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UNIVERSITY TECHNOLOGY TRANSFER IN ISRAEL

Evaluation of Projects and Determinants of Success

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A Survey Analysis of University Technology Transfer in Israel: Evaluation of Projects and Determinants of Success

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KEYWORDS: technology transfer; technology transfer organization; startup; license; patent; success factors

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Abstract

The purpose of this study is to examine how technology transfer organizations (TTOs) at Israeli universities evaluate projects and how they perceive the success or failure of these projects once they are selected. We also analyze whether the criteria they use are similar to those employed by venture capitalists and MIT. We find that the decision criteria used by Israeli universities are similar to those employed by venture capitalists and by the relatively entrepreneurially-focused TTO at MIT. The perceived success of a technology transfer project is strongly related to the quality and motivation of the project team. Dimotech, an Israeli TTO that is focused on entrepreneurial startups, appears to place a stronger emphasis on the characteristics of the individuals involved in launching a new venture than the other Israeli TTOs, which are focused on licensing.

1. Introduction

Effective technology transfer policies are arguably more crucial for Israel than for any other country. While Israel is among the world leaders in the productivity and intensity of its basic research in science and technology, its ability to transfer the fruits of this knowledge-creation engine to commercial applications is inadequate. According to IMD's World Competitiveness Yearbook (2000), out of 47 countries Israel ranks 11th in "science and technology" and 8th in "people" (human resources), yet only 23rd in overall global competitiveness. Despite the high ranking in "science and technology", the IMD report shows Israel trails in key technology transfer areas, ranking 41st in "company-university cooperation" and 40th in "development and application of technology".

Grupp, Maital, Frenkel and Koschatzky (1992) used a variant of linear programming known as Data Envelopment Analysis (DEA) to demonstrate that Israel's efficiency in generating research is relatively high, but declines rapidly as the fruits of that research are moved toward commercialization. The persistence of Israel's trade deficit, averaging 10 per cent of GDP in recent years, suggests that Israel's "brains" are not being turned into export-related "bucks". [1] The question is: Why?

A substantial proportion of basic research in Israel is done in by universities. While only 10 per cent of civilian R&D resources in Israel are allocated to universities, a disproportionately large share of basic research is produced there. A reasonable hypothesis, then, is that the heart of Israel's technology transfer problem

[1] The US may share this problem to some extent. Preston and Staelin (1993) note existence of a "gap between the stage of development of research leaving our (U.S.) universities and Government Labs and the stage at which industry is willing to adopt the research and imbed it in products". (p.12). Preston is a former MIT technology licensing officer.

is the process in which knowledge is transferred from where it originates – Israeli universities -- to where it is commercialized, the private sector.

We therefore undertook a survey of the technology transfer organizations that operate in six of Israel's universities, along with two additional such organizations that have similar objectives, one for a leading hospital (Hadassah) and a second, for a group of seven leading agricultural research lab (Peri). We sought to examine whether the criteria for choosing technology transfer projects in universities, and the criteria used to judge their success, were similar to those used by private-sector institutions (such as venture capital funds), whose success has been proven and whose criteria are tested by competition in the marketplace.

The remainder of this paper is organized as follows. The next section provides a review of the relevant literature on university technology transfer. Section 3 describes the organizations we surveyed. The fourth section presents some of our main findings. The final section summarizes and concludes.

2. Research on University-Based Technology Transfer

A wave of research on technology transfer was generated by enactment by the U.S. Congress of the Bayh-Dole Act in 1980. This act gave universities property rights to federally-funded technologies that until then had to be placed by law in the public domain. Universities with significant technological research programs established Technology Transfer offices (TTOs), whose function it was to manage and enhance the value of the university’s intellectual property

Siegel, Waldman and Link (1999), build on research by Bania, Eberts, and Fogarty (1993); Henderson, Jaffe, and Trajtenberg (1998), Trajtenberg, Henderson and Jaffe (1997), Jensen and Thursby (1998), Mansfield (1995), Parker and

Zilberman, and Thursby and Kemp (1998). They outline a stochastic frontier model to assess the relative productivity of 113 university TTOs. They supplement their statistical analysis with 55 interviews of 100 administrators, entrepreneurs and scientists at selected institutions. The authors report that there is substantial variation in technology transfer efficiency across universities, and find a strong relation between the university-based "supply" of technologies for commercialization and the university's tenure, royalty and distribution policies.

Wide differences also exist among American universities' TTOs, in their licensing and startup policies. The three universities with the largest revenues in royalties (for 1995, in brackets) are the Univ. of California System ($57.3 m.), Stanford ($38.9 m.) and Columbia ($34.2 m.); understandably they focus on patent licensing. Most of those royalties come from two or three key patents: for Univ. of California, Hepatitis B and gene splicing; for Stanford, recombinant DNA; and for Columbia, sulfadiazine burn ointment (Bentur, 1998).

Shane (1999) examined the history of each of MIT's 1,397 patents, and found that fully 26% were licensed to a new firm specifically set up to exploit the technology. This reflects the MIT TTOs pro-startup policy. Shane found that five key dimensions determine whether a new invention will be commercialized by a startup: 'observability' and 'tacitness' of knowledge in use, the age of the field, tendency of the market toward segmentation; and the effectiveness of the patents.

