Relationships between Claim Structure and the Competitiveness of a Patent

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Abstract: A patent's competitiveness becomes crucial for the enforcement of patent right to protect business and ensure profits of companies. This study quantitatively analyses patent applications related to patent infringement lawsuits filed in trial courts in Japan. The total number of independent claims (**k**) and the maximum number of independent claims within a single claim category (**l**) at the time of filing patent applications of winning patents are found to have significant positive correlation with the number of references listed in Japanese granted patent publications or the like (**x**) in the case of winning patents, but not in losing patents. These results indicate that ensuring of the maximal technological scope of invention while avoiding envisioned prior inventions at the time of filing patent applications is critical to obtain a competitive patent and that patent applications in competitive fields should have more independent claims.

1. Introduction

Since various technologies are required to manufacture products in several key industries such as semiconductors and electronics, patents necessary to manufacture the products are prone to be owned by multiple patentees. This situation is called a 'patent thicket'. Market participants fret that their new products could infringe on patents issued after these products are designed and go on sale in the patent thicket. Cross-license is a natural and effective method used by the market participants to cut through the patent thicket (Shapiro, 2001). Nagaoka and Kwon have found cross-license plays an important role especially in the electronics industry of Japan (2003).

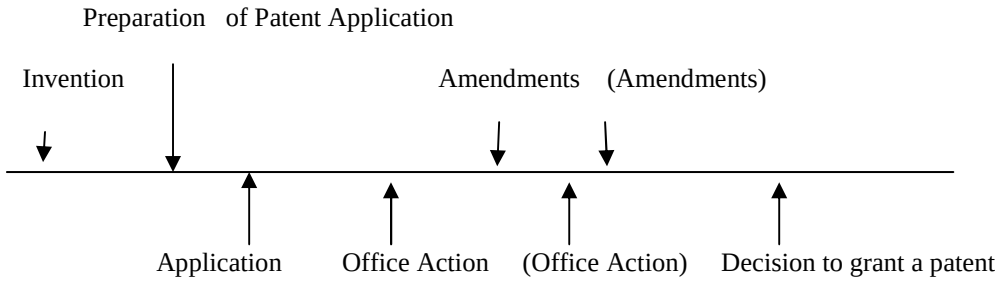
However, the rise of emerging 'fablesses' in developing nations has brought a fierce competition (Lu, Hung and Yang, 2004). This has a major impact on the business approach which places value on cross-license. 'Fabless' means a company which has no manufacturing facilities. The emerging 'fablesses' have grown remarkably in the past decade by specializing in the design and sale of products and putting new products into markets expeditiously, utilizing their mobility as a great advantage in addition to competitive prices. In fact, many of the emerging fablesses have begun to deprive many Japanese companies of their market shares. The emerging fablesses tend to have insufficient patent rights because considerable time is required to establish a portfolio of patent rights. This has led to interference with the traditional cross-license model. Japanese companies are facing a need for enforcement of patent rights than ever before in order to secure their business and profits in this emerging business environment. Enforcement of patent rights often leads to conflict with the party against whom patent right is to be enforced, so it is more crucial for companies to own a competitive patent rather than great number of patents, although the number of patents has been emphasized in the cross-license model (Onishi and Okada, 2005). A competitive patent enables to dominate its maximal technological scope and to exclude competitors from the scope even if they infringe actually the scope. In other words, the recent fierce competition in which enforcement of patent rights is often required to utilize to defeat an adversary has shifted the emphasis of patent from macro perspectives such as the number of patents to micro perspectives such as the competitiveness of a patent.

However, the emphasis has hitherto placed on patent value, which is usually evaluated from the economic or financial point of view, rather than the competitiveness of a patent. There have been many studies on patent values (Ernst, 1998; Ernst, 2001; Hall and Ziedonis, 2001; Hirschey and Richardson, 2001; Hirschey and Richardson, 2004; Lanjouw and Schankerman, 2004). Most of these studies relate to indicators extracted from bibliographic information such as forward citations, backward citations, science linkage, the number of inventors, and family size. Reitzig (2004) shows that the probability of an opposition against a patent can be an indicator of its value. Most of such existing indicators are determined after filing a patent application or decision to grant a patent. Thus it is difficult to use them as tools for improving patent values during patent prosecution process.

