Intellectual Property Paradoxes in Developing Countries: The Case of Software IP Protection in Iran

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In the context of developing countries, scholars have started to report at least two paradoxical phenomena related to intellectual property (IP) protection: (1) weak appropriability regime despite having fairly good IP laws and regulations, and (2) increased demand for intellectual property rights (IPRs) despite low level of IP protection. Beyond these paradoxes, prior research suffers in varying degree from two common flaws: (a) they either considered *de jure* or *de facto* IP laws, but not both, and (b) they did not represent all developing countries, being mostly focused on China with no empirical support. This paper aims at addressing these gaps by exploring both *de jure* and *de facto* software IP protection in Iran as a less-researched developing country. The authors look at the *de jure* software IP protection and, then, empirically investigate the *de facto* software IP protection in the country. The results show that despite having multiple legal mechanisms for protecting software innovations, Iranian software developers consider the overall level of software IP protection offered as low. Paradoxically, a vast majority of the surveyed software innovators had applied for various available IP rights.

Keywords: Intellectual property paradoxes, developing countries, software, Iran

Software is a typical knowledge-intensive output that without strong intellectual property (IP) protection and proper economic incentives for its developers would most probably not exist.[1] Despite the growing international market for software technologies, copying them is usually much easier, and takes much less energy and time, as compared with many other tangible and intangible products. The fact that potential applications of software are diverse across a wide range of industries and not limited to or defined for a specific context[2], makes the legal protection thereof more complex.

Given the unique and complex nature of software, various legal regimes (e.g., copyright, patent and *sui generis*) have been put in place by different countries to help protect the rights of software developers.[3,4] Since the original purpose of these legal mechanisms differs, each of them only covers a certain aspect of software IP.[1] What makes things even more complex is the fact that the legal protection of software and software-embedded technologies varies considerably across countries. These differences are due, in part, to the territoriality of IP rights and the specific nature of software itself.

While software protection has been extensively studied in the context of developed economies, especially of the US and the EU[5-8], much less is known in the developing country setting. A notable exception is China and software protection therein, which has been the subject of several papers.[9-11]

Intellectual property protection in developing countries deserves more research attention for taking into account its distinctive characteristics. Apart from the well-known fact that IP infringement is more common in the developing world, scholars have started to report at least two paradoxical phenomena related to IP protection in the context of developing nations: (1) weak appropriability regime despite having fairly good IP laws and regulations[12-14], and (2) increased demand for IPRs despite low level of IP protection.[15]

There are several prior studies related to the aforementioned paradoxical phenomena in the Chinese context: some focused on foreign companies[16-18] while some that only investigated Chinese firms.[19,20] Yet, although the prior researches are interesting, they suffer in varying degree from two common flaws: (a) they either considered *de jure* or *de facto* IP laws, but not both, and (2) they did not represent all developing countries. Studies of these paradoxes in the context of other developing countries are very few and mostly non-empirical.

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This paper aims at addressing this gap by exploring both *de jure* and *de facto* software IP protection in Iran as a less-researched developing country. To this end, the authors first look at different mechanisms of legal protection of software innovations as defined by Iranian law. Then *de facto* software IP protection in the country is empirically investigated.

Despite the limitations in accessing IP registration and enforcement data in Iran, this paper aimed at empirically investigating the aforementioned IP paradoxes in the context of Iranian software industry. The results reinforce those from prior studies suggesting that despite having multiple legal mechanisms for protecting software innovations, Iranian software developers consider the overall level of software IP protection offered as low. Again, paradoxically, a vast majority of surveyed software innovators had applied for various available IP rights. Descriptive statistics for analysing the companies' evaluation of the level of protection and the effectiveness of IP enforcement mechanisms are provided, distinguishing them according to their previous IP litigation experience.

The contribution of the current research is three-fold. First, two paradoxical phenomena in developing countries' IP setting are highlighted and the related evidence reported in literature reviewed briefly. Second, a picture of the *de jure* software IP protection in Iran and available legal mechanisms therein is given. Third, *de facto* software IP protection in Iran is empirically investigated. Accordingly, this paper addresses the aforementioned two paradoxes in a less-researched developing country.