Outside the U.S., Roper and Frenkel (2000) compare the electronics sector in Israel and Ireland. They note that Israel has been successful in building R&D and technology transfer competency in electronics than Ireland. However Ireland has become wealthier than Israel by attracting large-scale foreign investment by global companies and becoming a low-cost production center. It appears that more value added is captured in production (Ireland) of knowledge-based products than in R&D (Israel). This research suggests that improving the technology transfer process in Israeli universities is not a sufficient condition for increasing exports and revenues in the high-tech sector, if the products emerging from the technology transfer "leak" abroad to low-cost production centers.

We now describe our own survey of Israel's leading university-based TTOs.

3. Technology Transfer Offices in Israeli Universities

We surveyed six Israeli universities that operate one or more organizations dedicated to facilitating technology transfer. They are: Yisum (Hebrew U.), HU Research Authority (Hebrew U.), Ramot (Tel Aviv U.), Yeda (Weizman Institute), B.G. Negev (Ben Gurion University), Bar Ilan (Bar Ilan U.), and Dimotech (Technion-Israel Institute of Technology). In addition to these TTOs, we added two more tech transfer units to our survey: Hadassim (Hadassah Hospital, Jerusalem) and Peri (operating on behalf of group of seven Agricultural Research Stations), in view of the large amount of applied research carried on at these two institutions. (See Appendix for a brief description of each TTO). During our survey, a new CEO of Dimotech was appointed; so we included survey results for both the old (Dimotech I) and the new (Dimotech II) managing directors. This gave us 10 data points in all. The survey was conducted by Meseri (1996), who interviewed either the CEO, or second-in- command, of each company. They also filled out three detailed questionnaires, which focused on the criteria used to accept or reject technology transfer projects proposed by faculty members, whether to provide financial support, and the factors that determine (perceived) success of these projects. Specifically: we gave the CEO's a list of 15 success factors and asked them to rank each; and we asked them to score (on a scale of 1 to 5) to each of 20 factors relevant for accepting or rejecting tech transfer projects.

We also collected subjective data on a total of 20 tech transfer projects, implemented by five of the TTOs [Yeda, HU Research Authority, BG Negev, Peri, Dimotech] and asked the CEO's to grade the success of each one, along 15 dimensions, on a scale of 1 to 10.   The data thus enabled us to examine the effect of success factors on perceived success or failure, and also to determine the policies that drove crucial decisions about which projects to support.

We also paid special attention to the crucial issue of "license or startup". Technion, Israel's technological university founded in 1924, is unique in that its tech transfer organization Dimotech Ltd. has a declared pro-startup policy, while most (though not all) of the other organizations focus mainly on licensing agreements for patents.   We also interviewed the Director of MIT's Technology Licensing Office, in an effort to compare MIT's technology transfer strategy to the technology transfer strategy of a somewhat comprable Israeli institution.   MIT was chosen, because it is unique among American TTOs due its aggressive pro-startup policies.

Our overall objective was to understand and compare the processes through which technology officers chose projects for their support, and to examine the perceived success factors for such projects, as seen by the technology officers. Since only Technion's TTO Dimotech actively pursues a startup policy, we sought to compare differences in tech transfer policies and strategies between Dimotech and its counterparts.

4. Main Findings

The questions we addressed are:

- *Are Israeli TTOs' selection criteria for projects they support similar to those employed by private-sector agents, such as Venture Capital funds and investors?*
- *Do selection criteria for projects differ for 'license' TTOs compared with 'startup' TTOs? Do the Israeli TTOs selection criteria differ from those of MIT?*
- *What are the most important perceived success factors that determine the ultimate success or failure of supported tech transfer projects, as seen by the tech transfer officers? Are these perceived factors in fact determinants of perceived project success?*

Selection criteria: In one of our questionnaires, administered in person, we asked: *Which factors in your opinion influence the acception or rejection of projects for the support of your university's TTO, and what is the degree of their importance?* Our objective was to learn more about how tech transfer projects are selected by university TTOs, and to compare differences among them, and between them and, for instance, VC funds. We listed 20 potential factors, and for each, respondents provided a score from "1" (not important) to "5" (very important). Responses from MIT's TTO were also obtained. The results are shown in Appendix Table 2A.

Results: The six factors that scored highest were (together with their average scores):

> *Market need (5); Market size (4.3); Existence of patent (4.3); Success chances for R&D stage (4.2); Level of innovativeness (4.2); Degree of maturity of the idea (4.1).*

Moreover, ‘degree of consensus’, measured by ‘one minus the coefficient of variation’ of the scores across the eleven sets of responses, were also highest for these six factors, relative to other factors.

Israel’s TTOs clearly apply the same criteria used by counterparts in the private sector. An entrepreneur approaching a Venture Capital Fund manager will be judged similarly, by, first and foremost, existence and size of the potential market and the need for the product; existence of intellectual property (patent); the probability that the proposed R&D project will succeed; the degree of innovativeness, and degree of maturity of the idea. [Source: Israel Venture Association]. The basis of this VC consensus is that from experience, these factors have been shown to be most critical.

Therefore, it is reassuring that University TTOs choose projects much in the same way that the private sector chooses to invest its funds. It is noteworthy, that “contribution to the national economy of Israel” was one of the lowest-scoring selection criteria. The factor “adds value to the national economy” [#15] scored among the lowest of all the 20 factors. Clearly, the university TTOs do not have the overall benefit to Israel’s economy as a major selection criterion. This reinforces our finding that the TTOs are run along lines similar to those of commercial concerns, focusing on market-based criteria rather than perceived national need. We found only small differences between the ‘pro-startup’ TTOs (Dimotech) and ‘pro-license’ TTOs (others): (See Figure 2). Dimotech (average of I and II) scored ‘existence of patent’ [#17], ‘level of innovativeness’ [#1] and ‘market size’ [#9] about 0.8 points lower than the average of the others, but scored the same for the other three factors. A major exception was “involvement of the innovator” #18 – Dimotech scored this highly, reflecting the ‘startup’ mentality, while other TTOs rated it far lower, in a sense regarding intensive involvement of the innovator as a hindrance to licensing efforts.

