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Hybrid Organization In High-Tech Enterprise

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Abstract

This paper describes research-in-progress that examines the dynamics of hybrid R&D organizations in high-tech industry, and compares them to hybrid research organizations in academia. Our preliminary definition of “hybrid organization” is based on funding: it is an enterprise that receives revenues from commercial activity (in goods and/or services), but that primarily sustains its R&D work through competitive grants and awards. Hybrid organizational forms have been studied in academia, but there is very little literature on industry hybrids. Through prior research, we have encountered several firms that we would call industry hybrids, and in our view, this finding demands further investigation. Therefore, we have launched a pilot study to characterize the “industry R&D hybrid” as an emergent organizational form. This line of inquiry explores the possibility that these hybrid forms are viable and legitimate ways of organizing R&D activities over the long term, and not simply project-based collaborations among independent firms, immature forms of the commercial firm, or corrupted forms of the academic research unit. Our study will begin to elucidate this possibility in ways that may inform policy-making and strategic planning, not only within industry and academia, but also at regional and federal levels.

1 Introduction

Much of the hope for economic growth related to e-commerce rests on firms in high-tech industries, where research and development (R&D) efforts are focused on commercializing promising innovations. A few high-tech industries, such as biotechnology, aerospace and information technology have drawn a great deal of research attention for their network-intensive organizational forms and their forays into e-commerce; but firms in other high-tech domains, such as ocean engineering and marine exploration, are also participating in new organizational forms and research collaborations.

Among these diverse high-tech R&D firms, hybrid forms of organization have emerged to harness the research efforts of industry and academic scientists. A “hybrid organization” is one that receives revenues from commercial activity (in goods and/or

services), but that primarily sustains its R&D work through competitive grants and awards. Hybrid organizations have become increasingly central to university-industry technology transfer efforts – not just in the US, where a great deal of basic research is funded, but in all regions that hope to fuel technological innovation as a generator of economic development. However, when hybrids involve the presence of commercial firms within university research units, this form has stirred a great deal of controversy and debate. For this reason, hybrid organizational forms have been relatively well-studied in academia (Liebeskind, 2001; Calvert, 2002; Owen-Smith, 2003), but there is very little literature on industry hybrids (Goyal et al., 2003; Kraemer, 2003).

In this paper, we will examine the industry R&D hybrid form by drawing on literature in e-commerce and organization theory, as well as on findings from our own studies of collaboration among scientists in academia and industry. We will discuss our rationale for conducting a pilot study to better characterize this hybrid form, as well as possible trajectories for more extensive research that will examine the legitimization and adaptation of hybrid organizational forms. In the next section, we define the hybrid form we intend to study, and why this form is important to understand in the context of international business. We then examine institutionalist understandings of organizational form that help shape the motivating questions of our pilot research study and the appropriate design for preliminary investigation. In the final sections of this paper, we describe our pilot study methodology, and explain why we expect that a focus on industry R&D hybrids in Hawaii can yield insights for entrepreneurs and policy-makers around the globe. We believe that this presentation of our research interests will engage readers in a lively debate about the dynamics that shape global e-commerce, and we hope it will draw commentary and participation that will benefit our long-term study design.

2 Characterizing Hybrid Organization

The term *hybrid* has been used to describe academic organizations that span the boundaries of traditional academic research and commercial R&D. This form contrasts with the idealized pure academic research center, in that academic research teams collaborate with industry organizations as partners, clients, and providers. Interestingly, it seems that high technology companies in Hawaii, and elsewhere, also adopt a hybrid form as they collaborate with, but also compete with, academic groups for military and government research awards. Figure 1 suggests how these hybrid forms might fit into the larger spectrum of organizational models.