Developing Countries' IP Setting: Two Paradoxes

De jure vs de facto IP protection

Many scholars have implicitly assumed that IP rights are readily enforceable. Although there are evidences to support this basic assumption in the context of developed economies, it is not always the case. For instance, in the context of developing countries, where IP infringement is more common, weak IP protection is sometimes due to ineffective enforcement and weak sanctions rather than the IP law itself.[21] Carroll reported that IP laws and legislations in many Arab countries have a history of decades, but lack of implementation and enforcement of these laws is evident.[14] Sarkissian points to cases, in which there were explicit articles of Iranian IP law on a particular type of IP, but they were never enforced. He argues that 'many aspects of IP protection are determined not only by particular IPR laws, but also by administrative practices and

intervention of courts, which ultimately decide over infringement and validity of IPRs.'[13]

Keupp *et al.* refer, in particular, to China as an extreme example of the difference between passing laws and enforcing laws in emerging economies. They explain that China passed a variety of IPR laws, joined all major international IPR conventions and became a member of the World Trade Organization, which obliged it to abide by the TRIPS (Trade-Related Aspects of Intellectual Property Rights) regulations.[12] However, China is not really enforcing these existing laws. They describe the situation as a paradox: 'Despite the formal presence of IPR laws, a foreign firm's IPR is difficult to enforce in China.'

Although the reasons may vary from country to country, the gap between *de jure* and *de facto* IP protection seems to have a fairly consistent pattern in many developing economies. In other words, despite the fact that many developing economies have already passed seemingly advanced IP laws, IP enforcement is often ineffective. It is no wonder that a vast majority of companies active in such a context, then, consider the level of IP protection as low. In other words, IP system is unable to provide a proper and balanced incentive to innovators, at least given the standards of the developed world.

Despite the importance of the gap between *de jure* and *de facto* IP protection, it has not sufficiently addressed in the academic literature. One reason could be the multidisciplinary nature of research in the field. On one hand, there is a large body of literature on IP rights and economic development in developing countries, which has mostly confined itself to *de jure* IP law.[22-26] On the other hand, there is a growing body of literature on how companies active in developing nations actually protect their IP, which focuses more on *de facto* IP law.[12,27,28] Research in the latter falls in the sub-discipline of IP and innovation management while the former deals with law and economics. It seems quite unlikely that systematic research on the developing countries' IP paradox -*de jure vs de facto* IP protection- can be achieved without overcoming the silos of academic departments and disciplines.

Increased Patenting despite Weak Legal Protection

Teece's seminal paper shows that in weak appropriability regimes it is reasonable to see very little or no motivation for patenting.[29] In innovation management literature, appropriability regime very much depends on the core-knowledge features of the innovation (tacit *vs* codified) and the strength of legal protection for IP.[29-31]

Yet despite this widely accepted premise and its seemingly indisputable logic, recent research has shown that patenting in a wide range of these economies including Brazil, China, and Mexico, is growing at an increasingly fast pace.[32] For instance, the number of patents granted to foreign applicants in China in the period from 2000 to 2009, more than tripled.[16] Hu & Jefferson also point to the dramatic upsurge in patenting in China, especially by domestic applicants.[15] This trend is certainly paradoxical when considering the weaknesses in developing countries' IP system, as these weaknesses in theory should decrease incentives to patent.

As mentioned earlier, management scholars have started to address this paradox mostly focusing on *de facto* IP law. For instance, there are increasing reports of companies in the context of developing nations using variety of market strategies or complementary measures to deter misappropriations, mitigate their impact, and even turn them to an advantage.[12,16,21] Complementary measures usually refer to methods for protecting IP without using the legal system, formal litigation or lawsuits, such as moving down the learning curve, being the first to commercialize, relying on complementary assets, benefiting from complexity of design, or ensuring secrecy.[29,33]

On the other hand, some management scholars have tried to explain why companies patent in weak appropriability regimes. Keupp *et al.*, for instance, investigated the motivations of foreign firms who patent in China and grouped those companies into four different archetypes.[16]

Before describing Iranian software IP law in detail, the authors briefly reviewed the literature on software protection in Iran.

Review of the Literature on Software Protection in Iran

In recent years, dozens of countries have entered the competitive market of exporting software products and services. A research that has been done on new software exporting nations categorized them into four-tier taxonomy based on three criteria, namely, export revenues, cluster size, and maturity. According to the same research, in which countries like the United States, Canada, Japan and India are categorized as Tier 1 or 'major software exporting' nations, Iran is among the Tier 4 or 'infant stage software exporting' nations.[34] Another study on the plans and prospects of Iran's software industry refers, *inter alia*, to endemic piracy as a significant barrier to development of the industry.[35] To date, however,

there have been very few studies on the Iranian IP system in general and on software protection in the country in particular.

