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Assessing value-added contributions of university technology business incubators to tenant firms

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Abstract

This paper assesses the value-added contributions of university technology business incubators (UTBIs) to their new technology-based tenant firms. The business incubator is widely believed as providing a nurturing environment for new business start-ups. However, the role played by university relationships in supporting the development of new technology-based firms (NTBFs) has escaped systematic review in the US due to a lack of historical data. To fill this gap, this article presents empirical data on UTBIs by focusing on their value-added dimensions which include typical incubator services along with university-related inputs. The study is based on a national survey of six representative UTBI facilities, providing an insight into the value-added aspects as perceived by the clients. It concludes that several UTBI services, specifically some of the university-related inputs such as university image, laboratories and equipment, and student employees add major values to the client firms, making the UTBI a viable strategy for nurturing NTBFs.

1. Introduction

The university technology business incubator (UTBI) is a modern enterprise development tool employed by some entrepreneurial universities to provide support for nurturing new technology-based firms (Mian, 1994a). The incubation concept seeks to link effectively talent, technology, capital and know-how to leverage entrepreneurial talent, accelerate the development of new companies, and thus speed the commercialization of technology (Smilor and Gill, 1986). Three major groups of elements have been identified as providing the infrastructure for supporting the development of new technology-based firms: business, technical, and social inputs (Miller and Marcel, 1987). The UTBI's efforts in providing these in-

frastructure elements in the form of a variety of incubator services and other inputs from the surrounding university environment are aimed at providing a milieu for technological entrepreneurship (Bullock, 1985; Mian, 1994b).

The term value-added, employed in this paper, has become part of the lexicon of the technology business incubation industry, which corresponds to the provision of the aforementioned three major groups of elements sought for nurturing new technology-based ventures. In the incubator industry, value-added refers to those specific ways that an incubator program enhances the ability of its tenants to survive and grow in business (Allen and Bazan, 1990). To accomplish these firm survival and growth objectives a typical business incubator program provides shared office services

and business assistance including affordable rent and fostering connections with firms inside the incubator and in the local economy. In the case of UTBIs, these value-added components are further supplemented by the provision of various university-related inputs such as university image, student employees, faculty consultants, and the institutional support provided by the R&D community in and around the university.

This article assesses university technology business incubators in the US by exploring their value-added contributions to technology-based start-ups. The study is based on six cases of UTBIs representing a population of 30 5-year

and older facilities in the US. The paper attempts to answer questions such as: What contributions do university incubators make to new technology-based start-ups in the form of various services provided? What additional benefits accrue from the university relationships? What are some of the implications for technology-based firms?

2. Relevant literature and study framework

With the popularity of the business incubation concept starting in the early 1980s, numerous

Table 1
University technology business incubator perspective: major studies

Author(s), year	Research sample	Study context	Key findings/contribution
Allen, 1985	70 incubators (UTBIs 15%, response 66%) 910 firms (response 56%)	Institute of Public Administration, Pennsylvania State University, University Park, PA and the US Department of Commerce, Washington DC	This study pointed out the potential of incubators for regional development. It helped to define incubator organization types based on sponsorship, and service categories provided to the tenants. The concept of incubator was described as: a network of organizations providing skills, knowledge and motivation, real estate experience, provision of business and shared services
Smilor and Gill, 1986	117 incubators (UTBIs 10%, response 43%) 211 firms (response NA)	IC ² Institute, University of Texas at Austin, TX	The findings of this research supported much of what was already known and provided new data about the age, education, and salary of incubator managers. Using the four incubator organization types identified earlier the study further identified their measures of success
Campbell et al., 1988	13 incubators (UTBIs 21%, case study) 294 firms (response 55%)	H. Humphrey Institute, University of Minnesota, Minneapolis, MN	In this case study, the features identified contributing to the incubator effectiveness were: low cost developing and operating; and quality management of facilities
Mian, 1991, 1994a	6 incubators (UTBIs 100%, case study) 150 firms (response 32%)	School of Business & public Management, George Washington University, Washington DC	As the first UTBI focused work, the study supported the assertion that university incubators appear to provide the resource base and environment conducive to the development of NTBFs. It provided a checklist for successful facilities and developed an assessment framework for UTBIs
Rice, 1993	9 incubators (56% UTBIs, case study) 36 firms (selected)	School of Management, Rensselaer Polytechnic Institute, Troy, NY	The study contended that managerial intervention is the key in incubation support, and success is measured by proactive direct intervention. Factors limiting the effectiveness of direct intervention were identified as the availability of time and lack of responsiveness of the firms