Even if the invention is of high quality, unskilful patent practice may nullify its competitiveness. Even negligent slips in claims, specification and prosecution may lead to the patent enforcement claim being defeated or to a weakening of the position of its owner in settlement negotiations. There is a high correlation between the competitiveness of a patent and the activities of patent practitioners in the prosecution process. As shown in Figure

1, which shows prosecution process from the creation of an invention to a decision to grant a patent, a practitioner first prepares a patent application. The preparation of a patent application, which is reflected in claims and a specification of a patent application at the time of filing of the patent application, is especially crucial since Japanese Patent Law, as with other major patent laws such as European Patent Law and Chinese Patent Law, imposes tight restrictions on amendments of claims after filing a patent application. Nonconforming amendments often preclude enforcement of patent rights.

Figure 1. Typical prosecution process from creation of an invention to a decision to grant a patent.



In this respect, the paper titled 'Quality of patent specifications that enable to enforce the patent rights' appeared in a journal issued by Japan intellectual property association (the second subcommittee of the second patent committee of Japan intellectual property association, 2006). This paper proposes a checklist including following characteristic features: target definition (1); verifiability of patent infringement (2); inevitability in utilization (3); ease of royalty estimation (4); ease of comparison (5); unambiguity of technical terms (6); ability to be understood (7); thoroughness of embodiment description (8); logical consistency (9); clarity of technological description (10); fairness (11); appropriateness of disclosure of prior arts (12); and ease of implementation (13). This checklist can be applied to patent practice until filing of a patent application such as preparation of a patent application.

However, since many of these characteristic features are those which pertain to a specification of a patent application other than claims, the checklist demands an immense amount of time and effort to fully use it and is difficult to utilize in a limited time of the preparation of a patent application from a practical standpoint. Further, results of this checklist are influenced by user's ability or subjective view because it is difficult to assess quantitatively these characteristic features.

Therefore, we focus on 'claim structure' at the time of filing of a patent application. Claim structure means herein overlap between claims and operational breadth of the claims quantified by plural parameters such as those described in the following section. By analyzing claim structure quantitatively with such parameters, we expect to obtain objective knowledge regarding the competitiveness of a patent. The obtained objective knowledge is expected to develop tools for obtaining a competitive patent.

The paper is organized as follows: the next section outlines the data and methodology. In particular, this study picks up patent applications involved with patent infringement lawsuits and analyzes claim structures in relation to their victories and defeats, which is one of the tangible outcomes of the competitiveness of a patent. Parameters used to analyze claim structure are also described. The parameters include the total number of independent claims, which stand on their own and do not quote other claims. The third section presents results obtained by analyzing claim structures. The main finding is that the total number of independent claims increases with the number of references regarding patent applications for patents court-affirmed to be infringed (winning patents), but does not in the patent applications for patents court-affirmed not to be infringed (losing patents). A further finding is that there is differences in the average ratio of the number of references divided by the number of the independent claims between the patent applications for the winning patents and those for the losing patents. The fourth section deals with explanations for the obtained results. The last section summarizes our conclusions.

2. Data and methodology

In order to investigate claim structure, this study pays attention to the following parameters:

- the total number of claims (i);
- the total number of claim categories (j);

- the total number of independent claims (k);
- the maximum number of independent claims within a single claim category (l); and
- the number of references listed in Japanese granted patent publications or Japanese examined patent publications (x).