Sarkissian examined the main features of the Iranian IP system in order to give a 'broad-picture' of it. He looked into the IP related laws and regulations as well as administrative practices and organizational set-ups. He points to the rather long history of IP protection in Iran and adds that there is no evidence that the country's patent system performs well in terms of its incentive function. His arguments, though, remain at a high level of abstraction and do not address each IP mechanism in detail. As regard to software protection, he briefly mentions the related laws and correctly points out that despite a declaration-based patent system, some sort of examination is conducted for software patenting. He also illustrates the crucial role of the High Council of Informatics (HCI) in the registration of software in Iran both under copyright and patent.[13]

Bagheri *et al.*, give a detailed description of the changes in Iran's IP regime created by the new 'Patent, Industrial Designs, Trademarks Law' ratified in 2008. In their paper, they indicate that 'since computer software is not mentioned as exclusion from patentability in Article 28 of the new law, one can infer that the Iranian legislators have meant computer software to be patentable.' Then they refer to the law on 'the registration and protection of computer software' enacted in 2001 and conclude that software innovations 'can be protected both under copyright and patent systems in Iran'.[36]

Moghadam and Bagheri investigated the legal protection of a specific type of software, namely chemical engineering software (CES) in Iran. They referred to the ever-increasing industrial application of CES and the increasing pursuit of patent protection by CES developers. They argued that exclusion of software algorithms from patentability in Iran could jeopardize future development of the CES software in the country.[37]

Bagheri *et al.*, in another investigation analysed the state of software patenting in Iran by looking at the country's patent law and also the patenting process. They point out some distinctive characteristics and shortcomings of the software patenting system in Iran, including: (1) A patent for a software algorithm is not granted in Iran; (2) In the patenting of software, one requires approvals from the Ministry of Culture and Islamic Guidance (MCIG) and High Council of Informatics (HCI), while the Iranian patent office decides on patentability of filed applications; (3) Applicants are required to provide the patent

office with a fully operative version of their software; (4) It is possible to register business method patents as software patent; (5) No clear and practical guidelines for examination of software or computer-related inventions has been issued by the Iranian patent office and, therefore, the examination process has remained vague and uncertain.[38]

Ghazinoory *et al.*, in their historical perspective of the IP regime of Iran showed how IP legislation evolved over the last nine decades. The paper shows that although the first Iranian IP law dates back to 1924, the first explicit reference to the protection of computer software in the law occurred as late as 2000. It then presents the results of a survey of 180 manufacturing firms active in Iran which clearly indicates their lack of motivation to engage in IP management. This is despite major upgrading of the country's IP law.[39]

Although previous research allows one to have a basic understanding of the Iranian IP regime, there is still a good deal of knowledge lacking about IP protection of software. Further prior studies addressed IP from a predominantly legal perspective and did not provide empirical evidence to either support or challenge the role of IP protection in promoting innovation in Iran.

De jure Software IP Protection in Iran

Several state-created IP regimes are usually referred to in granting the necessary protection to software as intellectual creations, among them copyright, patents and *sui generis* are the most important and widely used ones. Trade secrets, trademark and trade dress law may also be used to protect software, but they are not explored here.[3,4] In this section, the three main branches of IP protection available for software innovations as reflected in the Iranian IP laws and regulations are explored.

Copyright Protection

Literary and artistic works in Iran are covered by the law on protection of writers, composers, and artists or simply the Iranian Copyright Law enacted on 12 January 1970. In accordance with Article 3 of the Iranian Copyright Law, the author's rights include the exclusive right to publish, broadcast, perform and publicize works, and further right to any financial and intellectual profit resulting from his work or name. Article 12 of the law makes it clear that the financial rights of the author are transferred to his heirs, or by covenant, for a period of thirty years after his death. Article 13 indicates that the financial right of a work produced by employees belongs to the

employer for a period of thirty years from the date of production, unless a shorter period or more limited arrangements has been agreed upon. The protection of the Iranian Copyright Law is only afforded to works that are printed, distributed or performed for the first time in Iran.[40]

In the Iranian Copyright Law, there is no explicit reference to inclusion of software in literary and artistic works. This is quite expected, considering the fact that the law was enacted way back in 1970. In January 1992, however, an Iranian court ruled against the unauthorized use of a software product by referring to the Articles 2-11 of the same law.[41] The aforementioned article extends coverage of the copyright protection to the original technical work. The decision made it clear that the Iranian copyright law can potentially offer a minimum level of protection to software.[37]

Given the fact that Iran has not acceded to Bern Convention, the level of copyright protection afforded to literary and artistic works is not compatible with international norms and standards and, as mentioned earlier, is limited to works published for the first time in Iran. Non-Iranian works, therefore, are only protectable in Iran if they are first published in the country.