For the six top acceptance/rejection factors, scores of MIT's TTO and the average for the 10 Israeli TTOs matched almost perfectly. (See Figure 3).   The only slight difference was that MIT scored "existence of patent" as 5.0, while the Israeli TTOs averaged 4.3.   We found similar congruence between Dimotech (I and II)

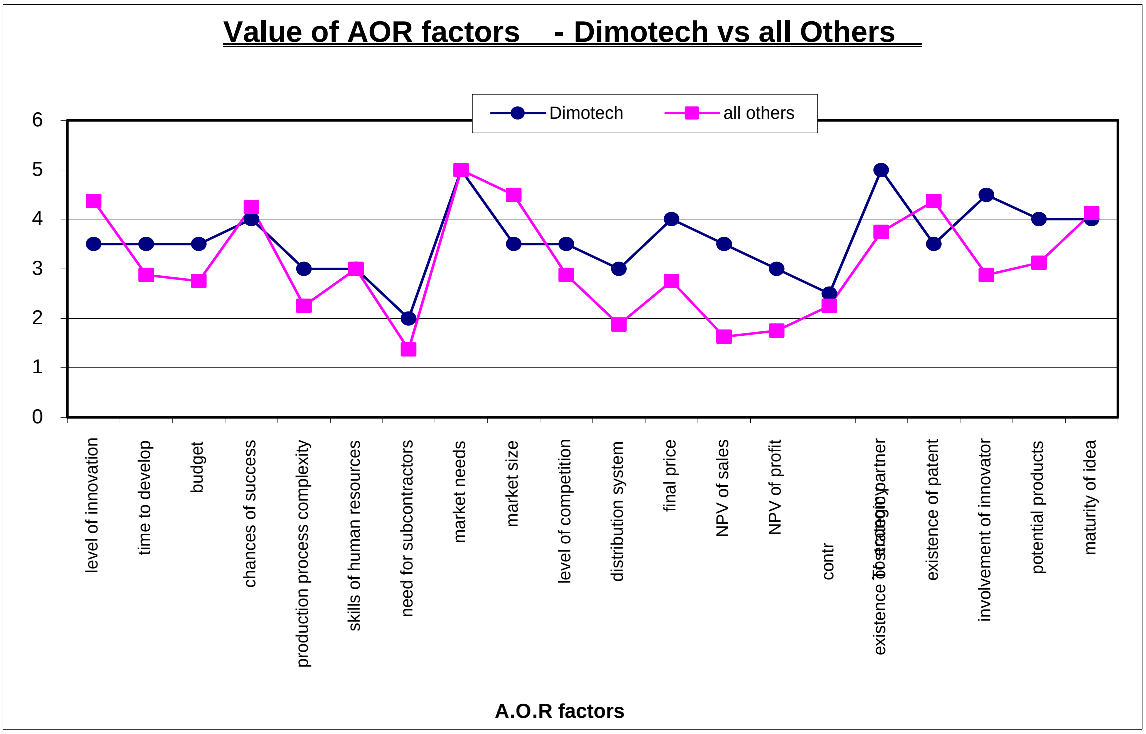


Figure 2. Factors Considered in the Decision

To Accept or Reject (AOR) Projects: Dimotech vs. Other Israeli TTOs

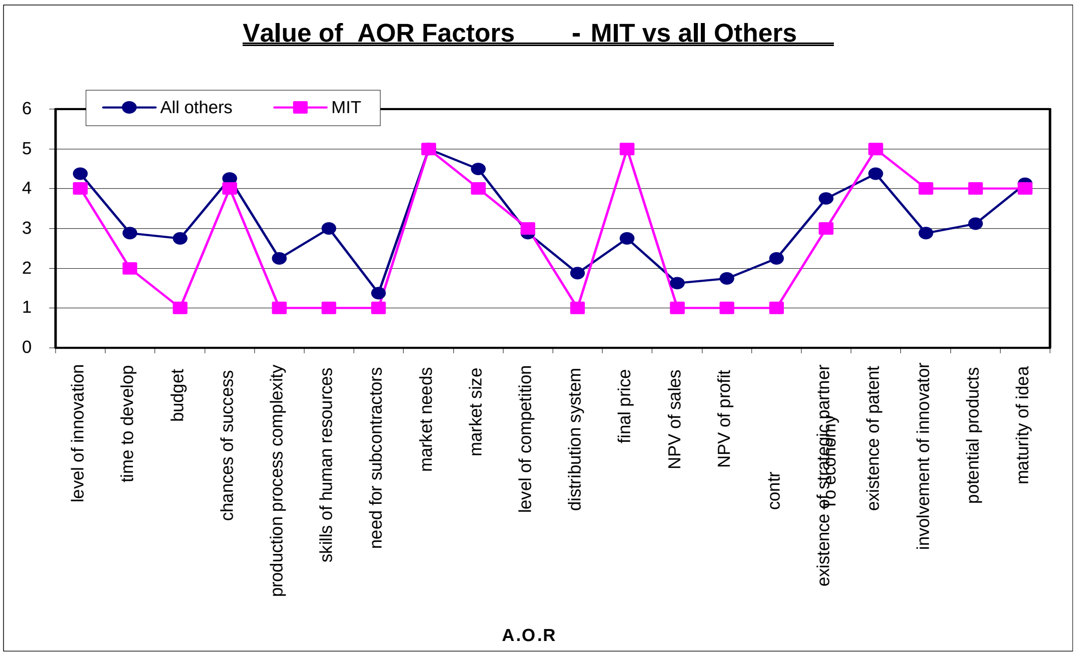


Figure 3. Factors Considered in the Decision

to Accept or Reject (AOR) Projects: MIT vs. Israeli TTOs

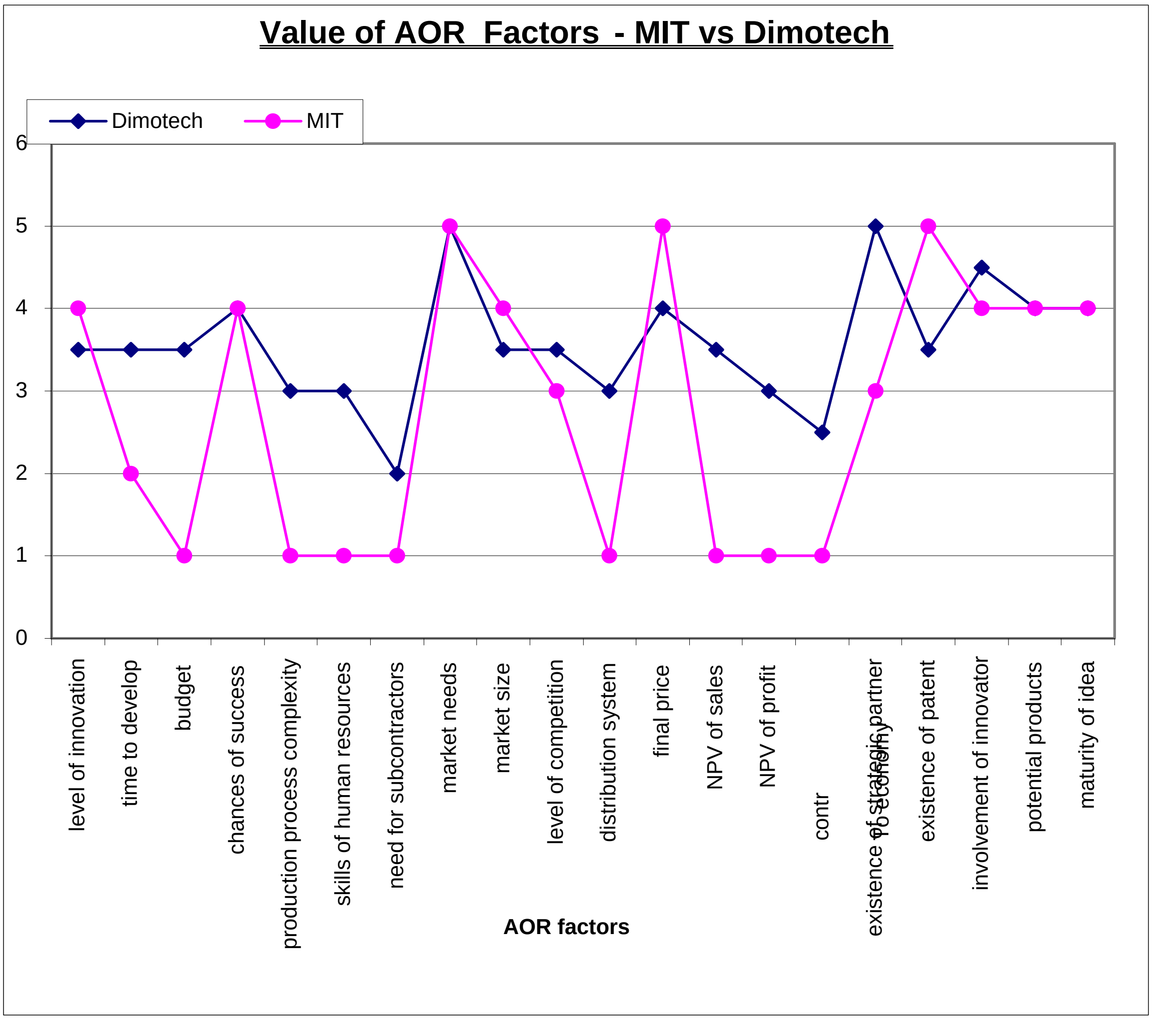


Figure 4. Factors Considered in the Decision to Accept or Reject (AOR) Projects: MIT vs. Dimotech

and MIT, except that MIT valued ‘existence of patent’ and ‘market size’ more highly. (See Figure 4).

We conclude that whether they have a licensing or startup orientation, Israeli TTOs choose their projects on the basis of criteria widely-accepted and employed in the private sector. Thus, if there are flaws in the tech transfer process among TTOs, it does not seem to lie in the way projects are chosen for support.

<u>Success factors</u>: In a second questionnaire, also administered in person, we asked each TTO officer to choose, and rank, the ten most important factors “that influence the success or failure of projects”. The rankings are listed in Appendix Table 1A.

The highest-ranking factors (with their average score shown by inverse rank – with first scoring ’10' and last scoring ‘1’) were*: Real and agreed need for the project’s innovation (7.5); clearly defined project goals (7.5); demonstrated market demand, and ability to penetrate that market (6.7); and adequate and stable financing (5.2).* The degree of consensus (measured as “one minus the coefficient of variation’) was highest, too, for these four factors. (See Figure 5).