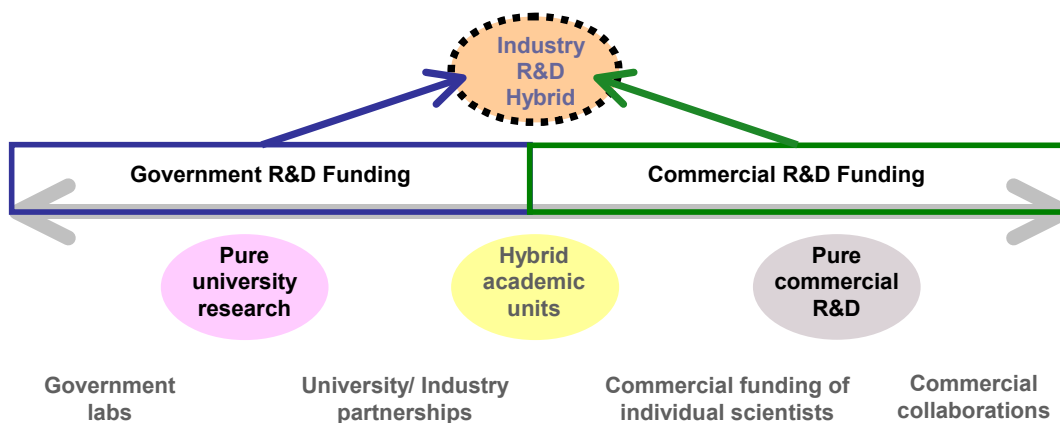


Figure 1: Hybrid Organizational Forms of R&D in Industry and Academia

We are aware of only two other research groups who have sought to characterize hybrid R&D forms in industry. Both identify hybrid forms that take shape within or among traditional commercial firms, either as R&D collaborations in industry networks (Goyal et al., 2003); or as tightly integrated value chains in product manufacturing (Kraemer, 2003). We would classify these forms entirely within the commercial sector, even though many involve R&D in the service of government initiatives (particularly in aerospace), because funding is provided to these units through contracts, rather than grants and awards.

To develop a more precise definition of hybrids is the point of our pilot study research. Funding is our focal dimension at this stage, because it largely determines organizational viability. The potential for funders to exert strong influence on the activities of R&D units, as many have noted, is a central structural consideration of both critics and proponents of this form. Therefore, we have identified mixed-funding as one visible marker of a hybrid, although we expect that a more distinguishing definition of hybrid would incorporate a sense of the way an enterprise is organized to conduct research, and its links to academic institutes. As we proceed with our pilot research, we will refine our preliminary categorization of the hybrid forms shown in Figure 1.

2.1 High-Tech R&D Hybrids In International Business

It is critically important that we understand the viability of the hybrid form in globalizing contexts. With basic research capacity concentrated in the US, and a few other nations, technological innovations tend to emanate from these centers to other regions. Even though many countries are struggling with how to turn local technological advances into regional economic prosperity (cf. Cabo, 1999; Turpin et. al., 1996; Wen and Kobayashi, 2001), most are also net importers of US-based research and development. Our study focuses on R&D research in the US because of this potential to disproportionately affect global economic development through technology transfer. From this perspective, we view technology transfer as fundamentally an international business process.

Technology transfer processes are constrained by how people conceptualize them. When policy-makers believe that only a handful of organizational forms are acceptable or desirable for industry firms, that limits thinking about how technology transfer can be facilitated from academia to industry (or vice versa), or from region to region, and it constrains the plans for economic development that policy-makers put forward. In the US, concerns about funding have shaped their conceptualizations.

Arguments for a clear separation between commercial R&D and academic research arise from several constituencies. Scientists and policy makers have expressed concerns about the growing role of commercial funding of academic research, arguing that commercial interests run counter to scientific objectivity, that sharing scientific results through publication can be limited, and that public research funds are often hijacked by commercial firms who participate in joint projects (Adams, 2001; Birch and Cohn, 2001; AIP, 2002.) Academics and the public are particularly troubled by the potential removal of scientific research findings, which have been supported with public funds, from “the public common” of scientific ideas through special agreements with collaborating private firms. They also worry about the possibility of private firm control of University research, and ethical conflicts from undue influence on researchers to report findings favorable to a commercial sponsor’s interest, or to suppress unfavorable findings (Argyres and Liebeskind, 1998; Birch and Cohn, 2001). Although much less frequently, some small high technology firms also complain that academic researchers, supported by

public funds, unfairly compete with commercial firms when they cross the boundary from academia to commerce with their research or technologies¹.