Patent Protection

Patenting has a rather long history in Iran. The first Iranian patent law dates back to 1931. According to that law, exclusive rights could be given to anyone who registers 'an invention or discovery in the various fields of industry or agriculture'. However, 'financial schemes', 'inventions harmful to public law and order, or public health or morality', and 'pharmaceutical formula or compounds' were excluded from patentability as per Article 28 of the same law. Considering Articles 26 and 27 on patentable subject matter and also Article 28, one could infer that computer software with industrial applicability were covered and protected by patent law.

The old law was replaced by a new law entitled 'Patent, Industrial Designs, Trademarks Act', (hereinafter Industrial Property Law), which was passed by the Parliament on 22 January 2008 and formally entered into force on 16 February 2009. In general, the changes introduced by the new law clarified certain issues like the patentability requirements, priority, exclusion from patentability, grace period, joint inventions and hire-to-invent situations, civil remedies, compulsory licensing and also the intention to shift to an examination based

system.[36] On the other hand, computer software is not expressly excluded from patentability under Article 4 of the new law. Again this only implies that the Iranian legislators have not meant to consider computer software as a non-patentable subject matter.

Sui Generis Protection

Ambiguities in the legal protection of software has caused the creators of software products not to feel sufficiently protected and not to pursue enforcement of their rights against alleged infringers and unauthorized users. Developing a *sui generis* legal mechanism was hence considered by Iranian legislators as a way of providing more protection to software.

On 9 January 2001 a new law entitled 'The Registration and Protection of Computer Software' (hereinafter Software Law), which was meant to improve all aspects of software protection, was enacted. The law categorizes software under 'literary and artistic works' and 'inventions' and introduces the registration as a requirement for protection. Moreover, Article 22 of its regulation provides for the possibility of simultaneous protection under both patent and copyright systems. According to this law, the economic rights of software creators will be valid for a period of 30 years and moral rights have no time limit. The Software Law is very clear when it comes to infringement remedies. Article 13 says that a court may award monetary damages as a remedy for infringement and infringers will be sentenced to corrective imprisonment for a period of time not more than 91 days and pay statutory damages, ranging from a minimum of 10,000,000 Rials to a maximum of 50,000,000 Rials. Article 16 of the law, though, limits the protection only to those software products created and published for the first time in Iran.

With regard to Article 9 of Software Law, software inventions can only be registered before the Iranian Patent Office (IPO) if they manage to get 'Technical Certificate', an important milestone in the registration process of software, from the Iranian Supreme Council of Informatics (SCI). Getting this certificate, in turn, is conditional on receiving a 'Publication Clearance' from the Ministry of Culture and Islamic Guidance (MCIG). Publication Clearance mostly concerns the effects of software on public morality and its compliance with Islamic teachings.

A Patent Committee formed under the supervision of HCI examines each software invention to see whether it qualifies to receive the Technical Certificate. The committee consists of three software experts and a law expert appointed by HCI and a

representative from 'The Registration Organization for Deeds and Properties of Iran'. Article 2 of the Software Law regulation and the guideline of the Patent Committee clearly excludes all sorts of computer algorithms (not merely mathematical algorithms) from patentability. Moreover, according to Article 2 of the regulation, successful completion of all stages of software development, namely analysis, design, construction, and implementation is a prerequisite for enjoying protection under Software Law.

The guideline of the Patent Committee applies the general patentability requirements to software patents too. However, there are no details on the specific standards of patentability in the field of software. The same guideline excludes, software merely used for mathematical calculations, from patentability. It also allows granting patent right to business method software inventions. Applicants are required to provide the Patent Office a fully operative version of their software together with their application.

In Software Law there is no explicit reference to the Iranian Copyright Law, although almost similar rights are envisaged for the right owners. However, the Patent law is clearly incorporated by reference in Article 2 of the Software Law and also Article 22 of its regulation. Therefore, as far as software inventions are concerned, the most important role of the software *sui generis* protection is to clearly underline their patentability. In relation to copyrighted software works, its role is to repackage the existing Copyright Law in a way that: (1) removes any ambiguity in terms of software's eligibility for protection; (2) adds the registration requirement; and (3) limits the protection only to works created within Iran.

Empirical Data

The most common way of analysing *de facto* IP protection is to look at IP litigation records to see how many registered patents actually hold and are reliably enforced in court. Access to the non-electronic files of the only specialized IP court in Iran, however, is practically impossible. Also, there is still no open-to-public searchable database for Iranian patents. Accordingly, national patent data could not be examined in analysing the actual demand for IP rights.

In such a setting, a possible way of gathering and analysing empirical data on *de facto* software IP protection as well as the demand for acquiring software IP rights, was to directly contact the companies involved in software innovation to understand the perception of their managers on

strength of software IP protection in Iran and if they really registered their software innovations through SCI or IPO.