In contrast with accept/reject factors, significant differences for ‘success factors’ were found between Dimotech (‘startup’) and the others (‘license’). (Fig. 6).

Figure 5. Level of Consensus for 15 Success Factors

Measured as: [1 - coefficient of variation], for 10 respondent TTOs

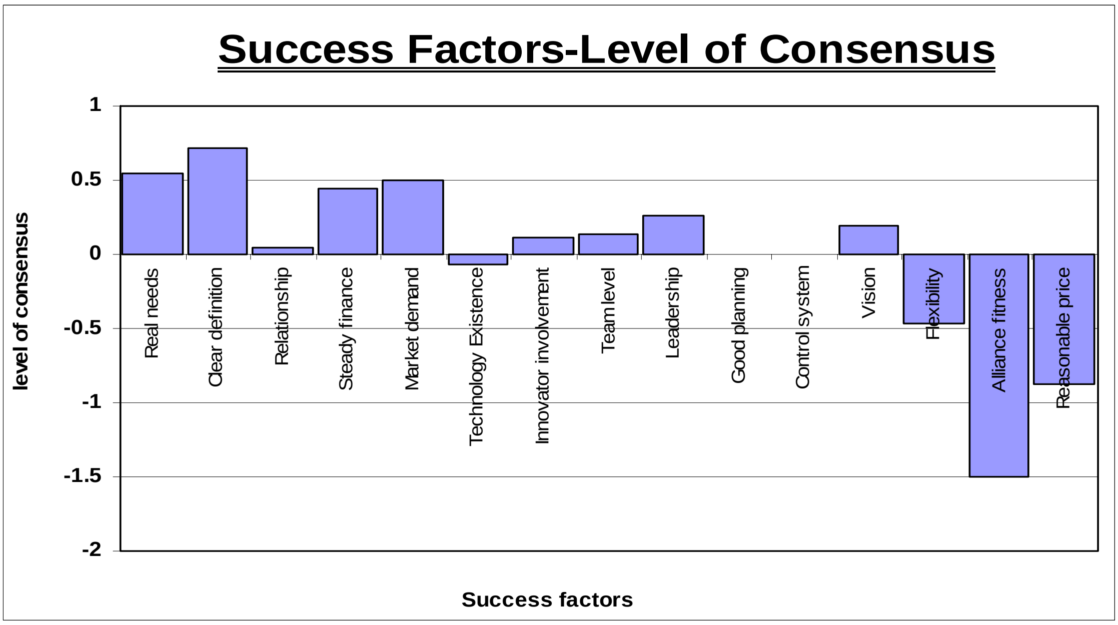
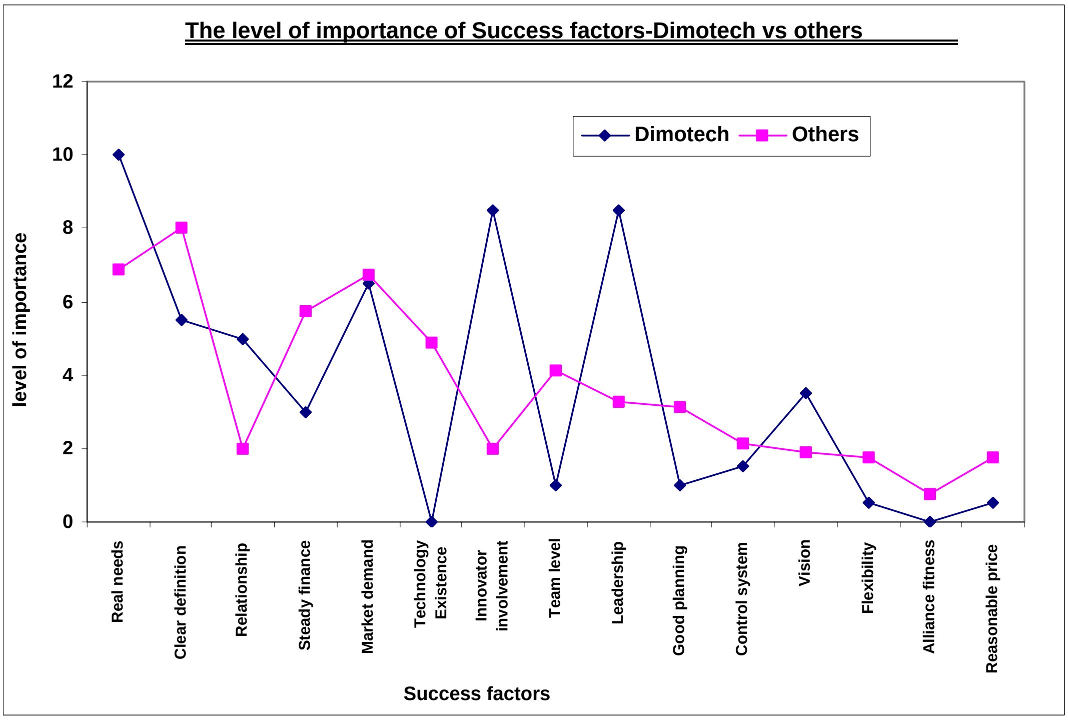


Figure 6. Importance of Success Factors (Scale of 1 to 10), Dimotech vs. Other TTOs



Dimotech gave high scores to ‘involvement of innovator in project’ and ‘leadership’ – second only to ‘real and agreed need’. This is understandable. The quality and motivation of the leadership team are crucial for the success of a startup company, but less so if the technology is to be licensed to other firms at the conclusion of R D & E. [Regrettably, we were not able to obtain success-factor scores from MIT’s TTO].