In this often heated discourse, there does not seem to be much analytical discussion of the new hybrid organizational forms that operate on the boundaries of academia and industry.

A number of incentives have been legislated to incubate innovative firms, and to assist in the transfer of new ideas from academic research centers to commercial firms (Databank Consulting, 2003; Seely, 2003). These efforts have met with limited success, in Hawaii and elsewhere. Therefore, a better understanding of the characteristics of hybrid organization forms, and of the environments in which they can thrive and contribute to innovation and economic development could help guide public policies and help focus entrepreneurial energies. This line of study could also relate the emergence of hybrids to other new organizational forms, such as electronic collaboration markets (Christiaanse and Markus, 2003), through comparative analysis of environmental factors.

In prior research, we have examined several hybrid academic research groups, and one hybrid commercial venture. Through local networking in Hawaii, we have also become aware of a few other hybrid commercial firms that we will enlist in our study. However, the work of our colleagues in Europe indicates that the industry R&D hybrid is a global phenomenon among SMEs (DEEDS, 2003). These multiple sources begin to show how deeply hybrids may be implicated in the dynamics of technology transfer. Moreover, anecdotal data from these sources suggest that, among high-tech firms, the hybrid form may survive where more purist commercial forms fail. Therefore, we believe it is paramount to determine how, why, when and where hybrids are viable, and whether the industry R&D hybrid is a stable organizational form that should be legitimized and nurtured, or as many perceive, merely a transitional phase that firms should pass through as quickly as possible.

3 Theorizing Hybrid Organization

Our study of hybrid R&D organizational forms is theoretically anchored in institutional theories of organization (Scott, 2001). Institutional theorists view organizations as open systems that adapt to the technical and institutional influences of their environment (Scott, 1987, 1994). In doing so, organizations seek not only rational efficiencies but also institutional legitimacy (Powell and DiMaggio 1991). Organizational forms, functions and processes thus reflect influences in the organizational environment (Scott, 1987). When environmental influences shift, organizational forms are likely to adjust, whether through adaptation within existing organizational populations or through population ecology dynamics, i.e. the creation of new and the demise of old organization members (Hannan and Freeman, 1979).

3.1 R&D Environments

Firms that engage in technology innovation and transfer are influenced by the institutional environment in a number of ways. In the U.S., federal government policies

¹ Although we do not find references to this phenomenon in the academic literature, local entrepreneurs whom we have interviewed have voiced bitter complaints about the revenue-generating activities of some University of Hawaii research units.

are a key influence on both academic (public) and commercial (private) research. Since the establishment of NASA² in the 1960's, the U.S. government has emphasized dual-use technologies and commercial spin-offs to help justify governmental investments in research and development. All government agencies that fund R&D now have technology transfer programs as part of their mission (Seely, 2003). Funding programs, such as the Small Business Innovation Research (SBIR) program, established in 1982 to enable such technology transfer, foster not only dual-use technologies but also collaborative partnering between commercial firms and private research programs (Seely, 2003). The 1980 Bayh-Dole Act, which allows universities to patent faculty inventions developed through U.S. government research funds, has transformed the university research mission. A dual emphasis on basic science/academic research and development/patenting of commercial technologies has become an essential, and self-reinforcing, strategy for research universities to maintain or build a competitive position (Owen-Smith, 2003). Nearly all Research I³ universities now have administrative units to facilitate and manage patenting and licensing of inventions. Consequently, revenue generation through innovation has become a key university goal (Mowery et. al., 1999).

