DETERMINANTS OF TECHNOLOGY LICENSEE'S SATISFACTION: AN EMPIRICAL INVESTIGATION

Shenzhao Fu, University of San Francisco
Debra S. Perkins, Purdue University

ABSTRACT

This study uses the disconfirmation paradigm to investigate technology licensee's satisfaction. Analyzing the data collected from a mail survey, the authors find that a longer than expected delivery process, lower than expected quality, higher than expected price, and lower than expected profit significantly affect licensee satisfaction. In contrast, a longer than expected negotiation process, a greater than expected input of manpower, a less than expected training, etc. do not affect licensee satisfaction as much as people used to think. On the basis of the disconfirmation paradigm and this study's empirical results, several practical suggestions for technology licensors are drawn and elaborated. In addition, the role of licensee satisfaction in licensing research and related future research topics are discussed in the paper.

INTRODUCTION

Technology licensing can help achieve a variety of business objectives that might otherwise be very difficult, or even impossible, to achieve. These objectives may include 1) entering a new market, 2) forging a strategic alliance, 3) avoiding a legal dispute, 4) reducing new product development cost, and many more (McDonald and Leahey 1985). Recognizing such benefits, experts have called upon technology possessing firms to "take technology to the market" (Anderson 1979; Ford and Ryan 1981), and on all firms to consider inward technology licensing as a viable alternative or supplement to their in-house R&D programs (Gold 1975; Link, Tassey and Zmud 1983). Moreover, marketing scholars have suggested that every firm formulate its own comprehensive "technology strategy," which integrates technology acquisition, management and exploitation through licensing as well as other internal and external means (Capon and Glazer 1987; Ford 1988).

Despite the advantages technology licensing is thought to be able to bring, however, many companies have never tried it (Ford 1985). Likewise, the concept of technology strategy is found to be largely foreign to most companies (Clarke, Ford, and Saren 1989). In order to understand why some firms are more likely than others to adopt technology licensing, prior researchers have compared the characteristics of licensing participants with those of non-participants. The characteristics that have been examined include industry affiliation, firm size, degree of diversification, R&D capacity, executive's past experience, cost and benefit perceptions of technology licensing, and satisfaction over past licensing projects (Link, Tassey and Zmud 1983; Ford 1985; Adam, Ong, and Pearson 1988).

While these studies have provided useful guidance in identifying likely participants, they have failed to explicitly address a pair of closely related, but more important, questions. First, could a non-participant be converted to a participant by technology marketers? If the answer to the first question is yes, then what are the practical means to convert such a firm?

In theory, as long as one knows what separates non-participants from participants, the answer to the first question should be "yes," and the answer to the second question should simply be "letting the non-participant acquire the characteristic(s) all participants share." In reality, however, this approach faces problems. Some of the identified characteristics cannot be acquired without changing the very identity of the firm (e.g., firm's industry affiliation and size). Other characteristics may be acquired, but so far no effective ways to manage the acquisition processes are known (e.g., manager's cost and benefit perceptions for technology licensing, and satisfaction over past licensing projects).

This paper's goal is to investigate one of the acquirable characteristics -- technology licensee's satisfaction. Our objective is to find out how licensee satisfaction can be practically lifted. In other words, the goal is to uncover the important determinants of licensee satisfaction so they may be manipulated by future licensors to generate a desirable level of satisfaction. The benefits of

developing and disseminating this knowledge are two-fold. First, current and future licensors will be able to improve their operations and hence retain and recruit more clients, thereby expanding the rank of licensees. Secondly, reluctant technology possessing firms will gain more knowledge and confidence so that they will be more inclined to becoming licensors, which also helps expand the licensing business.

The remainder of the paper is presented in five sections. The first section draws from past research to define our research question and to formulate hypotheses. The second describes the research method. The third presents and interprets the results of our data analysis. The fourth discusses practical suggestions these results imply for technology licensors. The last section summarizes the study by pointing out its strengths and weaknesses, and suggests directions for future research.

RESEARCH QUESTION AND HYPOTHESES

The term *technology* as used in this research refers to the means or capacity to perform a particular activity. It is an intangible asset rather than a physical object (Telesio 1979). Practically speaking, technology under this definition includes all licensable knowledge, whether patented or not, such as product designs, product formulas, manufacturing processes, customized computer software, management know-how, and the like. It does *not* include so-called high-tech products such as computers. In turn, *technology licensing* refers to a contractual agreement whereby a seller (licensor) sells to a buyer (licensee) the **right to use** such an asset for a lump-sum and/or ongoing royalty payments (Contractor 1981).