To what extent could the 15 key perceived success factors ‘predict’, in a statistical sense, the perceived success of actual projects? In a sense, such an analysis could help validate the perceived success factors provided by the TTO heads. We wondered: Would the most powerful explanatory factors, in a statistical sense, coincide with the factors ranked highest by the University TTO officers? In other words: were TTO officers’ perceptions about project success factors consistent with actual results?

To answer this question, we collected data on 20 actual projects. We asked the TTOs to score each project for the 15 success factors [reduced to 14, with "alliance fitness" (suitability for a joint venture) removed because it was inapplicable for many projects], on a scale of 1 to 10, then rescaled them from +10 (contribute positively, with high rank) down to –10 (contribute negatively, with a low rank), so that each factor’s scores matched the posited direction of its impact on success. (See Table 3A). We further reduced the data by dividing the 20 projects into 9 "unsuccessful" ones (scoring 7 or lower) and 11 "successful" ones (scoring 8 or higher), with the score of "7" as approximately the median.

We used stepwise multiple discriminant analysis, a classification technique, to define a linear discriminant function of the 14 success factors, that assigns each project to the 'successful' or 'unsuccessful' group based on its 'discriminant function' score. (See Table 1). This method gradually reduces the number of explanatory variables (success factors), seeking the most parsimonious set that still achieves 'reasonable' accuracy in classifying projects as 'successful' or 'unsuccessful'. [2]

Two key success factors were sufficient to accurately predict perceived success for all of the 11 successful projects; to accurately predict lack of success for 6 of 9 unsuccessful ones; but wrongly assigned three projects to the "successful" group. They were: "leadership" and "good planning". In two of the three misclassified projects (where the discriminant function assigned an unsuccessful project to the 'successful' group), the perceived success score was a borderline "7" out of 10. It can be said, then, that two key factors, related to the quality of the project's leadership and to the quality of the project's planning, can broadly predict success with reasonably high accuracy.

We noted earlier that many 'pro-license' Israeli TTOs appear to weigh projects' chances for success based on the product or the technology, while the factors stressed most heavily by the 'pro-startup' Israeli TTOs focus on the quality of the people involved. The 'pro-startup' perception of technology transfer is more closely aligned than the 'pro-license' view with what is widely known about criteria used by Venture Capital funds. It is a truism in Venture Capital that VC's weight the quality of the person sitting opposite them far more than the quality of the business plan on the table. (Roberts, 1991).

[2] The conditions for use of Ordinary least squares (OLS) are not met by our data; nor is the sample size, N=20, adequate for significant tests based on t-statistics. We considered using one of the logit-probit techniques, but in the end opted for discriminant analysis, as it offers the most direct answer to our research question: which factors best predict perceived success?

Table 1. Stepwise Multiple Discriminant Analysis of 20 Projects

Canonical Discriminant Function:

X9 = "Leadership" ; X10 = "Good Planning"

Y* = 1 (unsuccessful) or 2 (successful)

Unstandardized coefficients

Predicted Success = -0.735 + 0.069 X9 + 0.132 X10

Standardized coefficients:

Predicted Success = -0.735 + 0.397 X9 + 0.685 X10

Test of Function:

Wilks' Lambda	Chi-square	degrees of Freedom	significance level
.447	13.705	2	$p < 0.001$

Simple correlation between x9 and x10: 0.686

Classification Accuracy:

85% of the 20 projects were correctly classified by the discriminant function (17 cases out of 20); 3 of 9 unsuccessful projects were incorrectly classified as 'successful'; *2 of the 3 misclassified projects were borderline, scoring "7" out of a possible "10".*

	Unsuccessful	Successful	Total
Actual	9	11	20
Predicted	6	14	20

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* *Calculations were carried out using SPSS Version 9.0*

5. Conclusion

In this pilot study, we examine attitudes in Israeli TTOs regarding methods of selection and evaluation of technology transfer projects. Based on our preliminary qualitative analysis, it appears that Israeli TTOS evaluate projects in a manner that is broadly similar to venture capitalists and investment banks. If indeed Israel does have a technology transfer problem, as we believe it does, the primary source of that problem probably does not lie in the decision-making process of its university TTOs. Benchmarked against a leading US TTO – that of MIT, with nearly 1,400 patents, on a technology base of $700 m. in MIT-sponsored research -- Israeli TTOs seem to operate in a broadly similar manner.

Technology transfer is a complex process, involving the diffusion of basic research and its ultimate commercialization. To properly understand all phases of this process, it is necessary to adopt a systems approach, in which the 'ecology' of the innovation process -- the interactions among research, development, innovation, commercialization, marketing and distribution -- is studied as an integral whole. That is, we need to examine all the relevant stakeholders in this process, including government, industry and academic scientists, rather than just those who operate university-based TTOs. This is a subject for future research.

References

Bania, B., Eberts, R., and M.S. Fogarty (1993). "Universities and the startup of new companies: Can we generalize from Route 128 and Silicon Valley?" Review of Economics and Statistics, 76 (4), 761-766.

Bentur, A. (1998). "Technology transfer at the Technion: Issues for discussion and background data". Technion: Technion City, Haifa.

Gibbs, W. Wayt. (1995). "Lost science in the Third World". Scientific American, August 1995, 92-99.

Grupp, H., S. Maital, A. Frenkel, K. Koschatzky. "A data envelopment model to compare technological excellence and export sales in Israel and EU countries". Research Evaluation, 2 (2), August 1992, pp. 87-101.