In concert with these changes in the institutional environment, scientific advances in fast-moving fields, such as biotechnology, have accelerated another important trend: commercial investment in academic research programs (Kenny, 1986). The 1990s agreement between Sandoz Corporation and the Scripps Institute (a University of California, San Diego research institute) marked a major shift in commercial R&D strategy, and it raised a number of policy and ethics questions about commercial ownership of government-funded research (Seely, 2003). Despite similar concerns that continue to surface whenever the institutional logics of private and public research conflict, a number of universities and not-for-profit research facilities have since developed hybrid R&D arrangements with private sector organizations (Owen-Smith, 2003).

Institutional theory suggests that when organizational environments change dramatically, as they have in many scientific research fields, new organizational forms are likely to arise (Scott, 1994, 2001; Scott et. al. 2000). Within organizational fields⁴ like biotechnology, "pure or simple forms" of academic research or commercial R&D are becoming less common, and hybrid forms are emerging (Argyres and Liebeskind, 1998; Powell and Brantley, 1992.) The hybrid categories depicted in Figure 1 represent complex rearrangements of simple organizational forms and functions. In our classification, hybrids would include university technology transfer organizations, university/industry cooperative agreements, university- (or individual scientist-) directed commercial endeavors, and commercial firms that participate in government-funded research. In order to understand them better, we will need to examine how they interact with other organizations.

² National Aeronautics and Space Administration

³ Carnegie Research I Classification: This classification of US universities identifies them in terms of their research capabilities. (See: <http://www.washington.edu/tools/universities.html>.)

⁴ Powell and DiMaggio (1991) define organizational field as "those organizations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, resources and product consumers, regulatory agencies, and other organizations that produce similar services or products" (p. 64-65). Within this institutional domain, organizations share common meaning systems and interact primarily with each other (Scott 1994).

3.2 Organizational Networks

Innovation diffusion research highlights the importance of communication among partners in research, development and commercialization processes and the role of organizational networks in the dissemination of technological know-how (Rogers, 1995). Hybrid organizational forms play a key role in these processes, particularly in centers of innovation such as the San Diego area for biotechnology where commercial investors, start-up firms, and academic researchers are closely located (Owen-Smith, 2003). The hybrid form is a common adaptation among (formerly) academic research scientists, who establish a not-for-profit research institute to work closely with for-profit technology firms. In many instances, the for-profit firm and not-for-profit institute share researchers and even research facilities. The not-for-profit institute can attract more government funding, as it may appear to be a more legitimate awardee of public funds in grant peer review processes than a commercial firm doing similar research. Within these arrangements, resultant technologies are then licensed to the for-profit firm (Adams, 2001).

It is a relatively small step for the academic researcher with ample start-up funding from venture capitalists and/or government-sponsored research projects to move nominally into the commercial arena. However, it takes many large and difficult steps to transition that single-researcher start-up operation into a viable commercial firm. Only a few "make it." More often, industry R&D hybrids that originate in this way tend to persist as hybrids for many years, while striving to become viable commercial firms (TechEnterprise2003). Although these small start-up firms figure prominently in studies of organizational networks, no long-term legitimacy is given to their hybrid form (Powell and Brantley, 1992). We suspect that much less attention has been given to industry R&D hybrids, because researchers, policy-makers and entrepreneurs themselves expect the firm to evolve beyond its transitional hybrid form (Lewis and Sappington, 1991). In fact, the studies of non-academic hybrids that we know of focus exclusively on hybrid forms of organization among already-profitable commercial firms (Goyal et al., 2003; Kraemer, 2003.) However, we believe that other industry R&D hybrids are as fundamentally important and equally as interesting as their academic counterparts. Moreover, institutionalist researchers have found that organizational forms change within an industry population more by "birth and death" of individual firms, than by structural change within the firm (Scott et al., 2000; Hannan and Freeman, 1977.) In other words, the industry R&D hybrid may represent a new form, rather than organizational change "in the making." We have also noted that hybrid R&D organizations outside innovation centers, like San Diego or the San Francisco Bay area, are virtually unstudied. For a hybrid firm functioning outside such dense local networks, its boundary spanning role between government, academia and commercial firms could be even more critical to regional economic development.