The parameters i, j, k, and l are selected because a practitioner can control them in the preparation of a patent application. There are two types of claims: the independent claim and the dependent claim. The independent claim stands on its own and does not quote another claim while the dependent claim quotes or depends on a single claim or several claims. An independent claim is broader than the dependent claim which depends on it. Independent claims contribute to the operational breadth of claims of a patent application. Claims often belong to different claim categories such as device and method. The parameter x can be used as an indicator for the degree of competition in its technological field.

The following example concretely explains these **i**, **j**, **k**, and **l**.

Claim 1. *A printing apparatus for printing an image on a printing medium by electrifying and driving a printing head, wherein said printing head has resistive elements for driving a plurality of printing elements, input terminals each for receiving a different type of pulse signal for driving said resistive elements, memory means for storing inputted selection data for selecting one of the plurality of types of pulse signals entering from said input terminal, and applying means, which is responsive to the selection data stored in said memory means, for selecting one of the different types of pulse signals entering from said input terminals and applying to said resistive elements, said apparatus comprising:*

- characteristic information storing means for storing printing characteristics of the printing elements of said printing head;
- transfer means for deciding the selection data based on the printing characteristics, which have been stored in said characteristic information storing means, and transferring the selection data decided to said printing head;
- preliminary electrifying means for outputting the different types of pulse signals to said printing head and for performing preliminary electrification of said printing head; and
- printing electrifying means for performing printing by applying current to said resistive elements of said printing head in conformity with image information.

Claim 2. *A printing apparatus for printing an image on a printing medium by electrifying and driving a printing head comprising a plurality of element substrates each having a plurality of printing elements and a circuit for performing printing by applying signals to said printing elements in dependence upon printing data, said printing head including a memory for storing data for correcting printing characteristics of each of said element substrates, each of said element substrates having a plurality of input terminals each receiving a different type of pulse signal for driving printing elements, memory means for storing inputted selection data, each of the selection data selects one of the different types of pulse signals entering from said input terminal, and signal applying means, which is responsive to the selection data stored in said memory means, for selecting one of the different types of pulse signals entering from said input terminal, and applying the selected pulse signal to each of the printing elements, the apparatus comprising:*

- *characteristic information storing means for storing printing characteristics of the printing elements of said printing head;*
- *transfer means for deciding the selection data based on the printing characteristics, which have been stored in said characteristic information storing means, and transferring the selection data to each element substrate of said printing head;*
- *preliminary electrifying means for outputting the plurality of types of pulse signals to said input terminals of said printing head and for performing preliminary electrification of said printing head; and*
- *printing electrifying means for performing printing by flowing current through said resistive elements of said printing head in conformity with image information.*

Claim 3. *The apparatus according to claim 2, further comprising detecting means for detecting resistance values of said resistive elements, wherein said printing means decides printing electrification time of said resistive elements in conformity with said resistance values.*

Claim 4. *A printing method for printing an image on a printing medium, comprising the steps of:*

- *providing the printing apparatus according to claim 2;*
- *deciding the selection information based on the printing characteristics of said printing head;*

- *transferring the selection information to said printing head and storing it in said storing means;*
- *outputting different types of pulse signals to said printing head and performing preliminary electrification of said printing head; and*
- *performing printing by flowing current through said resistive elements of said printing head in conformity with image information.*

Claim 5. *A printing head having a plurality of printing elements and a circuit for performing printing by applying a signal to said printing elements in dependence upon printing data, said printing head comprising:*

- *a plurality of input terminals each receiving a different type of pulse signal for driving each of the printing elements;*
- *memory means for storing selection data, each of the selection data selecting one of the different types of pulse signals entering from said input terminals with respect to the printing elements;*
- *latch means for receiving printing data and latching the printing data with respect to each of the printing elements; and*
- *signal applying means, which is responsive to the selection data stored in said memory means, for selecting one of the different types of pulse signals entering from said input terminals, and applying the selected pulse signal to each of the printing elements based on the printing data latched in said latch means.*

The total number of claims (**i**) is five because there are five claims in all. The total number of claim categories (**j**) is three: "printing apparatus", "printing method", and "printing head". The total number of independent claims (**k**) is three: claims 1, 2, and 5. The maximum number of independent claims within any single claim category (**l**) is two because claims 1 and 2 are included in the claim category of "printing apparatus" and claim 5 is included in "print head" among the three independent claims.