studies have been conducted to assess the emerging incubator industry across the nation (Allen, 1985; Allen and Levine, 1986; Smilor and Gill, 1986; Campbell et al., 1988; Mian, 1991; Rice, 1993). Most of these studies are primarily descriptive, generally covering various types of incubator models. Table 1 provides a summary of the major studies including UTBI perspective. As shown, only a handful of the studies were comprehensive enough to include the role of university-related facilities in providing business incubation support. And with the exception of one study (Mian, 1991) none of the other studies specifically focused on the university technology incubator, generally understood to provide a resource base necessary for the development of new technology based firms (NTBFs) (Allen and Levine, 1986; Mian, 1991, 1994a,b)

From the incubation business literature reviewed (Allen, 1985; Allen and Levine, 1986; Smilor and Gill, 1986; Campbell et al., 1988; Mian, 1991; Rice, 1993) it is clear that most of the incubator-related knowledge does not have a sound theoretical base of its own and is by and large anecdotal in nature. Hence, our understanding of the business incubation function in general and the university-sponsored business in-

cubation support for developing new technology-based firms, in particular, remains fairly rudimentary. Consequently, there is no consensus on what makes up the content of successful UTBI management practices in providing an optimal set of technology and business incubation services and how the value-added contributions of these services may be enhanced (Allen and Levine, 1986; Deutriaux, 1987).

The UTBIs' value-added dimensions employed in this research along with the authors who used these dimensions in various studies are summarized in Table 2. These dimensions are derived from parallel but separate incubator and university–industry interaction studies reported in the literature (Mian, 1991). As shown, there are two main categories of services: (a) typical incubator services which include shared office services, business assistance, access to capital, business networks, and rent breaks; and (b) the university-related services including faculty consultants, student employees, university image conveyance, library services, labs/workshops and equipment, mainframe computers, related R&D activity, technology transfer programs, employee education and training, and sports and other social activity. The determination of the provision

Table 2
Summary of the literature on value-added contributions of UTBI services

Contribution	Used by
<i>Typical incubator services and their impact</i>	
1. Shared office services	Allen and Rehman (1985), Smilor (1987), Hisrich and Smilor (1988)
2. Business assistance	Allen and Bazan (1990), Smilor (1987)
3. Access to capital	Plosila and Allen (1985), Smilor (1987)
4. Business networks	Smilor (1987), Lichtenstein (1992)
5. Rent breaks	Hisrich and Smilor (1988), Allen and Bazan (1990)
<i>University-related services and their impact</i>	
1. Faculty consultants	Allen and Levine (1986), Smilor et al. (1988), Udell (1990)
2. Student employees	Same as above
3. University image	Smilor (1987), Scheirer et al. (1985)
4. Library services	Smilor (1987), Allen and Levine (1986)
5. Labs and workshops	Brown (1985), Smilor (1977), Doutriaux (1987)
6. Mainframe computers	Bullock (1985), Hisrich and Smilor (1988)
7. Related R & D activity	Allen and Levine (1986), Smilor et al. (1988) Doutriaux (1987)
8. Technology transfer programs	Allen and Levine (1986), Smilor (1987), Hisrich and Smilor (1988), Abetti and Stuart (1985)
9. Employee education and training	Allen and Levine (1986), Hisrich and Smilor (1988), Udell (1990)
10. Sports and social activity	Allen and Levine (1986), Smilor (1987)

Table 3
Selected UTBIs' background, institutional support, and their client firms' survey data