3.3 Hybrids and Diversification

Although much attention is given to new forms associated with networking among increasingly specialized firms; we see something else happening in Hawaii's firms. Rather than moving relentlessly toward ever greater specialization, these firms have had to diversify to remain viable. Diversification seems to be a necessity in local/isolated areas where economies of scale are hard to operationalize (e.g. in developing nations, among SMEs); and we see this kind of diversification in Eastern Europe as well as Hawaii (DEEDS, 2003). Diversification used to be a strategy of business in the US

(1950's, 1960's), but many big conglomerates have broken up to concentrate on core competencies and networking (Fligstein, 1991; Davis et al., 1994). Some theorists suggest that diversified firms create cross-disciplinary interaction forums that are fertile grounds for new innovation, because they provide an environment where idea transition can take place through the mental activities of a single individual who has a deep knowledge of two or more disciplines; and that this is a key feature of breakthrough innovation (Bijker, 1995; Hughes, 1983). Other researchers have explored network-based models of innovation, and believe that learning takes place within organizational and regional networks, rather than within individual firms (Powell and Brantley, 1992.) Von Hippel's (1998) studies also indicate that innovation occurs at several sites within the product manufacturing chain, rather than primarily within the manufacturing firm itself. This line of research suggests that an innovative industry R&D hybrid can only remain viable if it is a member of a vibrant interorganizational network.

Over the past two decades, management rhetoric has de-legitimized the 'firm-as-portfolio' model that promotes diversification as a business strategy (Davis et al., 1994.) These understandings shape biases that the 'conglomerate is dead', and that diversification is a wasteful strategy – regardless of a firm's size, location or organizational field characteristics. We wonder if diversification can make sense in a global economy. Is the proliferation of anti-diversification strategies better understood as an example of "big firm" concepts driving "small firm" development policy? We ask these questions because, as part of our ongoing research, we have looked carefully at the networks of our case study organizations. The network topologies that our analyses draw show that Hawaii research units do have extensive networks, but that most links are to other organizations outside Hawaii. Could diversification within the firm spur serendipitous connections between disciplinary concepts and lead to innovations in the absence of 'learning networks' or manufacturing value chains in Hawaii?

On this theoretical basis (and with one data point of support, noted above), we speculate that in the absence of a 'local-enough' network⁵, diversification provides not only viability, but also an important source of innovation. In new and developing industries and/or regions this combination of hybrid form and diversification can be a powerful strategy for economic growth.

4 Research Design

Our brief literature review presents some challenges to conventional understandings about viable organizational forms for R&D, but it also establishes an institutionally-grounded basis for meeting those challenges by identifying the characteristics of hybrid firms, and by examining the ways in which this form may be viable. As a first step along this research path, we have designed a pilot study of industry R&D hybrid organizations that will begin to address the following questions:

1. What are the characteristics of a firm we would call a hybrid?
2. Where does the hybrid fit in a spectrum of R&D organizational forms?
3. How prevalent is this form in Hawaii?

⁵ Because of geographical distances, for our study, that would mean a network that is contained within the Hawaiian island chain.

4. Where else do we find this form (or variations of it)? Where is it viable? Are Hawaiian hybrids different from others?
5. What policy implications/recommendations would devolve from an improved understanding of hybrid organizations in academia/industry research and in local/global contexts?

Site selection. To address the first 3 questions listed above, we intend to work with some local Hawaiian firms that we have encountered in prior studies who are themselves hybrids. We have approached them to help us in a joint project to articulate a general model of hybrid organizations and their environments; and one firm, where we conducted a case study for another research project, has already agreed to participate. Our understanding of this organization is currently incomplete, because organizational form was not the focus of our earlier case study. (It focused on the uses of information and communication technologies within research collaborations.) Together, we will analyze why and how the hybrid approach to high technology works for them, where it encounters difficulties, and so on.

We have also begun to solicit participant firms among other hybrids we have encountered. At the TechEnterprise 2003 conference in Waikiki in August, 2003, we met members of several firms that might be classified as hybrids; and we have invited them to join the study as well. We anticipate that 2-4 Hawaii firms will be part of this pilot study. However, as we pursue our ongoing research, we expect to encounter other hybrids on the US mainland and elsewhere. Where this helps us address question 4, we may invite them to join this study.