To find innovative software companies in Iran, the Supreme Council of Informatics (SCI) online database was used. The SCI is a high-level government body that monitors and ranks all companies active in the Iranian informatics sector. SCI's ranking plays a critical role in selecting the best qualified bidders and developers for government projects. Annually, SCI evaluates companies according to the type of informatics activities they are involved in and gives them a score. It then ranks them based on their scores (Table 1) and publishes the results through its online portal. These scores are calculated using three indicators: human resources, annual revenue (last two years), and customer satisfaction. The companies are ranked between 1 and 7, with 1 being the most qualified and 7 being the least qualified.

The present research is confined to companies belonging to rank 1 to rank 4 which are located in the capital Tehran. Since most of the country's software companies are situated in Tehran, the survey covers some of the most innovative software developers in Iran.

The SCI's online portal provides the details of about 250 companies. The questionnaire was distributed in 2012 with a cover letter explaining the scope and purpose of the research and sent via e-mail. A total of 52 companies responded to the questionnaire. All the companies that responded were private firms active in the software sector and primarily involved in software development. During the survey, the authors did their best to ensure that questionnaires were filled by the CEOs or top management executives.

Figure 1 shows the number of companies per rank. As can be seen, the majority of companies belong to rank 3 and 4.

Details about all the product categories and the number of firms that belong to each category are provided in Fig. 2. Several firms have products

belonging to more than one category. An overwhelming majority of the respondent companies (30 out of 33) were involved in developing new software for specific application domains.

In order to capture the evaluation of Iranian companies on Iranian IP enforcement mechanisms and level of overall software IP protection, data from the questionnaire were employed. Those companies that had registered their software as copyrighted material through the Supreme Council of Informatics (SCI) and those that had applied for patents through the Iranian Patent Office (IPO) were distinguished in the study. Companies were asked to indicate how they consider IP enforcement mechanisms and their perception of the overall level of software IP protection in Iran. Another question referred to their previous experience with IP litigation against potential infringers before the Iranian IP court.

Although the typical five-level Likert scale was used to ask about the managers' perception on the effectiveness of IP enforcement and their evaluation of the overall level of software IP protection in Iran, the respondents' answers were concentrated around
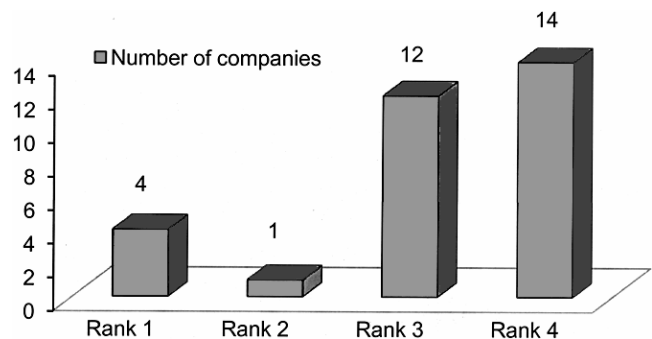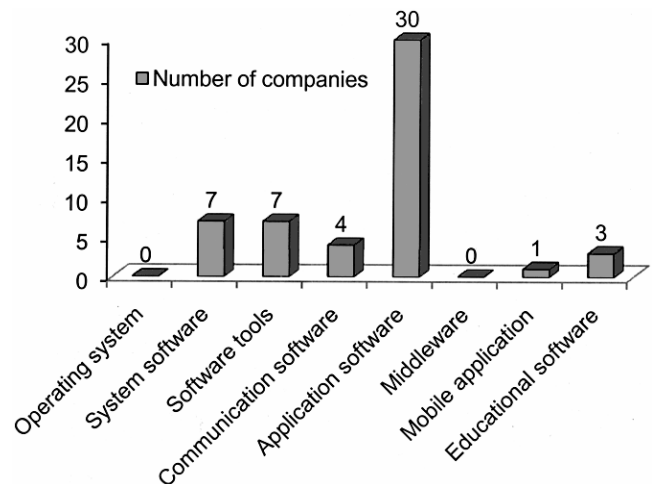

Fig. 1—Number of firms per rank

Fig. 2—Distribution of firms per product category

Table 1—SCI-ranking score

SCI rank	Scores
1	$X \geq 10000$
2	$5000 \leq X \leq 9999$
3	$2000 \leq X \leq 4999$
4	$500 \leq X \leq 1999$
5	$150 \leq X \leq 499$
6	$50 \leq X \leq 149$
7	Start-ups

the 2 poles of the Likert scale and in order to provide more readable results, it was decided to collapse the 5 modalities into 2 (as in Table 3 and 4). An overview of the dummy variables employed and their summary statistics are presented in Table 2.