The concept of *satisfaction,* or customer satisfaction, does not need special definition here. But it is necessary to give a brief review of its theoretical consequences and antecedents, which explains more fundamentally why this research is undertaken and how the problem will be tackled. More than a mere association with positive perception, as reported in a licensing research (Atuahene-Gima 1993), satisfaction is found to *lead to* attitude change, repeat purchase, and brand loyalty in general consumer behavior research (Oliver 1980). This definitive causal relationship guarantees that satisfaction is a worthy marketing goal for the seller's long term well-being. On the other hand, satisfaction is found to have positive disconfirmation of prior expectations as its antecedent (Oliver 1980; Anderson 1973; Churchill and Surprenant 1982; Olshavsky and Miller 1972). In other words, if the seller meets or surpasses the buyer's initial expectations, customer satisfaction is nearly a sure thing. This disconfirmation paradigm, predominant in customer satisfaction research, points out the general direction in licensee (customer) satisfaction. However, which aspects of disconfirmation, or what attributes of product performance and customer expectations, affect customer satisfaction the most is an empirical question, which is investigated here in the context of technology licensing.

Within the framework of the aforementioned concepts and the theoretical disconfirmation paradigm, the primary research question is formulated as follows:

> *What are the determinants, directionality, and magnitude of technology licensee's satisfaction?*

To identify probable attributes and to develop testable hypotheses, the licensing research literature was reviewed thoroughly and a series of personal interviews with business executives in charge of licensing were conducted. These interviews suggested that there were basically four types of problems that concern the licensee: 1) the negotiation process, 2) the transfer/delivery process, 3) the technical and financial performance of the licensed technology, and 4) the licensing arrangement's long term impact on the licensee's other operations. In each of these four areas, the licensee should have an initial expectation, explicitly or implicitly, which would later be confirmed, positively disconfirmed, or negatively disconfirmed.

Negotiation has always been a major component of the technology licensing process, and has drawn much research attention (Contractor 1981). The internalization theory in multinational enterprise research attributes the long negotiation phenomenon partially to the small number of sellers and buyers of any specific piece of

technology, which is one of the typical characteristics of an "imperfect market" as defined by economists (Buckley and Casson 1976). It is well known that market imperfection leads to a high degree of indeterminacy with respect to price. Hence the price of technology "may simply be a function of the negotiation skills of the parties involved" (Killing 1980). Other complications in technology licensing sometimes also dictate that the negotiations drag on for a long time and demand extraordinary skills. In reality, however, not every firm possesses the negotiation skills desired, nor can every firm afford the intensity and duration of licensing negotiations. According to the interviewees, some companies choose to avoid this costly activity by staying away from licensing altogether, and some choose to hire experienced professionals, such as lawyers and consultants to help conduct licensing negotiations. It is reasonable to assume that licensees prefer to have negotiations take less time, and to have experienced external helpers more readily available when needed. Taking prior expectations into consideration, the following hypotheses are offered:

H1: The *more the actual time* of the negotiation exceeds expected time, the *less* satisfied the licensee is.

H2: The *easier* it is to find experienced external helpers than expected, the *more* satisfied the licensee is.

Technology is often delivered, or transferred, through a series of activities such as adapting the technology to suit the buyer's application, installing necessary equipment, conducting technical training, etc. The process is necessarily complex and time consuming. Obviously, if this process can be made more smooth and less time consuming, the licensee will view licensing more favorably. The interviewees were asked what aspects of the actual implementation processes bother them the most. Among numerous project-specific and industry-specific answers, three common concerns stand out: 1) used more manpower than anticipated, 2) received insufficient training, and 3) significantly delayed completion. Incidentally, these three problems are also cited in Ford's 1985 study, although they are phrased somewhat differently. For testing purposes, three delivery/transfer related hypotheses are stated as follows:

H3: The *more* manpower requirements in the transfer process exceed expectations, the *less* satisfied the licensee is.

H4: The *more* thorough the training the licensee receives than was expected, the *more* satisfied the licensee is.

H5: The *longer* the time to complete the delivery process than expected, the *less* satisfied the licensee is.

Ultimately, the worth of a licensed technology is determined by the value it generates for the licensee (Oliver 1982). That value may be assessed in a dollar amount if it increases sales, reduces costs, or both. It may also be assessed in non-monetary terms such as manufacturing flexibility and product quality, especially when a process technology or a piece of management know-how is involved. Naturally, the higher the technology's achieved value over the expected value, the happier the licensee will be. Without getting into industry or project specificity, it is assumed that licensees have three kinds of prior expectations. The first is the technical capabilities of the technology. The second is how much it should cost at the time the technology is presented to the licensee. The last is how much profit it may help generate in subsequent years. For each of these prior expectations, a corresponding hypothesis is to be tested:

H6: The *better* the quality of the licensed technology is than anticipated, the *more* satisfied the licensee is.