Incubator facility, sponsoring university (year established)	Facility background	Programs institutions providing R & D and other support services to client firms	No. of client firms contacted	No. of client firms responded
(1) Technology Advancement Program (TAP), University of Maryland – a state university (1984)	TAP rents 15 700 square feet ² space to a group of 15 to 19 tenants at a rate of \$7.5 foot ⁻² , which is about 30% less than the market rate	<ul style="list-style-type: none"> – Technology initiatives program – Maryland ind'l partnerships – Technology extension service – Dingman entrepr. center – Law and enterpr. program 	25	10
(2) Advanced Technology Development Center (ATDC), Georgia Tech – a state university (1980)	ATDC rents 15 700 feet ² space at its main facility on Georgia Tech campus, at a rate of \$9.50 foot ⁻² , which is more than 30% cheaper than the market rate	<ul style="list-style-type: none"> – Georgia Tech res. inst. – Georgia Tech res. corp. – Manufacturing res. center – Industrial extension service – Georgia capital network 	37	9
(3) The Ben Craig Center (BCC), University of North Carolina at Charlotte – a state university (1986)	BCC's 87 000 feet ² rentable space at its newly built facility is available at \$10.50 foot ⁻² , which is slightly cheaper (0 to 15%) than the market rate	<ul style="list-style-type: none"> – Small business tech. dev. center – Univ. tech. transfer center – International bus. dev. program – Univ. res. park 	17	8
(4) Technology Innovation Center (TIC), Northwestern University – a private university (1986)	TIC rents its 33 000 feet ² of rentable space at its new facility at a rate of \$14.75 foot ⁻² , which is market competitive	<ul style="list-style-type: none"> – Small bus. dev. corp. – Evanston bus. investment corp. – Basic ind'l research lab. – Basic ind'l research inst. – Inst of learning sciences 	31	7
(5) Ben Franklin Technology, Incubator (BFTI), Lehigh University – a private university (1983)	BFTI rents 21 900 feet ² of its rental space in four different buildings. The rental rates vary from \$5.00 to \$15.00 foot ⁻² . These rates are about 30% less than the market rate	<ul style="list-style-type: none"> – Technical assistance program – Business assistance program – Challenge grants program – Seed grants program – Univ. tech. transfer office 	29	9
(6) Edison Technology Incubator (ETI), Case Western Reserve University – a private university (1984)	ETI rents 13 000 feet ² of its space in its multistory building. The rental rate varies from \$4.50 to \$12.50 foot ⁻² . These rate are about from 15 to 30% less than the market rates	<ul style="list-style-type: none"> – Edison biotechnology center – Cleveland adv. manuf. program – University tech. trans. office – Marketing services associates 	11	4
Total			150	47 (32%)

Table 4
Client firms' use and value-added contributions of incubator services (values in percent)

Incubator service/item	Reported frequency of use				Value added contribution				Rel. between use and value-added: correlation coefficient (significant?)
	Daily/weekly	Monthly/yearly	Only at inception	Never	No value	Minor value	Moderate value	Major value	
<i>A. Shared office services</i>									
1. Photocopier	83	5	10	2	2	10	35	53	0.31 (yes)
2. Telephone	61	3	9	27	14	7	31	48	0.76 (yes)
3. Facsimile (Fax)	66	13	8	13	11	8	34	47	0.66 (yes)
4. Conference room	40	50	7	3	3	15	37	45	0.47 (yes)
5. Security	83	0	3	14	9	13	38	40	0.55 (yes)
6. Receptionist	61	3	9	27	22	19	19	40	0.75 (yes)
7. Custodial/maintenance	94	0	3	3	3	19	39	39	0.35 (yes)
8. Personal computer	47	14	14	25	26	3	39	32	0.76 (yes)
9. Shipping/receiving	46	20	8	26	18	27	24	31	0.68 (yes)
10. Mail sorting	72	0	3	25	10	30	33	27	0.48 (yes)
11. Word processing/clerical	19	31	9	41	23	26	32	19	0.62 (yes)
12. Cafeteria/lunch room	57	0	4	39	33	11	48	8	0.17 (no)
<i>B. Business assistance and networks</i>									
1. Govt. grants and loans	9	32	12	47	38	14	10	38	0.68 (yes)
2. Business plan	0	39	28	33	12	21	35	32	0.56 (yes)
3. Legal/govt. regulations	3	40	6	51	28	30	14	28	0.20 (no)
4. Tax assistance	0	27	6	67	36	16	20	28	0.20 (no)
5. Accessing outside capital	5	34	16	45	40	24	9	27	0.46 (yes)
6. Marketing	5	35	11	49	32	19	23	26	0.64 (yes)
7. Accounting	3	33	11	53	26	35	16	23	0.39 (yes)
8. Personnel recruiting	3	38	9	50	35	35	15	15	0.24 (no)
9. Business connections outside the incubator	17	66	3	14	6	21	32	41	0.59 (yes)
10. Business connections between tenants	24	68	3	5	10	24	37	29	0.43 (yes)
11. Rent breaks	-	-	-	-	41	8	8	43	-