Tables 3 and 4 provide more details. Table 3 reflects the companies' evaluation of IP enforcement in Iran. The nature of protection taken for their software, i.e., copyright or patent, if at all, is also included in the table.

As Table 3 shows, among the companies that had registered their software through SCI, the majority (71.87 per cent) considered IP enforcement in Iran as ineffective, while only 28.13 per cent of them considered it as effective. Only one company out of the 33 that had not registered any software through the SCI, considered the country's IP enforcement as effective. Out of 32 companies (96.97 per cent) with SCI software registration record, only 5 companies (15.62 per cent) had previous software IP litigation experience.

Table 3 also shows that the majority of companies being surveyed (81.82 per cent) had registered software patents before IPO and the majority of them (70.37 per cent) considered the IP enforcement in Iran ineffective. Only 7.4 per cent of the companies with patent registration record had previous IP litigation experience.

Table 4 focuses on companies' evaluation of the overall level of software IP protection in Iran. In this table the authors again distinguished between companies that had or had not registered their software innovations as copyrighted material or patents.

Table 4 shows that among those companies that had registered their innovations as copyright through SCI, 81.25 per cent considered the overall level of software IP protection to be low, while only 18.75 per cent considered it high. Only 15.62 per cent of the companies with patent registration record had previous IP litigation experience. On the other hand, among those companies that had registered their software through the Iranian Patent Office, 77.77 per cent considered the overall level of software IP protection as low.

Table 2—Overview of the variables and summary statistics

Variable	No of observations	Mean	Std dev
Previous IP litigation experience	33	0.1515	0.3641
Perceived overall level of protection	33	0.212	0.4151
Software registered through the SCI	33	0.9697	0.174
Software registered through the Iranian Patent Office	33	0.8181	0.3916
Evaluation of Iranian IP enforcement mechanisms	33	0.3030	0.4667

Table 3—Evaluation of IP enforcement in Iran by software companies

| | | Evaluation of IP enforcement | | | |
| | | Ineffective | | Effective | |
		Without PIPLE*	With PIPLE*	Without PIPLE*	With PIPLE*
Software registered through SCI	No	0	0	1	0
	Yes	18	5	9	0
Software registered thorugh IPO	No	1	3	2	0
	Yes	17	2	8	0

*PIPLE stands for Previous IP Litigation Experience

Table 4—Evaluation of the overall level of software IP protection by software companies

| | | Evaluation of overall level of software IP protection | | | |
| | | Low protection | | High protection | |
		Without PIPLE*	With PIPLE*	Without PIPLE*	With PIPLE*
Software registered through SCI	No	0	0	1	0
	Yes	21	5	6	0
Software registered thorugh IPO	No	2	3	1	0
	Yes	19	2	6	0

*PIPLE stands for Previous IP Litigation Experience

For correlation among variables, due to the fact that they are binary, the phi coefficient was used. In the present sample, there is little correlation between software registration through SCI and previous IP litigation experience (phi coefficient = 0.0747), software registration through SCI and the evaluation of IP enforcement mechanisms (phi coefficient = 0.26), software registration through IPO and evaluation of IP enforcement (phi coefficient = 0.03), and software registration through IPO and the evaluation of the overall level of software IP protection (phi coefficient = 0.052). On the other hand, there is a weak positive correlation between software registration through Iranian Patent Office and previous IP litigation experience (phi coefficient = 0.458), and software registration through Supreme Council of Iran and evaluation of the overall level of software IP protection (phi coefficient = 0.34).

Discussion, Limitations and Further Research

The present research shows that, software companies doing business in Iran have the option of using a mix of legal avenues to protect their IP. The Iranian IP law is clear about patentability of software inventions and enforceability of granted exclusive rights. Moreover, software innovators have the option of registering their software as copyrighted materials too. The Iranian IP law is also clear when it comes to copyright infringement sanctions. More importantly, Iranian software innovators, where applicable, have the option of acquiring double protection for their software by registering them as copyrighted work as well as patent. Having said this, one would reasonably expect the Iranian IP system to provide sufficient economic incentive for software innovators inside the country. This, however, is a picture of software IP protection as defined by law.