H7: The *more* the licensee pays for the licensed technology than he was originally prepared to, the *less* satisfied the licensee is.

H8: The *more* profit subsequently generated by the licensed technology than anticipated, the *more* satisfied the licensee is.

Some seemingly harmless contractual clauses and activities may create problems beyond the current operation the licensed technology is expected to improve. McDonald and Leahey (1985) insightfully discussed many of them. For instance, the commonly adopted grant-back clause, which grants the licensor free use of improvements made by the licensee, may eventually help other licensees who are competitors of the firm making the improvements. Another example is that frequent follow-up service calls, which may be necessary to keep the licensed technology working properly, may result in the licensee's becoming overly dependent on the licensor. This dependency can be catastrophic if the licensor goes out of business. Other potentially troublesome items include territorial restrictions, purchasing obligations, non-competition guarantees, and so forth. In a particular licensing arrangement, some of these potential problems may be well understood by the licensee and well prepared for, but never become a real problem. Some others may be less well understood and never prepared for, but can strike with unexpected harshness at a later time. Apparently, such disconfirmation of expectations will have some impact on licensee satisfaction. Hence, the following two general hypotheses are offered, which encompass most of the problems discussed above.

H9: The *more* actual protection/freedom the licensing contract provides the licensee than he expects to get, the *more* satisfied the licensee is.

H10: The *more* follow-up services are necessary than expected, the *less* satisfied the licensee is.

METHOD

A mail questionnaire survey was chosen to collect the relevant data for this research. The attempted sample consisted of 1967 manufacturing and business service firms, which were selected from a 1993 manufacturers register of a major western state in the United States. The survey form was mailed to presidents, CEOs, or owners of selected companies in early December 1993, with the return deadline of January 5, 1994. It was explicitly suggested that if the addressee felt appropriate, the survey form could be passed to and answered by another person who was responsible for the company's licensing operations. Eighty-five questionnaires were quickly returned either because the company had moved and left no forwarding address, or the respondent refused to participate. This led to an approached sample size of 1882. By the middle of February 1994, 336 completed questionnaires were received for a return rate of 17.9%. Due to resource limitations and an intervening holiday season, no systematic follow-up phone calls, nor second mailing, were attempted. Non-response bias was checked by comparing response rates in various industry groups and company size groups, as well as comparing key characteristics between early and late respondents. No statistically significant differences were present in most of these comparisons, which suggested that non-response bias was not a serious problem in the survey (Armstrong and Overton 1977). Among the 336 completed questionnaires, 82 were answered from the licensee's perspective, 80 the licensor's, and the remainder from that of the non-participant's viewpoint.

All attribute-specific disconfirmation constructs and overall satisfaction were measured on bipolar 5-point rating scales, with specific reference to the respondent's latest licensing project. In addition to these measures, a significant number of objective questions were asked first in the questionnaire. One of the purposes of including the objective questions, such as how long the negotiation actually took, was to refresh respondents' memory, so that they could answer main questions more accurately.

RESULTS

This paper analyzes the data supplied by 82 licensees. The break-down of this sample's respondent position, company size and industry affiliation are shown in Exhibit 1. As Graph (a) of the exhibit indicates, the majority of the questionnaires are answered by CEOs, presidents, and business owners, implying that these business leaders are genuinely interested in the subject and that the data collected are credible. Graph (b) indicates that this sample is skewed to the small

firm end, suggesting that the findings presented in this paper largely reflect small businesses' thinking. Finally, Graph (c) indicates that there is a high concentration of four industries in the sample. They are SIC codes 35 (industrial and commercial machinery and computer equipment), 36 (electronic and other electrical equipment and components), 38 (measuring, analyzing, and controlling instruments), and 73 (computer software and business services). We should bear in mind that all statistics and interpretations are presented in the context of this limited data set.

Exhibit 2 shows characteristics of licensed technology under investigation. Graph (a) of the Exhibit indicates that the majority of respondents answered questions with reference to their not-so-distant-past experience, which tends to be reliable. Graph (b) indicates that the types of technology concentrate more in product designs, customized software, and specific manufacturing processes. Graph (c) indicates that less than one quarter of the respondents (19 out of 82) reported that their licensing contracts were the first, and perhaps the exclusive ones, with their respective licensors. All others either report that theirs were not the first, or they did not even know or care whether they were the first.