and tenant firms' perceived value-added contributions of these UTBI services forms the basis of this study.

This framework captures most of the key UTBI services described in the literature and is able to address the major aspects of the UTBI value-added dimensions. The following sections employ this framework to analyze the selected six cases.

3. Methodology and sample

In this study a multiple-case design with an embedded survey of the client firms was em-

ployed (Mian, 1991). For data collection on-site interviews were conducted with the incubator managers and their staff, and these were supplemented by information obtained through mail surveys administered to the client firms¹ of the following six selected UTBI cases:

- Technology Advancement Program (TAP),
- Advanced Technology Development Center (ATDC),
- The Ben Craig Center (BCC),

¹ Client firms include both tenant firms as well as graduate firms.

Table 5
Client firms' use and value-added contributions of university-related services (values in percent)

University related service/item	Firm's degree of involvement in (or use of) services/items			Value added by each of these factors/items				Rel. between use and value added: (significance?)
	No involvement	Occasional involvement	High involvement	No value	Minor value	Moderate value	Major value	
1. University image	18	40	42	19	12	28	40	0.80 (yes)
2. Labs/workshops and equipment	40	38	22	33	16	18	33	0.85 (yes)
3. Student employees	15	53	32	13	20	35	32	0.76 (yes)
4. Faculty consultants	23	63	14	20	28	26	26	0.79 (yes)
5. Library resources	21	62	17	19	26	29	26	0.80 (yes)
6. Related R & D activity	55	30	15	49	9	20	22	0.92 (yes)
7. Education and training	80	18	2	69	9	13	9	0.73 (yes)
8. Tech. transfer programs	73	25	2	59	23	12	6	0.86 (yes)
9. Sports and social activities	68	22	10	56	29	9	6	0.87 (yes)
10. Mainframe computer	85	12	3	73	15	9	3	0.89 (yes)

- Technology Innovation Center (TIC),
- Ben Franklin Technology Incubator (BFTI),
- Edison Technology Incubator (ETI).

Table 3 provides a list of the six selected cases, their sponsoring universities, facility background, institutional support, and their client firms' survey data. As shown, the six UTBIs studied were chosen (from a sampling frame of 30) to represent programs which ²: (a) were sponsored by a 'major' university in the US; (b) represented both public and private university types; (c) were generally viewed as successful or otherwise unique; (d) were at least 5 years old. Out of the total 150 client firms contacted 47 responded to the survey (a response rate of 32%). ³

² Fourteen of the most highly respected experts in the field were interviewed personally during the annual professional conference (with extended telephone follow-ups). These experts were asked to verify the selection criteria and help identify a representative sample for the case study. Based on a summation of their responses a total of seven UTBI facilities were identified out of which six allowed access.

³ Mail reminders, and help from the respective facility management was sought to encourage response without bias and selectivity. None the less, most of the non-respondents were found to be relatively newer tenants and were not dissimilar to the responding tenants in terms of industry type and/or size.

4. Provision of services and infrastructure support

University technology business incubators are multi-tenant buildings, in and around university campuses, which provide affordable, flexible space and a variety of typical incubator and university-related services for a select group of technology-based tenant firms.