Henderson, R., Jaffe, A.B. and M. Trajtenberg (1998). "Universities as a source of commercial technology: A detailed analysis of University Patenting 1965-1988". ?" Review of Economics and Statistics, 80 (1), 119-127.

Jensen, R. And M. Thursby. (1998). "Proofs and prototypes for sale: The tale of university licensing". NBER Working Paper # 6698, August.

Mansfield, E. (1995). "Academic Research underlying industrial innovations: Sources, characteristics and financing". Review of Economics and Statistics, 77 (1), 55-65.

Meseri, O. "Technology transfer and licensing offices in Universities: A study of their operations and the acceptance or rejection of innovative technological projects". Dissertation for M.Sc. in Business Admin. , Technion, Haifa, 1996.

Parker, D.D. and D. Zilberman (1993). "University technology transfers: Impacts on local and U.S. economies". Contemporary Policy Issues, 11(2), 87-99.

Preston, J. And D. Staelin. (1993). “National strategies for technology commercialization”. Mimeo, MIT Sloan School of Management.

Roberts, Edward B. Entrepreneurs in High Technology: Lessons from MIT and Beyond. Oxford University Press: New York, 1991.

Roper, Stephen and A. Frenkel. (2000). “Different paths to success: The growth of the electronics sector in Ireland and Israel”. S. Neaman Institute, Technion, Feb.

Shane, Scott. (1999). “Technology regimes and new firm formation”. Working Paper: Smith School of Business, U. Of Maryland.

Thursby, J. And S. Kemp. (1998). “An analysis of productive efficiency of university commercialization activities”. Mimeo, Purdue Univ., May.

Trajtenberg, M., Henderson, R., and A. Jaffe. (1997). “University vs. Corporate patents: A window on the basicness of invention”. Economics of Innovation and New Technology, 5(1), 19-50.

World Competitiveness Yearbook. IMD: Lausanne, Switzerland: 2000.

Appendix

Brief Description of Participating TTOs

1. Yissum (Hebrew University): Exclusive owner of the University's know-how; aim: "create business arrangements with industry throughout the world to commercialize innovations of Hebrew Univ. Scientists. Has 400 registered patents, 150 current projects. Uri Litwin, Managing Director
2. Peri - operates on behalf of a group of 7 agricultural research stations. Managing Director: Reuven Rivlin. Founded in 1985, to commercialize R&D, transfer technology and raise capital, through licensing, joint ventures and startups.
3. Bar Ilan R&D Co. (Bar Ilan Univ.) Managing Director: Joseph Lichtenstein. Serves as "the commercial arm of Bar Ilan University". Seeks to "efficiently interface between scientific and technological development at the University and the world of business and industry".
4. Hadasit (Hadassah Hospital). Manager, Business Development: Elli Malki. Operates in three lines of activity: "service R&D contracts, research and licensing contracts utilizing know-how, patents and technologies, and joint ventures with other companies".
5. B.G. Negev (Ben Gurion University): Amnon Sintov, Scientific Director. Gives economic, legal and managerial advice in locating business partners and investors for scientists who do research within the university.
6. Yeda (Weizmann Institute): Scientific Director, Dr. Orgad Leov. "technology-transfer entity responsible for creating commercial opportunities for novel developments and inventions emanating from the Weizmann Institute. Established in 1959. "Yeda has a current portfolio of diverse research projects (800 of them) for which it seeks industrial partners. Potential licensees are offered a wide spectrum of patents in various fields of applications".
7. HU R&D Authority: (Hebrew U.) Dr. Shabtay Dover, Director. Specializes in fund raising and allocation of funds to research projects. Cooperates closely with Yisum.
8. Dimotech Ltd. (Technion). Dimotech I: Yehuda Dvir, Managing Director. Dimotech II: Amiel Lowenstein, Managing Director. "holding company for startup industries at the Technion- specializing in commercialization of R&D projects". Set up 22 high-tech companies in the fields of: medicine, computers, electronics, biotechnology, agriculture, energy and economics.
9. Ramot (Tel Aviv University): Technology transfer organization of Tel Aviv University.

Table 1A.. Value of Success Factors

		Real needs	Clear definition	Relationship	Steady finance	Market demand	Technology Existence	Innovator involvement	Team level	Leadership	Good planning	Control system	Vision	Flexibility	Alliance fitness	Reasonable price
No'	***Company***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	Yessum	9	10	0	7	8	0	1	6	2	3	4	5	0	0	0
2	Dover	2	5	0	8	10	0	3	9	6	7	1	4	0	0	0
3	Ramot	10	8	5	6	9	0	4	3	7	0	0	2	1	0	0
4	Yeda	0	10	0	1	2	9	0	3	4	5	6	0	7	0	8
5	B.G negev	9	10	0	8	5	4	2	0	1	7	3	0	0	0	6
6	Hadasit	9	8	1	6	0	10	2	7	0	0	0	3	4	5	0
7	Dimotech-1	10	7	5	0	6	0	9	2	8	0	3	4	0	0	1
8	Dimotech-2	10	4	5	6	7	0	8	0	9	2	0	3	1	0	0
9	Bar ilan	7	5	6	8	10	9	4	0	0	0	3	0	2	1	0
10	Peri	9	8	4	2	10	7	0	5	6	3	0	1	0	0	0
11																
12	Total	75	75	26	52	67	39	33	35	43	27	20	22	15	6	15
13	***Average***	***7.5***	***7.5***	***2.6***	***5.2***	***6.7***	***3.9***	***3.3***	***3.5***	***4.3***	***2.7***	***2.0***	***2.2***	***1.5***	***0.6***	***1.5***
14	Standard Error	3.4	2.1	2.5	2.9	3.3	4.2	2.9	3.0	3.2	2.7	2.0	1.8	2.2	1.5	2.8
15	***Normal S.d***	***0.5***	***0.3***	***1.0***	***0.6***	***0.5***	***1.1***	***0.9***	***0.9***	***0.7***	***1.0***	***1.0***	***0.8***	***1.5***	***2.5***	***1.9***

Table No' 2A.