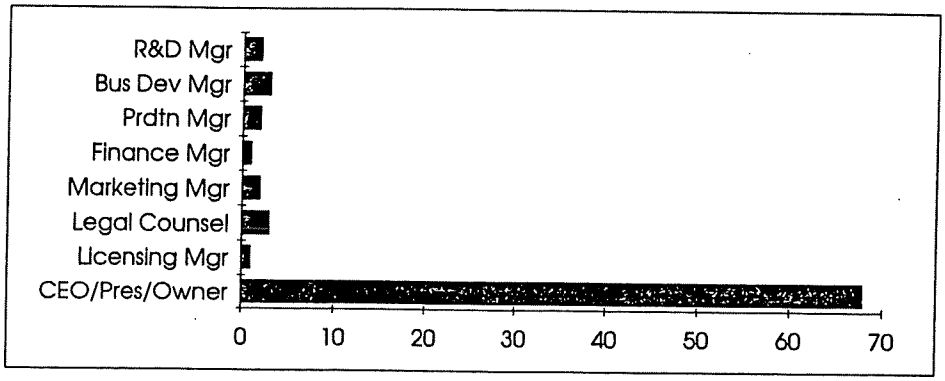
The ten hypotheses are tested utilizing simple correlation matrix and multiple regression analysis. Table 1 shows the correlation matrix of the dependent variable, licensee satisfaction, and ten hypothesized independent variables. H5, H6, and H7 show higher than 0.500 correlation coefficients with satisfaction, suggesting that the three corresponding hypotheses are supported.

Table 2 presents the regression output, in which the second column indicates the sign of each construct's expected impact on licensee satisfaction. More than telling that some of the hypotheses are supported and some are not, it tells in relative term that some are *more strongly* supported than others. As the table shows, the overall regression equation explains nearly 60% of the total variance in licensee satisfaction over its latest inward licensing project. The F statistic (12.8724) testifies that the model is significant at 0.0000 level. The beta estimate (regression coefficient), t-value, and one-tail significance level in each row tell us whether and how significantly the corresponding hypothesis is supported. Among the ten hypotheses tested, H5, H6 and H7 are supported at better than 0.005 significance level, and H8 is supported at better than 0.05 level. In contrast, the other six hypotheses are not significantly supported.

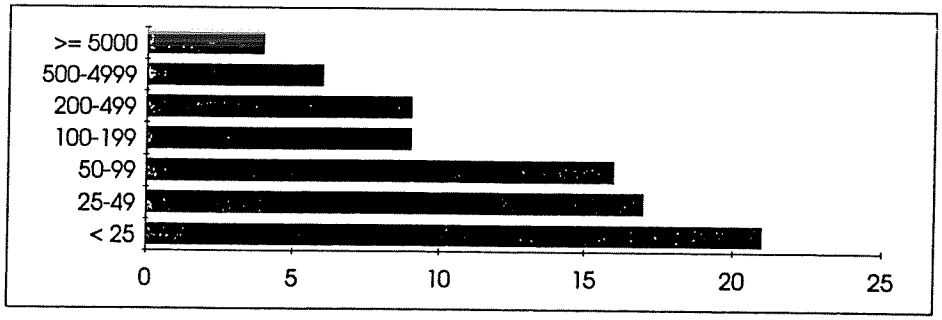
The sign, magnitude, and significance level of each beta estimate can be unreliable if a high multicollinearity is present. To assess how serious this problem is in this study, we have conducted auxiliary regressions, which regress each independent variable on all other independent variables (Judge, Hill, Griffiths, Lutkepohl and Lee 1982). The signal of high multicollinearity is a high R-square (close to 1.0) appearing in one or more of the auxiliary regressions (Lewis-Beck 1980). It turns out that the highest R-square produced is 0.4117 (see Table 3), which is considered far from 1.0. Hence multicollinearity is not deemed to be a serious problem in this data set.

The most important conclusion that can be drawn from this hypothesis testing procedure is that a typical licensee is very much end-result-minded: he will be satisfied as long as the *performance* of the licensed technology lives up to or surpasses his expectations. Specifically, it would seem that "performance" includes <u>when</u> the technology starts to perform as well as <u>how well</u> technically and financially it performs. Process related concerns such as how long the negotiation has taken and how much training has been provided do not affect the licensee satisfaction as much as expected. Similarly, concerns over the licensing agreement's and peripheral activities' long term impacts on the licensee's other operations do not significantly affect his satisfaction either. There are two possible explanations for these results. The straightforward one is just what we have said: the end result is more important than its proceeding processes and subsequent fall-outs. The other possible explanation is that because we are asking questions about the *latest* licensing project, our respondents tend to forget, or give less weight to, what had happened before the technology was put into use. Due to the very same reason or the importance of time lags in making consequences clear, these latest licensing projects have not yet reached the point when the seriousness of legal protection/freedom and over-dependency problems