If there is a claim which is expressed in the form of 'independent claim' but which actually depends on a single claim or on several claims, such claim is not counted as an independent claim because, in terms of it being an independent claim, it is substantively meaningless. A claim quoting another claim that belongs to a different claim category is not regarded as an independent claim but as a dependent claim.

The parameters **i**, **j**, **k**, and **l**, can be extracted from claims of patent applications described in Japanese unexamined patent publications. References listed in Japanese granted patent publications or Japanese examined patent publications are basically considered as references cited by the examiner in charge for examination (Ogawa and Watanabe, 2005). The number of references (**x**) is considered to correspond to the number of prior inventions.

In this study, patents involved in patent infringement lawsuits are collected, using websites of the precedent information retrieval system offered by the courts in Japan (Courts in Japan) and the database of patent precedents in Japan offered by Patent Bureau Co., Ltd (Patent Bureau Co., Ltd), which list patent infringement lawsuits filed in trial courts during the period 1967-2007. Patents for which patent applications were filed after January 1, 1976, when the revised Japanese Patent Law originally adopting multiple claiming took effect, are extracted from the collected patents since the above parameters **i**, **j**, **k**, and **l** make sense in the presence of the multiple-claim system. Analyses are carried out regarding claims of patent applications corresponding to the patents extracted, based on the approach explained above, except for patents judged to be invalid. The reason for excluding invalid patents is that validity is supposed to be exhaustively examined by the Patent Office before a patent is litigated. The analyses include quantitative comparisons of the above parameters between patent applications for patents which defendants or other parties are affirmed by the courts to infringe and not to infringe.

3 Results

The analyses are performed on all claims of 98 patent applications and 282 patent applications, where the former and the latter correspond to patents which were judicially determined to have been infringed (winning patents) and those held not to be infringed (losing patents), respectively. Table 1 shows the International Patent Classification (IPC) of patent applications for the winning patents and the losing patents. The IPC includes following categories: A (Human necessities); B (Performing operations; Transporting); C (Chemistry; Metallurgy); D (Textiles; Paper); E (Fixed constructions); F(Mechanical engineering; Lighting; Heating; Weapons; Blasting); G (Physics); and H (Electricity). As shown in Table 1, the patents analyzed in this study are categorized into various technological fields. Since some patents are categorized in more than one IPC category, the numbers indicated in Table 1 include patents each of which is counted in a plurality of IPC categories.

Table 1
International Patent Classification (IPC) of the patents court-affirmed to be infringed (winning patents) and the patents court-affirmed not to be infringed (losing patents)

	IPC							
	A	B	C	D	E	F	G	H
Winning patents	37	35	9	2	8	2	15	10
Losing patents	60	77	61	6	60	35	95	63

Table 2 shows results obtained by analyses of the parameters **i**, **j**, **k**, **l**, and **x** for the winning patents and those for the losing patents based on two-sided t tests, which is used to test whether there is a statistically significant difference between the averages of the two groups.

Table 2 indicates that as to all of these parameters there is no statically-significant difference between the winning and losing patents at 10% level with a two-sided t test.

