Edge of Chaos', *First Monday*, volume 5, number 3, Mar, 2000, <http://firstmonday.org/issues/issue5_3/kuwabara/index.html>, (Accessed 31 Jul. 00).
- [22] Lawrie, T., Arief, B. & Gacek, C. 2002, 'Interdisciplinary Insights on Open Source', Proceedings of the Open Source Software Development Workshop, Newcastle upon Tyne, U.K., 25-26 Feb. 2002, <<http://www.dirc.org.uk/events/osswd/OSSDW-Proceedings-Final.pdf>> (Accessed 25 Mar. 02).
- [23] Lee, K. Y. 2000, *From Third World to First: The Singapore Story: 1965-2000*, HarperCollins, New York.
- [24] Levy, S. 1984, *Hackers: Heroes of The Computer Revolution*, , Anchor Press/Doubleday, Garden City, New York.

- [25] Linux and Main 2002, 'Interview: Bart Decrem -- Leveraging desktop Linux', <<http://www.linuxandmain.com/features/decrem.html>> (Accessed 29 Apr. 2002).
- [26] Maclachlan, M. 1999, 'Panelists Describe Open Source Dictatorships', <<http://www.techweb.com/news/story/TWB19990812S0003>> (Accessed 26 Nov. 00).
- [27] McKusick, M. K. 1999, 'Twenty Years of Berkeley Unix: From AT&T-Owned to Freely Redistributable', In Chris DiBona, Sam Ockman and Mark Stone (Eds), *Open Sources: Voices from the Open Source Revolution*, CA, Sebastopol: O'Reilly & Associates, <<http://www.oreilly.com/catalog/opensources/book/netrev.html>> (Accessed 11 Jul. 00).
- [28] mettw 2000, 'Contribution balance', In response to lalo, 'Ask the Advogatos: why do Free Software projects fail?', <<http://www.advogato.org/article/128.html>> (Accessed 19 Oct. 00).
- [29] Moody, G. 2001, *Rebel Code: The Inside Story of Linux and the Open Source Revolution*, Perseus, Cambridge, Massachusetts.
- [30] Moon, J. Y. & Sproull, L. 2000, 'Essence of Distributed Work: The Case of the Linux Kernel', *First Monday*, volume 5, number 11, Nov, 2000, <http://firstmonday.org/issues/issue5_11/moon/index.html> (Accessed 15 Nov. 00).
- [31] Pavlicek, R. C. 2000, *Embracing Insanity: Open Source Software Development*, SAMS, Indianapolis, Indiana.
- [32] Pennington n.d., 'Working on Free Software', <<http://www106.pair.com/rhp/hacking.html>> (25 Nov. 00).
- [33] Raymond, E. S. 1998, 'Homesteading the Noosphere', <<http://www.tuxedo.org/~esr/writings/homesteading/>> (Accessed 30 May 00).
- [34] Raymond, E. S. 2000, 'The Cathedral and the Bazaar', <<http://www.tuxedo.org/~esr/writings/cathedral-bazaar/cathedral-bazaar.html>> (Accessed 30 May 00).
- [35] Romm, C., Pliskin, N. & Clarke, R. 1997, 'Virtual Communities and Society: Toward an Integrative Three Phase Model', *International Journal of Information Management*, Great Britain, vol. 17, no. 4, pp. 261-270.
- [36] Free Software Foundation 2002, Savannah, <<http://savannah.gnu.org/>> (Accessed 12 Jun. 02).
- [37] So, H., Thomas, N. & Zadeh, H. 2002, 'What is in a Bazaar? A Model of Individual Participation in an Open Source Community', *Proceedings of the Open Source Software Development Workshop*, Newcastle upon Tyne, U.K., 25-26 Feb. 2002, <<http://www.dirc.org.uk/events/ossdw/OSSDW-Proceedings-Final.pdf>> (Accessed 25 Mar. 02).
- [38] Software Liberty Association of Taiwan 2002, 'Software Liberty Association of Taiwan' <<http://www.softwareliberty.org/>> (Accessed 11 Jun. 2002).
- [39] Sourceforge 2002, Sourceforge, <<http://sourceforge.net/>> (Accessed 12 Jun. 02).
- [40] Stallman, R. 1999, 'The GNU Operating System and the Free Software Movement', In Chris DiBona, Sam Ockman and Mark Stone (Eds), *Open Sources: Voices from the Open Source Revolution*, CA, Sebastopol: O'Reilly & Associates, <<http://www.oreilly.com/catalog/opensources/book/netrev.html>> (Accessed 11 Jul. 00).

- [41] Stout, K. L. 2002, 'Beijing snubs Microsoft for homegrown coders', <<http://asia.cnn.com/2002/BUSINESS/asia/01/08/hk.microsoft.beijing.bid/>> (Accessed 11 Jun. 2002).
- [42] Turkle, S. 1984, 'Hackers: Loving the Machine for Itself', In Turkle, S., *The Second Self: Computers and the Human Spirit*, Simon & Schuster, New York, Chapter 6, pp.196-238.
- [43] Wan, W. Y. 1993, *A Christian Introduction to Communism*, 6 ed., Tien Dao, Hong Kong.
溫偉耀 1993, 《共產主義與基督教》, 第六版, 天道, 香港。
- [44] Wellman, B. & Gulia, M 1999, 'Net Surfers Don't Ride Alone: Virtual Communities as Communities', In Wellman, B. (Ed.), *Networks in the global village: life in contemporary communities*, Westview Press, Boulder, CO, pp. 331-366.
- [45] Zawinski, J. 1999, 'resignation and postmortem.', <<http://www.jwz.org/gruntle/nomo.html>> (Accessed 22 Jun. 2000).
- [46] Zymaris, C. 2002, 'The Penguin and the Hare', <<http://www.desktoplinux.com/articles/AT3633344463.html>> (Accessed 11 Jun .02).