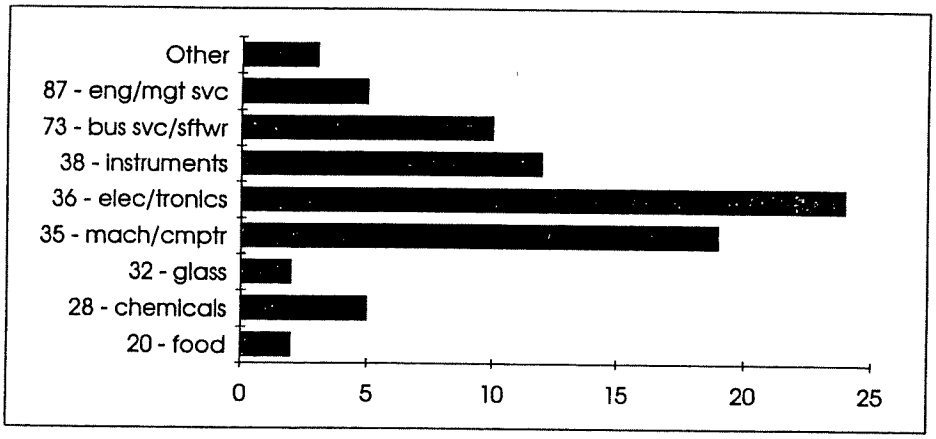
Exhibit 1
Sample Characteristics



a. Respondent's Position in the Organization

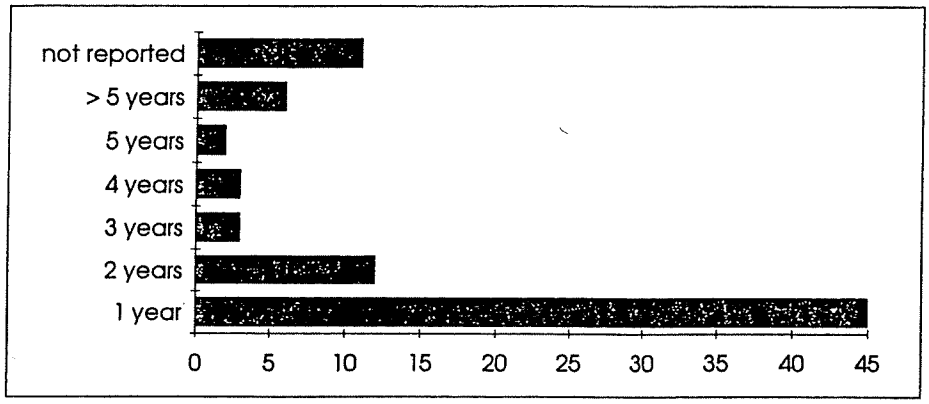


b. Company Size - # of Employees

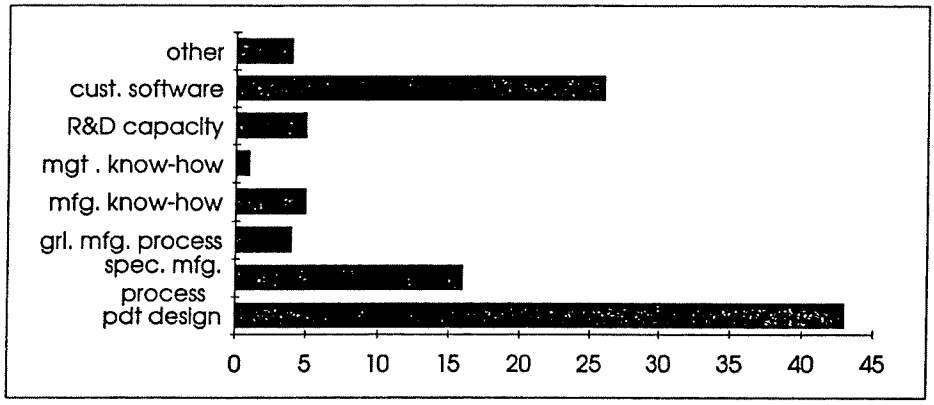


c. Company's Industry Affiliation - 2-Digit SIC Code

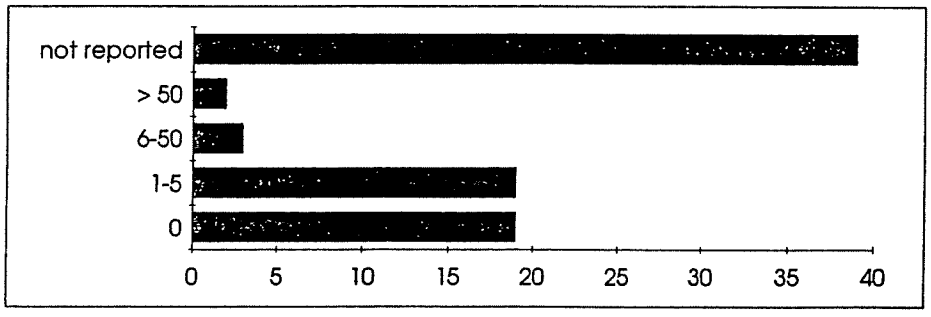
Exhibit 2
Characteristics of Licensed Technology Under Investigation