Table 2
Averages of the parameters **i**, **j**, **k**, **l**, and **x** for the patents court-affirmed to be infringed (winning patents) and the parameters **i**, **j**, **k**, **l**, and **x** for the patents court-affirmed not to be infringed (losing patents) and results of t tests

	Number of patents	Parameter				
		i	**j**	**k**	**l**	**x**
Winning patents	98	5.94	1.32	1.58	1.31	2.43
Losing patents	282	5.29	1.40	1.46	1.23	2.70
p-value for two-sided t tests	-	0.526	0.400	0.356	0.336	0.322

Reitzig (2004) indicates the number of independent claims correlates positively with the value of patent, based on analyses of European patents linked to the probability of an opposition. The Reitzig's paper observes that independent claims determine the operational breadth of a patent, so profits from its value should rise with the number of independent claims. There may be no significance in a rigorous comparison of the present results with those of Reitzig since the present results are based on analyses of patents irrespective of their technological field, while those of Reitzig are based on analyses of patents in specific technological fields such as chemistry. The number of opponents is considered to reflect the degree of competition, which varies according to technological field, as observed by Reitzig (2004). One explanation of the difference regarding the number of independent claims between the present results and Reitzig's results may be that the influence of the breadth of the patent in parameter **k** is hidden in the huge variety in the degree of competition which depends on the technological field.

These results find it difficult to use these parameters as definitive indicators for distinguishing between winning and losing patents.

This study conducts correlation analyses on relationships between parameters **i**, **j**, **k**, **l**, and **x** of patent applications for both the winning and the losing patents. Table 3 shows correlation coefficients between two parameters of **i**, **j**, **k**, **l**, and **x** for the winning patents, while Table 4 shows those for the losing patents.

Table 3
Correlation coefficients obtained by correlation analyses between two parameters of i, j, k, l, and x for the winning patents

Parameters	**i**	**j**	**k**	**l**	**x**
i					
j	0.385**				
k	0.437**	0.596**			
l	0.280 **	0.137	0.798**		
x	0.286**	0.172	**0.342****	**0.282****	

Note: ** Significant at 1 % level (two-sided tests).

Table 4
Correlation coefficients obtained by correlation analyses between two parameters of **i**, **j**, **k**, **l**, and **x** for the losing patents

Parameters	**i**	**j**	**k**	**l**	**x**
i					
j	0.486**				
k	0.446**	0.436**			
l	0.252**	0.119*	0.820**		
x	0.168**	0.081	0.114	0.104	

Note: * Significant at 5 % level (two-sided tests).
** Significant at 1 % level (two-sided tests).

Differences in these correlations between the winning and the losing patents are observable, as Tables 3 and 4 show. Correlation coefficients obtained by correlation analyses of **k** versus **x** and **l** versus **x** for the winning patents (indicated in bold) are statically-significant, while those for the losing patents are not. Thus the number of independent claims increases with the number of references regarding the winning patents, but does not in the losing patents.

This study further examines composites of the above parameters. Table 5 shows averages of ratios of two parameters of **i**, **j**, **k**, **l**, and **x**. The number of references (**x**) is divided by another parameter, since there is such a case that no reference is listed in Japanese granted patent publications or Japanese examined patent publications.

Of the possible paired combinations of the parameters above, p-values of **x**/**k** and **x**/**l** obtained by two-sided t tests between winning and losing patents are 0.06 and 0.07, respectively, which are not statistically significant at 5% level with a two-sided t test but are statistically significant at 10% level. The two-sided 95 % confidence interval of **x**/**k** is 1.42 to 2.15 while that of **x**/**l** is 1.62 to 2.42. The values of **x**/**k** and **x**/**l** for the winning patents are smaller than those for the losing patents. In other words, the total number of independent claims and the maximum number of independent claims within a single claim category per one reference for the winning patents are greater than those for the losing patents. Patent applications having more independent claims per one reference are more likely to obtain competitive patents to win in patent infringing lawsuits.

The ratios of the number of references (**x**) to the parameters related to independent claims can be used as quantitative indicators for evaluating the competitiveness of patents to distinguish between winning and losing patents. Since a patent practitioner can control parameters **k** and **l** in claim drafting, he or she can also control the values of **x**/**k** and **x**/**l** if he or she recognizes fully related prior inventions or references to be cited by an examiner.