Tables 4 and 5 (column one) list the type of services provided by the six UTBI facilities included in the survey. As shown in Table 4, essential shared office services were provided by almost all of the six facilities studied. Business assistance services were also generally available but with different arrangements. At ATDC, business and management consulting was provided by in-house consultants, while at BCC, TIC, BFTI, and ETI the services were available through resident private firms. No such formal arrangement was reported at TAP, where the incubator manager and the staff seemed to have assisted entrepreneurs in business/management problems.

Most of the typical university-related services were available at all the six facilities (Table 5). Access to a student labor pool, related R & D activity, technology transfer programs, mainframe computers, and library/information database fa-

cilities were reported across the board. However, with the exception of TAP, access to the remaining services (see Table 5) was not equally emphasized.

Table 3 (column 3) depicts the institutional support system available to the clients in each of the six facilities surveyed. As shown, tenants from all six programs can take advantage of their respective university research and development activities including technology transfer programs, technology and business development assistance centers, and research institutes. Two of the land grant institutions,⁴ that is, University of Maryland and Georgia Institute of Technology, have technology/industrial extension services which provide the necessary technology transfer environments. Both Georgia Institute of Technology and Northwestern University have established industrial research laboratories and institutes for contractual applied research. As for certain specialized areas, Northwestern University and Case Western Reserve University both have established biotechnology centers/institutes. Georgia Institute of Technology has recently established an information technology center. Only the Ben Craig Center at University of North Carolina at Charlotte has a focused international program to help develop US subsidiaries of foreign businesses.

5. Use and value-added contributions of the services

The individual case-by-case data on the UTBI services show considerable variation in the frequency of use and their client-perceived value-added contributions.⁵ In this section the case-wide data is aggregated (*N* = 47) and analyzed as de-

⁴ Land-grant institutions are American colleges and universities initially given federal aid in 1870s, especially by land grants, they are now supported by the individual states, with supplementary federal funds.

⁵ Value-added contributions of the services provided were assessed through tenant's perceptions recorded on a 4-level scale, with 0 as no value-added, 1 as minor value-added, 2 as moderate value-added, and 3 as major value added.

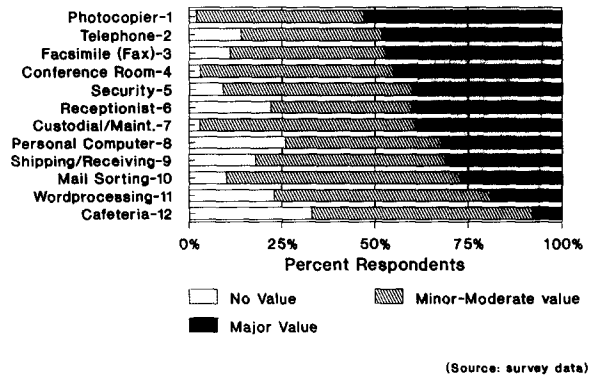


Fig. 1. Perceived value-added of shared office services.

icted in Tables 4 and 5. As shown, against each of the service, client reported frequency of use, the value-added contributions, and the relationship between these two variables are delineated. Furthermore, Figs. 1 to 3 provide details of the value-added contributions, which are rank ordered (in each figure) according to the percentage of respondents assigning major value-added contributions to each of the service reported. Table 4 shows the client firms' response data on typical incubator services which include 12 shared office services and 11 business assistance and network services including rent breaks.

In the shared office services category, the data show that a majority (more than 50%) of the

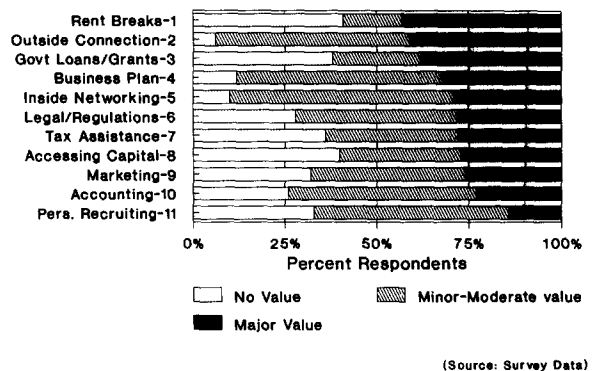


Fig. 2. Perceived value-added of business assistance/networking services.