a. Number of Years Since the Technology Was Licensed



b. Type of Technology Licensed



c. Number of Similar Licenses Granted by the Licensor Prior to The Respondent's

Table 1
Correlation Among Satisfaction and Hypothesized Independent Variables

	Stftn	H1V	H2V	H3V	H4V	H5V	H6V	H7V	H8V	H9V	H10V
Satisfaction	1.000										
H1V	-0.316	1.000									
H2V	-0.023	0.091	1.000								
H3V	-0.330	0.512	0.155	1.000							
H4V	0.285	-0.089	0.086	-0.105	1.000						
H5V	0.622	-0.483	0.166	-0.377	0.402	1.000					
H6V	0.540	-0.071	-0.201	-0.207	0.422	0.270	1.000				
H7V	0.613	-0.164	0.013	-0.328	0.349	0.387	0.500	1.000			
H8V	0.379	-0.136	0.100	-0.039	0.168	0.318	0.135	0.331	1.000		
H9V	-0.318	0.356	0.128	0.250	0.108	-0.218	-0.181	-0.221	0.052	1.000	
H10V	-0.169	0.122	0.275	0.370	0.192	0.003	-0.107	-0.125	0.092	0.279	1.000

Table 2
Hypothesis Testing Using Multiple Regression Analysis

Hypothesis / construct		Expected effect	Beta estimate	t-value	One-tail sig.
H1	Negotiation longer than expected	Negative	-0.0080	-0.090	0.4645
H2	External help more easily found than expected	Positive	-0.0122	-0.198	0.4220
H3	More manpower used than expected	Negative	0.0344	0.362	0.3591
H4	More thorough training than expected	Positive	-0.0848	-1.068	0.1446
H5	Transfer process longer than expected	Negative	-0.3594	-4.318	0.0001
H6	Quality better than expected	Positive	0.3105	3.174	0.0011
H7	Costs more than expected	Negative	-0.3371	-2.882	0.0026
H8	Generates more profit than expected	Positive	0.1141	1.836	0.0353
H9	More protection/freedom than expected	Positive	0.0964	1.102	0.1371
H10	More follow-up services than expected	Negative	-0.0710	-0.987	0.1635

Dependent Variable	Satisfaction
Adjusted R-square	0.5974
F	12.8724
Sig. F	0.0000

can be fully assessed against prior expectations. No matter which explanation is more accurate, however, one thing is clear: during the period when the licensed technology is in full use, licensee satisfaction is greatly defined by the disconfirmation in the four areas (H5-H8) which were just identified.

SUGGESTIONS FOR LICENSORS

Before more specific suggestions can be articulated, a general one should be laid out first: no matter which attribute a licensor tries to manipulate, it is as important to help the licensee develop a realistic expectation as it is for the

Table 3
Multicollinearity Check: Regress One Independent Variable on All Other Independent Variables

Independent Variables	Beta estimate	t	Two-tail sig.
Negotiation longer than expected	0.329121	3.025	0.0035
External help more easily found than exp	-0.166033	-2.131	0.0365
More manpower used than expected	0.160479	1.320	0.1911
More thorough training than expected	-0.250060	-2.538	0.0133
Quality better than expected	-0.074058	-0.586	0.5600
Costs more than expected	0.109545	0.725	0.4707
Generates more profit than expected	-0.143403	-1.821	0.0729
More protection/freedom than expectec	0.117417	-1.043	0.3004
More follow-up services than expected	-0.020992	-0.225	0.8225

Dependent Variable	Transfer process longer than expected
Adjusted R-square	**0.4117**
F	7.2204
Sig. F	0.0000

licensor to lift his performance on that attribute. It is especially true when there is an absolute limit on what the licensor can achieve. In fact, this suggestion has little to do with the research's empirical test results. Rather, it is derived from the disconfirmation paradigm itself, which implies that high customer expectation is as harmful as low product performance to judgments of satisfaction. It is self evident that the licensor should make every effort to raise the performance level of his technology and his service where practical. But without discrediting the value of performance improvements, it is important to call technology licensors' attention to the other side of the coin -- licensee expectations.