Table 5
Averages of ratios of the parameters **i**, **j**, **k**, **l**, and **x**

	Number of patents	Composite parameter									
		j/i	**k/i**	**l/i**	**x/i**	**k/j**	**l/j**	**x/j**	**l/k**	**x/k**	**x/l**
Winning patents	98	0.50	0.55	0.51	0.95	1.24	1.13	2.04	0.91	1.78	2.02
Losing patents	282	0.53	0.55	0.5	1.14	1.12	1.02	2.23	0.91	2.21	2.45
p-value for two-sided t tests	-	0.44	0.98	0.79	0.18	0.1	0.14	0.42	0.96	**0.06**	**0.07**

The reason why patent applications for winning patents have smaller **x**/**k** and **x**/**l** than those for losing patents is explained further in the following section.

Table 6
Averages of the parameters **i**-**m**, **j**-**n**, **k**-**o**, and **l**-**p** for the patents court-affirmed to be infringed (winning patents) and the parameters **i**-**m**, **j**-**n**, **k**-**o**, and **l**-**p** for the patents court-affirmed not to be infringed (losing patents) and results of t tests

	Number of patents	Parameter			
		i-m	**j-n**	**k-o**	**l-p**
Winning patents	98	1.420	0.010	0.010	0.020
Losing patents	282	0.530	0.043	-0.021	0.018
p-value for two-sided t tests	-	0.227	0.621	0.784	0.978

Note:

- the total number of claims in Japanese granted patent publications or Japanese examined patent publications (**m**);
- the total number of claim categories in Japanese granted patent publications or Japanese examined patent publications (**n**);
- the total number of independent claims in Japanese granted patent publications or Japanese examined patent publications (**o**); and
- the maximum number of independent claims within a single claim category in Japanese granted patent publications or Japanese examined patent publications (**p**).

This study further investigates the process from a filing of a patent application to a decision to grant a patent, concretely, the changes of the total number of claims, the total number of claim categories, the total number of independent claims, and the maximum number of independent claims within a single claim category from the filing of each patent application to the decision to grant a patent. With regard to the averages of the parameters **i**-**m** (**m** is the total number of claims in Japanese granted patent publications or Japanese examined patent publications), **j**-**n** (**n** is the total number of claim categories in Japanese granted patent publications or Japanese examined patent publications), **k**-**o** (**o** is the total number of independent claims in Japanese granted patent publications or Japanese examined patent publications), and **l**-**p** (**p** is the maximum number of independent claims within a single claim category in Japanese granted patent publications or Japanese examined patent publications), there are no significant differences between winning and losing patents as shown in Table 6. No significant differences in the averages of the parameters (**i**-**m**)/**i**, (**j**-**n**)/**j**, (**k**-**o**)/**k**, and (**l**-**p**)/**l** are also observed between the winning and losing patents as shown in Table 7. These results indicate that the process from a filing of a patent application to a decision to grant a patent do not significant contribution to the competitiveness of a patent.

Table 7 Averages of the parameters (**i-m**)/**i**, (**j-n**)/**j**, (**k-o**)/**k**, and (**l-p**)/**l** for the patents court-affirmed to be infringed (winning patents) and the parameters(**i-m**)/**i**, (**j-n**)/**j**, (**k-o**)/**k**, and (**l-p**)/**l** for the patents court-affirmed not to be infringed (losing patents) and results of t tests

	Number of patents	Parameter			
		(i-m)/i	**(j-n)/j**	**(k-o)/k**	**(l-p)/l**
Winning patents	98	-0.091	-0.032	-0.051	-0.009
Losing patents	282	-0.17	-0.037	-0.121	-0.048
p-value for two-sided t tests	-	0.397	0.901	0.19	0.398

Note:

- the total number of claims in Japanese granted patent or Japanese examined patent publications (**m**);
- the total number of claim categories in Japanese granted patent publications or Japanese examined patent publications (**n**);
- the total number of independent claims in Japanese granted patent publications or Japanese examined patent publications (**o**); and
- the maximum number of independent claims within a single claim category in Japanese granted patent publications or Japanese examined patent publications (**p**).