Historical comparison. We have also asked the local Hawaii conglomerate, Alexander & Baldwin⁶, to participate in the study to provide data about development through diversification in Hawaii, and the consequences of using diversification as a critical component of business strategy. We expect this line of inquiry to indicate any conditions which seem to necessitate diversification within Hawaii firms, and then to guide our exploration of the ways in which diversification can subsequently foster innovation through cross-disciplinary concept adaptation.

Data collection. Within each participating firm, we will conduct a qualitative case study. We will conduct in-depth interviews with firm founders and members. We will gather R&D researcher background information, firm histories, and organization charts. We will solicit functional role descriptions, research activity descriptions, and information about commercial aspirations and current operations. We will also gather information about interorganizational relationships for network analyses.

Analysis. We will develop iterative analyses concurrent with our data collection activities, as is common practice in qualitative case studies. We have used theoretically driven data collection, with constant comparative analysis to good effect in past research projects, and we will use that basis of prior work to inform this study with institutional perspectives, socio-technical analyses, and our emergent understanding of the entrepreneur as a social actor (Lamb, 1999; Davidson and Lamb, 2000; Lamb and Kling,

⁶ Alexander & Baldwin, Inc. is a diversified corporation with most of its operations centered in Hawaii. Its principal businesses are: [Property Development & Management](#) - Developing real property, primarily in Hawaii | Selling residential and commercial property | Managing a portfolio of commercial/industrial properties; [Ocean Transportation](#) - Carrying freight, primarily between Pacific Coast ports, Hawaii ports and Guam | Conducting related shoreside operations | Arranging domestic intermodal transportation; and [Food Products](#) - Growing sugar cane and producing raw sugar | Growing, marketing and distributing coffee (See: <http://www.alexanderbaldwin.com/>).

2003) Our analytical objective is to articulate a cohesive set of hypotheses for systematic study through long-term (3-5 year) research.

We have used this case study methodology in two prior studies. We have also been able to enhance our analyses of phenomena under study (eg. intranet development) through careful historical analysis of secondary data and published reports (Lamb and Davidson, forthcoming). Therefore, we consider historical analysis to be a logical addition to our methodology, and we feel confident that this combined approach will yield the desired results.

5 Preliminary Discussion

Our pilot study has just begun, but it is based on understandings and questions that we have developed through a series of research efforts and experiences that have spanned several years. We have examined hybrid phenomena as part of these ongoing analyses. In turning to the literature, we found that it doesn't discuss the industry R&D hybrid model, and, apparently, neither do the firms themselves. However, at the conclusion of the TechEnterprise 2003 conference in Waikiki, we witnessed an interesting realization: Hawaii R&D firms that had independently adopted an industry R&D hybrid model reported that they were surprised to find that other attending firms had done something very similar. This realization may be the first step in their collective acceptance of the hybrid form as a legitimate part of long-term operational strategy within the Hawaii business community.

5.1 Expecting the Unexpected

This came as no surprise to us, however. Through our ongoing study that examines the roles of information and communication technologies (ICTs) in collaborations between academia and industry, we have seen a variety of hybrid forms that pose new issues and provide alternative explanations to common assumptions drawn from the literature. As a result of this research, we have postulated that the existence of industry hybrids is what might be expected if there is a continuum of viable forms between the pure academic R&D unit and the commercial enterprise, rather than just these two discrete mature forms. This stretching of organizational form is what some theorists expect from new ICT implementations (Stinchcombe, 1990), but we believe that the hybrid reflects influences beyond ICTs – perhaps a shaping of organizational forms for collaborative research by increased networking opportunities and pressures. In other words, we speculate that hybrid R&D forms are an organizational response to the need to be adaptive within multiple, changing institutional contexts (i.e. to interface with various levels of government, with academia, and with commercial firms in their industry.)