With the above general guideline, several practical suggestions for current and future licensors can be discussed more meaningfully. First of all, the licensor should set the delivery time table conservatively, especially when the parties involved are not very experienced in technology licensing. In normal circumstances, the licensee's expectation of how soon the technology can be put into use is largely determined by what the licensor promises. That promise tends not to be compared critically with somebody else's fast pace, or slow pace for that matter, in technology delivery. On the other hand, however, once that promise is accepted, it becomes the licensee's firm expectation. Subsequently, the licensee will be very irritated if the expectation is not met, as the empirical data show very strongly. For these reasons, it is appropriate for the licensor to act conservatively when negotiating a delivery time table. After all, completing ahead of schedule will be appreciated rather than complained about.

Secondly, the licensor should be well aware of each rival technology's strengths, weaknesses, pricing strategy, and profit generation power. (These attributes correspond to H6 through H8.) Prospective licensees judge a technology on these measures against what rival technologies can do. In this circumstance, it is essential that one's technology is better, at least in some ways, than his rivals', and he can truthfully and confidently convey that message to prospective licensees without putting himself in jeopardy. Knowing what rivals can do will help a licensor in two ways: setting performance benchmarks to meet or beat, and avoiding overstatement or understatement of what his technology can do. And both can help improve licensee satisfaction.

Thirdly, longer negotiation, more manpower

used on the side of the licensee, less thorough training and more follow-up services being needed than expected are not viewed as critically as not making good on the promises for the above discussed four attributes. As this is true, the licensor may choose to be somewhat aggressive, if necessary, in promising what can be achieved. Please note, this is ***not*** to suggest that the licensor give unreachable promises to "hook" licensees first and then to disappoint them later. Rather, the suggestion is that it is *relatively* safer to promise more on these attributes than on the ones discussed earlier. After all, meeting a little higher expectation on these attributes should be easier than that on, say, the technology's profitability.

Last, but not the least, the licensor should retain more legal protection or freedom for himself, especially the freedom to grant the same or similar licenses to other users. As H9 is not significantly supported, licensees do not particularly care whether they receive more legal protection/freedom than they wish to receive. On the other hand, however, if the licensor loses such protection/freedom, it can be extremely costly. In the case of exclusive licensing (i.e., the licensor will not be allowed to grant any more licenses to other firms), what the licensor loses are not only chances of selling the technology to other needy users, but also opportunities to make later licensees more satisfied. This last point is particularly important. With track records and experiences accumulated from earlier licensing transactions, the licensor tends to "standardize" future licensees' expectations of his technology, to understand better individual licensee's special needs, to know better how improvement on performance can be made, and hence to make new licensees happier. In fact, a closely related suggestion can also be drawn: the licensor that has licensed out a technology on a non-exclusive basis should act aggressively to seek new users, because doing so is likely to demand less effort and yield greater licensee satisfaction.

CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

To conclude, this paper has made three fundamental contributions. First of all, licensee satisfaction is examined, for the first time, as a vehicle to lift firm's propensity to adopt, and keep adopting, inward and outward technology licensing. Next, disconfirmation of expectations in four general areas is identified as the cause of licensee satisfaction. Finally, ten specific licensing attributes in the four general areas are empirically examined to assess their impact on licensee satisfaction, and practical suggestions for technology licensors accordingly are drawn. It is likely that the one general and four specific suggestions elaborated in the proceeding section have long been followed by experienced licensors. However, the explicit and systematic presentation of these suggestions, with the strong support of test statistics, may still be of substantial help to a variety of people. It helps experienced licensors understand more explicitly why these guidelines work, and prompts them to think how the same principle may be applied to other attribute areas. It helps would-be licensors in that they can avoid costly mistakes and move more confidently into the rank of ready licensors. Even more importantly, at least we hope, it serves as the first target with which academicians as well as practitioners can debate whether these suggestions are indeed the key to licensee satisfaction, and challenge them with new ideas.

The study presented in this paper has certain limitations. First, the empirical test is conducted with a modest sample drawn from a confined sample frame. Results and interpretations may not be generalizable to all licensing situations. Secondly, the ten disconfirmation constructs tested are by no means exhaustive. There may be more important constructs that have been overlooked. It seems nearly certain that if one looks into technology licensing in a specific industry, or a specific type of licensing contract, a set of new constructs would legitimately emerge, and add into these to better explain the variance in licensee satisfaction. Thirdly, the structure of four problem areas where disconfirmation may occur is also subject to further debate. Do they cover all possible constructs that might cause licensee satisfaction or dissatisfaction? Do they overlap each other so that one can be treated as a subset of another? Should an overlapping area, if it exists, be extracted and treated as a fifth area? Should there be a different structure of several general problem areas that better embraces all possible

disconfirmation constructs? These are just a few sample questions this research does not, and cannot, address.