4 Discussion

4.1. Discussion on results of correlation analyses

Figure 2 shows a schematic explanation for observed correlations in the patent applications for the winning patents. As described above, the number of references corresponds to the number of prior inventions. Coverage of a maximum technological scope of invention is required for obtaining winnable patents. When there is no prior invention, which means that there is no reference, only one independent claim can cover the maximal scope (see the case of **x** = 0). This is because it is not necessary to avoid any prior invention. In contrast, the presence of a prior invention makes it difficult fully to cover its maximal scope by only one independent claim. Plural independent claims are thus required to cover the maximal scope while avoiding the prior invention (see the case of **x** = 1). More independent claims are required to fully cover the maximal scope with avoidance of prior inventions as the number of prior inventions increases (see the case of **x** = 4). In contrast, the correlations of **k** versus **x** and **l** versus **x** are not statically-significant in the patent applications for the losing patents. The fact that the correlations of **k** versus **x** and **l** versus **x** are statically-significant for the winning patents indicates that utilization of independent claims to fully cover the maximal scope with avoidance of prior inventions is necessary to obtain a winnable patent or competitive patent in the preparation of a patent specification. This indicates that patent applications in competitive fields, in which there are numerous prior inventions, should have more independent claims to obtain a competitive patent.

As shown in Figure 2, each of the plural independent claims should partly overlap another independent claim to satisfy the requirement of unity of invention, which is stipulated in Article 37 of Japanese Patent Law as with other major patent laws such as European Patent Law. Accordingly a patent practitioner must draft claims recognizing exactly technological differences among independent claims each of which partly overlaps another independent claim. Thus a high degree of perceptiveness in patent practice, which correlates with the ability of a patent practitioner, is required to make plural independent claims fully cover the maximal scope within the restriction of unity of invention. As will be appreciated from the foregoing, the correlation analyses of **k** versus **x** and **l** versus **x** can be used as tests for examining the performance of practitioner under constrained condition.

Statically-significant correlation between **x** and **i** for the winning patents is observed. This can be interpreted as being derived from the correlation between **i** and **k** or **l** because the correlations of **i** versus **k** and **i** versus **l** are statically-significant as indicated in Table 3, respectively.

*4.2. Discussion on results of the average values of **x/k** and **x/l***

The direct correlations of k versus x and l versus x above is considered to be reflected in the differences of the average values of x/k and x/l between winning and losing patents (Figure 3). The observed differences are statistically significant at 10% level with a two-sided t test. The fact that the values of x/k and x/l for the winning patents are smaller than those for the losing patents, as shown in Table 5, indicates that more independent claims per one reference or prior invention are required in order to cover the maximal scope while avoiding prior inventions.