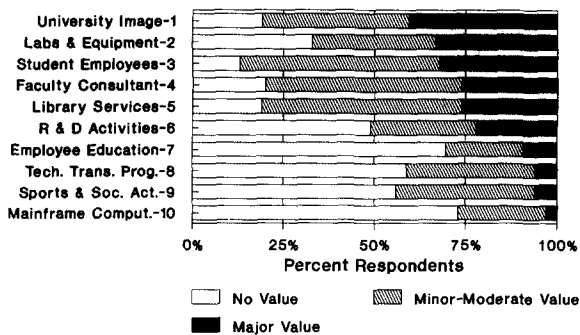


Fig. 3. Perceived value-added of university-related services.

respondents reported using eight out of 12 services frequently (daily/weekly); these include: mail sorting (72%), photocopier (83%), receptionist (61%), facsimile/fax (66%), custodial maintenance (94%), cafeteria/lunch room (57%), security (83%), and telephone (61%). Infrequent use (monthly/yearly) of a conference room was reported by 50% of the respondents. For wordprocessing, 41% reported they never used this service, while 31% reported infrequent use (monthly/yearly). In the case of personal computer services 47% reported frequent use (daily/weekly) while 25% reported they never used this service. For shipping and receiving, 46% reported frequent use (daily/weekly) and 26% reported they never used the service. In sum, almost all of the services had some use, with the majority being used frequently. On the value-added side of the table, a majority (67% or more) of the respondents reported that all 12 services had some value-added contribution (minor to major) to their firms.

As shown in Fig. 1, the 12 shared office services were ranked in terms of the percentages of respondents assigning a major value to these services. The figure shows that nearly half of the respondents assigned a major value to photocopier, telephone, and fax services.

In the business assistance set of services depicted in Table 4 section B (1–8), a majority or near majority of the respondents (45% or more) replied that they never used seven out of the

available eight services. In fact, only one service, i.e. business plan assistance was used at inception by 67% of the respondents. On the value-added side of the Table 4, a majority of the respondents assigned some value (minor or major) for all of the 11 services. This means that although they are not using these services, they do not consider them to be valueless. In business networking set of services (Section B9, 10), a majority of the respondents (66%–68%) reported monthly/yearly use of the assistance available in providing business connections among tenants and business connections outside the incubator. In rent breaks (Section B11), there was a major split between no value-added (41%) and major value-added (43%) responses. This seems obvious due to the fact that two out of six UTBIs (i.e. TIC and BCC) charged market competitive rents, while the remaining tend to subsidize rents.

As shown in Fig. 2, the 11 business assistance and other networking services are ranked in terms of the percentages of respondents assigning major values to these services. The figure shows that at least one quarter of the respondents assign a major value to nine out of the 11 services. These findings support the earlier work on the value-added contributions of Pennsylvania's business incubators (Allen and Bazan, 1990).

Similarly, the individual case-by-case data analyses on value-added contributions of university-related services show considerable variation in the frequency of use and the client-perceived value-added contribution. As stated earlier, here too the case-wide data was aggregated for the analysis. The results are shown in Table 5 which provide UTBI-wide data on the reported use and perceived value-added patterns of the university-related services ($N = 47$).

In terms of use, a majority (50% or more) of the respondents answered involvement/use (occasional to high) with five (out of ten) services frequently used, namely: student employees (85%), university image conveyance (82%), labs/workshops and sophisticated equipment (60%), library/information databases (79%), and faculty consultants (77%). No involvement was reported by 50% or more respondents in the remaining five service areas, namely: mainframe

computers (85%), technology transfer programs (73%), employee education and training (80%), and sports and other social activity (68%).

In terms of value-added contributions (see Fig. 3) more than one half of the respondents assigned some value to six out of the ten university-related services. These findings generally support the earlier work on the university and technology-based firms linkages (Allen and Levine, 1986).

A review of the study results show that, while most of the above services were provided at each of the six facilities studied, their modes of delivery differed. There is insufficient data to suggest that any one of the modes is better than any other, and these different modes apparently suited to the individual UTBI needs.