The limitations discussed above serve as a good basis for contemplating directions for future research. Apparently, duplicating this study with a larger sample, or a sample drawn from a different sample frame, can be valuable in that it will help us better understand the nature of the suggestions presented in this paper. At a different level, researchers may want to investigate other disconfirmation constructs and their impact on licensee satisfaction. To accomplish this, researchers may have to conduct personal interviews and/or focus group studies among relevant experts, participants, and non-participants of technology licensing. However, whatever emerges from such exploratory studies, it has to be empirically tested at a larger scale to establish its generalizability. With regard to the validity of the four-general-disconfirmation-area structure, interested researchers may test this structure and rival structures by using more sophisticated statistical tools, such as confirmatory factor analysis and covariance structure models to analyze similar data sets. With the ultimate objective of converting non-participants to participants, researchers may even want to tackle issues other than licensee satisfaction.

REFERENCES

Adam, Y., C. H. Ong and A. W. Pearson (1988), "Licensing as an Alternative to Foreign Direct Investment: An Empirical Investigation," *Journal of Product Innovation Management*, 5, 32-49.

Anderson, B. A. (1979), "Acquiring and Selling Technology -- Marketing Techniques," *Research Management*, 22, 26-28.

Anderson, R. F. (1973), "Consumer Dissatisfaction: The Effect of Disconfirmed Expectancy on Perceived Product Performance," *Journal of Marketing Research*, 10, 38-44.

Armstrong, J. S. and T. S. Overton (1977), "Estimating the Non-response Bias in Mail Survey," *Journal of Marketing Research*, 14, 396-402.

Atuahene-Gima, K. (1993), "Determinant of Inward Technology Licensing Intentions: An Empirical Analysis of Australian Engineering Firms," *Journal of Product Innovation Management*, 10, 230-240.

Buckley, P. J. and M. Casson (1976), *The Future of the Multinational Enterprise*, Holmes and Meier, New York, NY.

Capon, N. and R. Glazer (1987), "Marketing and Technology: A Strategic Coalignment," *Journal of Marketing*, 51, 1-14.

Churchill, G. A. and C. Surprenant (1982), "An Investigation into the Determinants of Customer Satisfaction," *Journal of Marketing Research*, 19, 491-504.

Clarke, K., D. Ford and M. Saren (1989), "Company Technology Strategy," *R&D Management*, 19, 215-229.

Contractor, F. J. (1981), *International Technology Licensing*, Lexington Books, Lexington, MA.

Ford, D. (1988), "Develop Your Technology Strategy," *Long Range Planning*, 21, 83-93.

Ford, D. (1985), "The Management and Marketing of Technology," in R. Lamb and P. Schrivastava, eds., *Advances in Strategic Management*, 3, JAI Press, Greenwich, CT, 104-134.

Ford, D. and C. Ryan (1981), "Taking Technology to Market," *Harvard Business Review*, 59, 117-126.

Gold, B. (1975), "Alternative Strategies for Advancing a Company's Technology," *Research Management*, 18, 24-29.

Judge, G. G., R. C. Hill, W. Griffiths, H. Lutkepohl and T. C. Lee (1982), *Introduction to the Theory and Practice of Econometrics*, John Wiley & Sons, New York, NY.

Killing, P. (1980), "Technology Acquisition: License Agreement or Joint Venture," *Columbia Journal of World Business*, 15, 38-46.

Lewis-Beck, M. S. (1980), *Applied Regression: An Introduction*, Sage Publications, Beverly Hills, CA.

Link, A., G. Tassey and R. W. Zmud (1983), "The Induce versus Purchase Decision: An Empirical Analysis of Industrial R&D," *Decision Sciences*, 14, 46-61.

McDonald, D. W. and H. S. Leahey (1985), "Licensing Has A Role in Technology Strategic Planning," *Research Management*, 28, 35-40.

Oliver, D. S. (1982), "Some Aspects of Technology Transfer," *SRA Journal*, 14, 5-16.

Oliver, R. (1980), "A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions," *Journal of Marketing Research*, 17, 460-469.

Olshavsky, R. and J. A. Miller (1972), "Consumer Expectations, Product Performance, and Perceived Product Quality," *Journal of Marketing Research*, 9, 19-21.

Telesio, P. (1979), *Technology Licensing and Multinational Enterprises*, Praeger Publishers, New York, NY.

Send correspondence regarding this article to:
Shenzhao Fu
McLaren School of Business
University of San Francisco
San Francisco, CA 94117-1080 USA