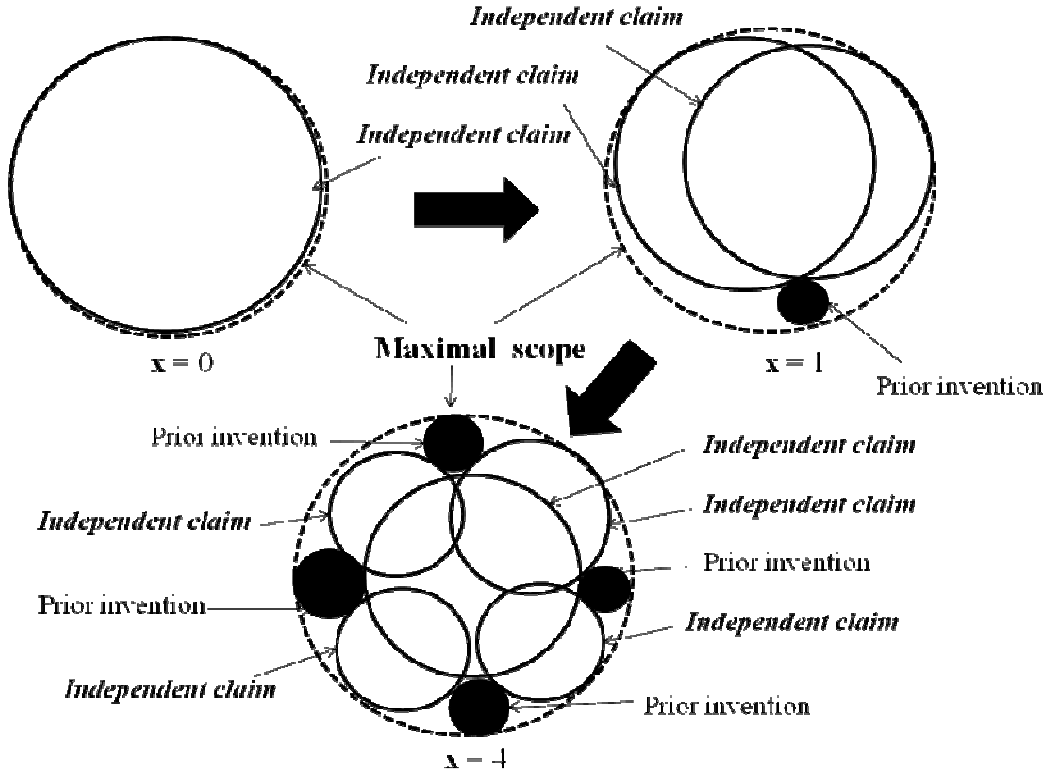
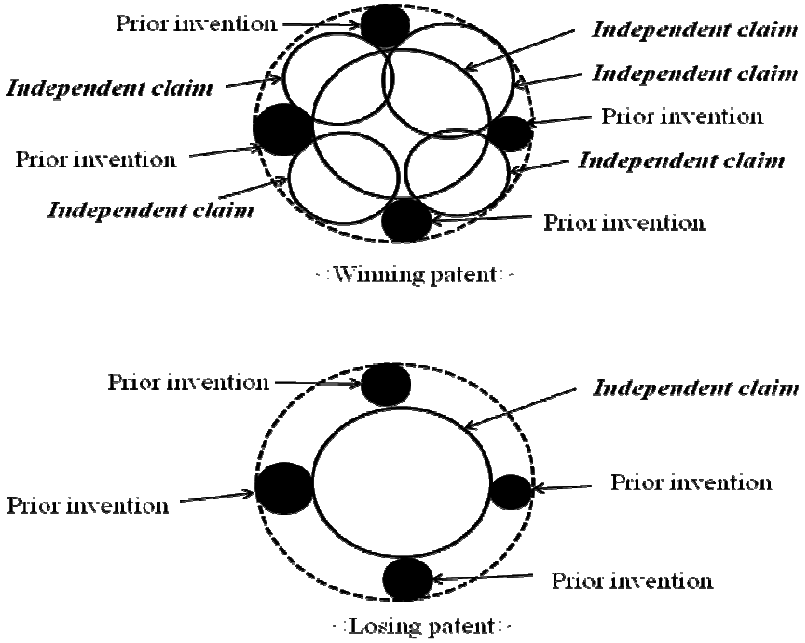


Figure 2. A schematic explanation for the observed correlations in patent applications for the winning patents.

5 Conclusion

The results obtained by this study show importance of preparation of a patent application. It is crucial to cover a maximal scope by plural independent claims with avoidance of prior inventions. According to the number of references to be cited by an examiner, or prior inventions revealed by detailed survey, the number of independent claims needs to increase. Since the specification must provide adequate support for claims of the patent application as stipulated by most of major patent laws, improvement of claims will lead to a high quality patent application. In other words, in order to obtain a competitive patent, a patent practitioner should survey prior inventions thoroughly and draft claims of a patent application so that the number of independent claims increases depending on the number of prior inventions.

Figure 3. A schematic explanation for the differences of the values of **x/k** and **x/l** between the winning patents and the lost patents.



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