Empirical investigation of the *de facto* software IP protection in Iran, though, painted a different picture. In this research, some of the most innovative software companies in Iran were studied. The results show that the majority of the companies surveyed (78.78 per cent) considered the overall level of software IP protection in Iran as low. Also a majority (69.69 per cent) of these software developing companies considered IP enforcement in Iran as ineffective. Nonetheless, the overwhelming majority of these companies acquired patent and copyright protection (Fig. 3). Only 18.18 per cent of the companies being surveyed had no patent registration record and only 3.03 per cent had no copyright registration record. These results show no correlation between the companies' perception of the overall
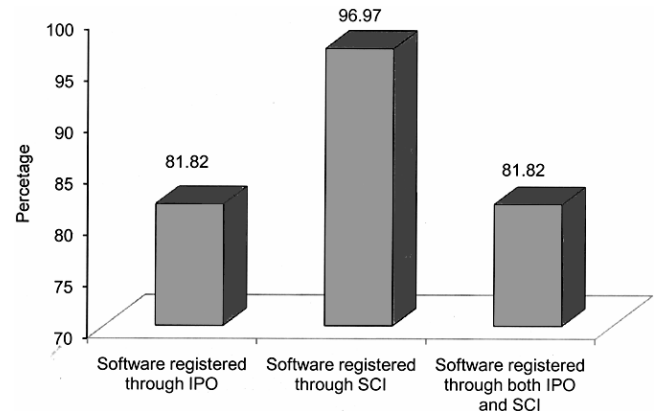

Fig. 3—Software companies with patents and/or copyright registration record

level of software IP protection in Iran and their IP registration record.

The results reinforce prior studies in suggesting that despite having multiple legal mechanisms for protecting software innovations, Iranian IP developers consider the overall level of software IP protection offered as low. However, paradoxically, a vast majority of surveyed software innovators applied for various available IP rights and no correlation could be observed between their perception of strength of the available IP protection and their record of applying for available IP rights.

The fact that no correlation was found between the companies' perception of the overall level of software IP protection in Iran and their IP registration record could be due to the relatively low number of observations. Moreover, the availability of mainly dummy variables for the companies' previous IP registration records did not allow anything more than descriptive statistics. This was mostly due to the fact that companies were reluctant to reveal the exact numbers of their patenting and copyrighting activities.

This research could be considered a first step towards empirically exploring the IP paradoxes in the Iranian context. The authors suggest three complementary approaches. First, a qualitative approach could be applied, for example using case study research. The findings of a case study research could help investigate as to why software innovators consider the level of legal protection offered to be low and how they actually protect their IP. It can also shed light on their motivation to acquire extensive IP rights despite their distrust in the protection offered by the IP rights. Second, further quantitative research that uses a larger sample and more detailed information should be conducted to give a more clear and robust

picture of *de facto* software IP protection in Iran. Due to time and data constraints, it has not been possible in this study to collect and analyse detailed statistics on the economic impact of software IP protection on the business performance of the surveyed companies. Finally, comparative studies aimed at boosting generalization of the results can be conducted in the context of other developing countries.

References

1 Suh D & Hwang J, An analysis of the effect of software intellectual property rights on the performance of software firms in South Korea, *Technovation*, 30 (5) (2010) 376-385.

2 Abraham S E, Software patents in the United States: A balanced approach, *Computer Law & Security Review*, 25 (6) (2009) 554-562.

3 Robert L G, The legal protection of computer software, *Communications of the ACM*, 27 (5) (1984) 422-426.

4 Story A, Intellectual Property and Computer Software: A Battle of Competing Use and Access Visions for Countries of the South, United Nations Conference on Trade and Sustainable Development (2004).

5 Graham S J & Mowery D C, *Intellectual property protection in the US software industry* (The National Academies Press, Washington DC), 2003, pp. 219-258.

6 Smith B L & Mann S O, Innovation and intellectual property protection in the software industry: An emerging role for patents? *The University of Chicago Law Review*, 71 (2004) 241-264.

7 Samuelson P *et al.*, A manifesto concerning the legal protection of computer programs, *Columbia Law Review*, 94 (1994) 2308.

8 Menell P S, Tailoring legal protection for computer software, *Stanford Law Review*, 39 (1986) 1329.

9 Li Y, Pushing for greater protection: The trend toward greater protection of intellectual property in the Chinese software industry and the implications for rule of law in China, *University of Pennsylvania Journal of International Economic Law*, 23 (4) (2002) 637-661.

10 Diallo B, Historical perspectives on IP protection for software in selected countries worldwide, *World Patent Information*, 25 (1) (2003) 19-25.

11 Perthuis A & Bulck P, Software Protection in China, *The Journal of World Intellectual Property*, 8 (4) (2005) 405-444.

12 Keupp M M, Beckenbauer A & Gassmann O, Enforcing intellectual property rights in weak appropriability regimes: The case of de facto protection strategies in China, *Management International Review*, 50 (1) (2010) 128-159.