6. Relationships between the frequency of use and value-added of the services

Tables 4 and 5 (last columns) list the strength of relationships between the frequency of use and the value-added contributions of the UTBI services, as indicated by the Pearson correlation coefficients.

As shown in Table 4, the measure of association between the frequency of use and value-added contributions show significant relationships (with Pearson correlation coefficients varying from 0.31 to 0.76) in 11 out of the 12 shared office services. The only exception is the cafeteria/lunch room service, where there is low positive relationship (Pearson correlation coefficient 0.17) which is not significant either.

In business assistance, relationships were significant (with Pearson correlation coefficient varying from 0.39 to 0.68) in five out of the eight services. Assistance in legal/government regulations, personnel recruiting, and tax matters did not show any significant association between their use and value-added contributions. In providing inside as well as outside business networks these associations were found significant (with Pearson correlation coefficient of 0.43 and 0.59, respectively).

In the case of university-related services the measures of association between the frequency of use and value-added contributions show a high positive relationship (with Pearson correlation coefficients varying from 0.73 to 0.92) in all of the ten university-related services. All these relationships were found significant. The highest relationship (0.92) was revealed in the use of related R & D activity, which means that if the client's business related R & D activities are in progress, then it becomes highly valuable for the client firm to locate in the UTBI and make use of the available knowledge. Same is true with respect to the remaining services where high positive relationships were found between the frequency of use and the values they add to the client firms. In sum, this analysis showed that the firms who needed and used these services valued them highly.

7. Summary and conclusion

The above findings indicate that the UTBI concept seems to provide a nurturing environment for the development of NTBFs through a combination of much needed university-related inputs and other typical incubator services. Furthermore, the vast majority of the respondents believed that the UTBI services they received were adding value to their fledgling firms. Thus, it can be concluded that the UTBI in the US does contribute to the growth and survival of their tenants making it a viable system for nurturing NTBFs. When compared with previous fragmented research findings (Allen and Levine, 1986; Allen and Bazan, 1990), these findings not only confirm that the incubators add value to their client firms, but go a step further to establish that UTBIs are specifically suitable for developing NTBFs.

In interpreting these conclusions on the client reported value-added contributions, there is, however, a need for caution. Some previous authors (Allen and Bazan, 1990) have commented on the generally modest perceptions of value-added components by incubator tenants saying that,

“entrepreneurs are not a particularly appreciative group, and their high degree of autonomy and self-esteem shade their perceptions of how much they are really being helped”. This further strengthens the findings.

In spite of the fact that the tenant response rate was only around one third and the plausibility that a majority of the respondents may have been ‘successful’ tenants, the overall conclusion would remain the same. Furthermore, the contributions reported here may not have fully accounted for some of the softer value-added aspects such as: (a) the psychological support the tenants draw from each other (Lichtenstein, 1992), (b) managerial interventions which may provide critical know-how and the sharing of entrepreneurial skills (Rice, 1993), and (c) miscellaneous other programs the UTBIs offer, for example, seminars and meetings and mentoring with local entrepreneurs etc.

From the NTBF entrepreneur’s viewpoint, the implications of these findings are obvious. The UTBI’s university linkage plays an important role in providing the infrastructure support necessary for nurturing their firms (Mian, 1994b). From the university point of view, the UTBIs’ contributions in their work with university-related clients (faculty, students, and alumni) is equally important in developing entrepreneurs from within at the same time enhancing the prospects for university technology commercialization (Abetti and Sheart, 1985; Doutriaux, 1987).

In a broader sense, what makes the UTBI’s value-added contributions justifiable from a university policy perspective is the continuing evidence that an entrepreneurial university is broadening its mission in addressing the technology-based economic development needs of their regions. While this preliminary effort has provided useful insights into the value added contributions of UTBIs, several challenges remain. To make the UTBI tool more attractive to the entrepreneurial university, perhaps more self-sustainable models will have to be developed. Additionally, from entrepreneur’s point of view the relative merits of the UTBI compared to the classic intrapreneurial model for new venture creation, or the traditional independent NTBF de-

velopment mode need to be probed. These areas including a better accounting of the aforementioned softer value-added components need further research.

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