Value of Acceptance Or rejection (A.O.R) factors of innovative technology-based projects

No'	Company	Innovation's level fac' 1	Develop's time fac' 2	Develop's budget fac' 3	Success chances fac' 4	Production process' complexity fac' 5	Men power skills fac' 6	Subcontractors fac' 7	Market's needs fac' 8	Market's size fac' 9	Competition level fac' 10	Distribution system fac' 11	Final price fac' 12	N.p.v of sales fac' 13	N.p.v of profit fac' 14	Add value to national market fac' 15	Existing of strategic partner fac' 16	existing of patent fac' 17	Innovator's involvement fac' 18	Potential products fac' 19	idea's maturity fac' 20
1	Yessum	5	4	3	4	1	4	1	5	5	1	1	1	1	1	1	5	5	2	3	4
2	Dover	5	3	3	3	1	1	1	5	5	1	1	5	1	1	1	5	1	1	5	5
3	Ramot	4	1	1	3	1	1	1	5	3	3	1	1	1	1	2	4	4	3	2	4
4	Yeda	5	2	2	5	3	1	1	5	3	2	1	1	1	1	3	4	5	1	1	2
5	B.G negev	3	4	1	5	3	3	1	5	5	5	2	4	2	3	4	5	5	2	5	4
6	Hadasit	5	1	4	5	1	5	2	5	5	2	1	1	1	1	1	3	5	5	2	5
7	Bar ilan	4	3	4	5	4	4	2	5	5	4	4	4	1	1	3	1	5	4	5	5
8	Peri	4	5	4	4	4	5	2	5	5	5	4	5	5	5	3	3	5	5	2	4
9	Dimotech-1	4	4	4	4	3	3	2	5	4	4	3	5	4	3	2	5	4	4	4	4
10	Dimotech-2	3	3	3	4	3	3	2	5	3	3	3	3	3	3	3	5	3	5	4	4

11	MIT	4	2	1	4	1	1	1	5	4	3	1	5	1	1	1	3	5	4	4	4
12																					
13	Total	46	32	30	46	25	31	16	55	47	33	22	35	21	21	24	43	47	36	37	45
14	Average	4.2	2.9	2.7	4.2	2.3	2.8	1.5	5.0	4.3	3.0	2.0	3.2	1.9	1.9	2.2	3.9	4.3	3.3	3.4	4.1
15	S.D	0.7	1.2	1.2	0.7	1.2	1.5	0.5	0.0	0.9	1.4	1.2	1.8	1.4	1.3	1.0	1.2	1.2	1.5	1.4	0.8
16	Normal S.D	0.2	0.4	0.4	0.2	0.5	0.5	0.3	0.0	0.2	0.5	0.6	0.6	0.7	0.7	0.5	0.3	0.3	0.5	0.4	0.2

Table 3A. Perceived Success of 20 Projects and Subjective Scores for 14 Success Factors

project #	x1 real need 1	x2 clear definition 2	x3 relation-ship 3	x4 stable finances 4	x5 market demand 5	x6 Exist-ence of tech-nology 6	x7 Involve-ment of inno-vator 7	x8 level of team 8	x9 leader-ship 9	x10 good planning 10	x11 control system 11	x12 vision 12	x13 Flexi-bility 13	x14 reasonable price 14	Y project success
1	0	-1	0	-10	-3	-8	0	-8	-8	-8	-10	0	-2	-1	3
2	0	8	0	8	8	9	0	9	8	8	8	0	10	10	8
3	0	-6	0	-10	-10	-8	0	-8	-7	-9	-9	0	-2	-2	2
4	-10	-8	-10	0	-8	0	-8	-3	-8	0	-8	-8	0	-2	2
5	10	8	0	1	10	1	3	0	1	8	1	0	0	9	8
6	10	7	0	5	10	5	2	0	1	9	1	0	0	9	7
7	9	6	0	5	8	8	5	0	1	6	5	0	0	1	9
8	-1	-10	0	-1	-1	-1	-1	0	-1	-10	-2	0	0	-1	2
9	5	10	10	6	1	8	0	10	10	10	0	8	0	0	10
10	-10	-10	-8	-4	-8	-5	0	-8	-8	-8	0	-8	0	0	3
11	6	10	8	5	8	5	0	8	9	5	0	5	0	0	5
12	8	8	9	10	9	0	10	0	10	9	0	9	10	0	10
13	8	8	9	9	10	0	10	0	10	8	0	10	10	0	7
14	8	10	10	8	10	0	10	0	10	9	0	10	10	0	10
15	8	10	10	8	9	0	10	0	10	9	0	10	10	0	9
16	-1	-1	-10	-1	-1	0	-10	0	-10	-5	0	-10	-5	0	1
17	8	8	10	7	7	0	10	0	10	7	0	10	5	0	8
18	10	10	10	9	10	0	10	0	10	10	0	10	10	0	10
19	10	10	10	8	10	0	10	0	10	10	0	10	10	0	10
20	8	10	10	8	10	0	10	0	10	8	0	1	7	0	8