13 Sarkissian A, Intellectual property rights for developing countries: Lessons from Iran, *Technovation*, 28 (11) (2008) 786-798.

14 Carroll J, Intellectual property rights in the Middle East: A cultural perspective, *Fordham Intellectual Property, Media and Entertainment Law Journal*, 11 (3) (2001) 555-560.

15 Hu A G & Jefferson G H, A great wall of patents: What is behind China's recent patent explosion? *Journal of Development Economics*, 90 (1) (2009) 57-68.

16 Keupp M M, Friesike S & von Zedtwitz M, How do foreign firms patent in emerging economies with weak appropriability regimes? Archetypes and motives, *Research Policy*, 41 (8) (2012) 1422-1439.

17 Yang D & Clarke P, Globalisation and intellectual property in China, *Technovation*, 25 (5) (2005) 545-555.

18 O'Keeffe M, Cross comparison of US, EU, JP and Korean companies patenting activity in Japan and in the People's Republic of China, *World Patent Information*, 27 (2) (2005) 125-134.

19 Fai F M, Using intellectual property data to analyze China's growing technological capabilities, *World Patent Information*, 27 (1) (2005) 49-6.

20 Hu M C & Mathews J A, China's national innovative capacity, *Research Policy*, 37 (9) (2008) 1465-1479.

21 Anand B & Galetovic A, How market smarts can protect property rights, *Harvard Business Review*, 82 (12) (2004) 72-81.

22 Gould D M & Gruben W C, The role of intellectual property rights in economic growth, *Journal of Development Economics*, 48 (2) (1996) 323-350.

23 Chen Y & Puttitanun T, Intellectual property rights and innovation in developing countries, *Journal of Development Economics*, 78 (2) (2005) 474-493.

24 Maskus K E, Intellectual property challenges for developing countries: An economic perspective, *University of Illinois Law Review*, 2001 (1) 464-66 at 457.

25 Kanwar S & Evenson R, Does intellectual property protection spur technological change? *Oxford Economic Papers*, 55 (2) (2003) 235-264.

26 Schneider P H, International trade, economic growth and intellectual property rights: A panel data study of developed and developing countries, *Journal of Development Economics*, 78 (2) (2005) 529-547.

27 Bird R C, Defending intellectual property rights in the BRIC economies, *American Business Law Journal*, 43 (2) (2006) 317-363.

28 Chadha A & Oriani R, R&D market value under weak intellectual property rights protection: the case of India, *Scientometrics*, 82 (2010) 59-74.

29 Teece D J, Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy, *Research Policy*, 15 (6) (1986) 285-305.

30 Teece D J & Pisano G, The dynamic capabilities of firms: an introduction in *Technology, Organization, and Competitiveness* edited by G Dosi, D J Teece & J Chytry (Oxford University Press, Oxford), 1998.

31 Levin R C, Appropriability, R&D spending, and technological performance, *The American Economic Review*, 78 (3) (1988) 424-428.

32 Zhao M, Conducting R&D in countries with weak intellectual property rights protection, *Management Science*, 52 (8) (2006) 1185-1199.

33 Hall B H, Helmers C, Rogers M & Sena V, The choice between formal and informal intellectual property: A literature review (No w17983), National Bureau of Economic Research (2012).

34 Carmel E, Taxonomy of new software exporting nations, *The Electronic Journal of Information Systems in Developing Countries*, 13 (2) (2003) 1-6.

35 Nicholson B, Building Iran's software industry: An assessment of plans and prospect, *The Electronic Journal of Information Systems in Developing Countries*, 13 (6) (2003) 1-19.

36 Bagheri S K, Moradpour H A & Rezapour M, The Iranian patent reform, *World Patent Information*, 31 (1) (2009) 32-35.

37 Moghaddam M T & Bagheri S K, Chemical Engineering Software and protection thereof, Proceeding of 14th International Oil, Gas & Petrochemical Congress, 19-20 May 2010, Tehran, Iran.

38 Bagheri S K *et al.*, Protection of software inventions in Iran, *The Iranian Journal of Science & Technology Policy*, 3 (2) (2011) 13-30 (in Persian).

39 Ghazinoory S *et al.*, IP Management in the context of developing countries: The case of Iran's industrial companies, *International Review of IP and Competition Law*, 43 (3) (2012) 267-285.

40 Iranian Copyright Law or Law for the Protection of Authors, Composers and Artists Rights, enacted on 12 January 1970.

41 Chitsazan M, *Intellectual Property Rights*, first edition, (Tehran), 2001 (in Persian).