In some ways, theoretical literature does anticipate the industry R&D hybrid. For example, behavioral theorists would expect formerly academic scientists to feel more comfortable in a university-like setting within industry, where they can work in an academic mode, while slowly becoming more business-oriented (Argyris, 1982.) In fact, by adopting hybrid forms within academia and within industry, scientists can move their research operations between these institutions without much structural change to their research organizations – but only for a while. There is an explicit expectation, mainly from funding agencies but also from the local community, that eventually these hybrids will become self-sufficient, income-generating, tax-paying, commercial enterprises.

5.2 *Perpetually Transitional*

Contrary to conventional wisdom, but not to institutional theory, our early findings have lead us to speculate that these forms are not transitional, that the industry R&D hybrids we see in Hawaii won't become traditional commercial firms, and that they shouldn't be pushed in that direction. Rather than shedding their hybrid form, they have instead spun out commercial ventures as separate entities, keeping the hybrid organization as an incubator or generator of R&D for future commercialization. In the firms we have observed, the hybrid is not evolving into a pure commercial form. Institutional theory about organizational ecologies supports this observation. Among the organizational populations they have studied, like hospitals and healthcare organizations in California, the forms of organizational populations don't change by internal transformation of each firm, but through the birth of one type of firm and the death of another (Scott et al., 2000). What is interesting here is that even though new commercial firms are being "born" through spin-offs, the hybrid is not "dying" -- but why kill the hybrid when it is acting as an incubator of innovation?

One source of concern for Hawaii, and perhaps for other locations of industry R&D hybrids, is that the spin-off commercial firms are not always local. Many are launched on the US west coast, or migrate there soon after start up. Exporting innovation is an issue for the US as a whole, not just Hawaii; and it is a potential issue for any constituency that invests in basic research. How can local innovation be captured to provide local returns? Alternatively, how can the local group receive compensation for developing and exporting it? One strong argument that is often advanced in favor of local basic research investment involves the potential for commercial spin-offs and dual-use technologies. In a truly global environment, however, we see that new high-tech firms migrate to centers like San Diego and San Francisco, where they have a better chance to survive. Rather than trying to tether these new firms to their original research locales, it might be more helpful to find ways to legitimize hybrid forms and find ways to encourage their support from 'export' constituencies. Something akin to this actually happens in Hawaii; where much of the investment capital for small start ups comes from the San Francisco Bay Area, where most of the spin-offs also go.

6 **Conclusion**

In this paper, we have described a pilot study that will examine a few viable hybrids in Hawaii; refine a set of hypotheses about hybrids; and define the strategy for a long term study that will provide a robust understanding of hybrids that can guide policy. This study will highlight the role of hybrid forms in high technology R&D firms in ways that will increase acknowledgement of this form, and may also increase the legitimacy of hybrids in terms of policy support.

Here in Hawaii, a few firms have adopted a model of industry-based R&D that could serve the wider community, and in the process provide an understanding of how local and global policies come together to shape a conducive environment for hybrids. We expect that our findings will emphasize the importance of long-term government and military funding for R&D firms, which seems underappreciated -- possibly due to a lack of understanding about hybrid models that work. By providing a model for Hawaii's R&D firms to emulate, this study could contribute to the development of the high-technology sector and foster a local contingent of R&D firms that will interact and partner with each other in the future. Conversely, this study may also shed light on our understanding of Hawaii as an exporter of innovation -- i.e. why commercial spin-offs of local hybrid firms

are launched as mainland start-up firms -- and provide creative ways to grapple with the policy implications of this condition.

As we expand our investigations beyond the pilot study, we believe that findings from this research stream could serve academic research policy-makers, inform state and federal research funding agencies, and also complement the efforts of existing academic e-commerce and entrepreneurship programs by providing a forum for exchange about viable alternative forms of R&D enterprise. By establishing a dialog about hybrids, and by relating these forms to alternative organizational forms, such as electronic collaboration markets, we can give researcher/entrepreneurs and technology start-up firms a comparative basis for analyzing environmental factors and for choosing among emergent forms.

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