INTRODUCTION

In August 2005, the TV channel BBC asked its overseas viewers to vote for the "Greatest Briton." In that poll, Sir Isaac Newton, who contributed much to the world's understanding of gravity and planetary motion, was voted the greatest. If a poll on the "Greatest Filipino" were done in the Philippines, who would she or he be? Would a scientist be voted the greatest Filipino? Or would the greatest Filipino turn out to be an actor, a politician, a singer, or a boxer?

This issue of the Philippine Sociological Review is about two topics: the culture and practice of science and technology in the Philippines, and the *study of* the culture and practice of science and technology. In the first, we have a chance to see the scientific mind at work as scientists and technologists think about the problems we encounter daily in the country; in the second, we find out about how science and technology can be understood using the language of sociology.

The exploration of these two topics takes the view that science and technology can be understood sociologically through its culture. As a set of ideas, values, and practices, culture provides a framework for organizing the world and our place in it. Thus, while the physical world is generally pre-given, culture may radically shape the implications of this reality for society.

As a rational way of understanding the physical world, science allows societies to develop technologically-based cultures that have the capacity to adapt to or alter the physical environment. Culture, as this issue will use the term, specifically refers to the patterns and dynamics of scientific and technological pursuits and the meanings that practitioners attach to these activities. Culture, then, refers to practices (Knorr Cetina 1999), and science and technology can be understood within a performative idiom (Pickering 1995) or as being in-the-making (Latour 1987). How indeed might sociological frameworks and methods contribute to an understanding of science and technology in general, and of Philippine science and technology in particular?

Science is concerned with the laws of nature which natural scientists (e.g., biologists, chemists, physicists) seek to discover and understand. Using nature's laws, technologists (e.g., designers, inventors, engineers, craftspeople) adapt nature to human needs. They use their knowledge and skills to design and manufacture a world that fulfill human needs.

A sociology of science and technology applies the analytic resources of sociology to science and technology in order to understand them. In general, sociologists of technology concern themselves with technology and the development of innovative processes and products, while sociologists of science study how an understanding of

the basic natural processes in the universe is arrived at. Based on current practice, the sociology of science and technology is related to the multidisciplinary field of science and technology studies (STS) that have their roots in history, philosophy, economics, sociology, humanities, among others. However, while the study of science and technology has been undertaken by many disciplines, STS research continues to heavily rely upon disciplinary-based master narratives (Bowden 1995).

The earliest forerunners of today's studies of science and technology looked at science and technology as entities separated from their social context. In the 1960s, for example, sociologists such as Merton looked at the institutional structure of science and its pattern of communication and reward. In the arena of technology, one of the earliest views is that of technological determinism, or a view of technology as independent and external of society yet exerting tremendous influence upon it.

In the mid-1960s, the insight that science and technology as a complex enterprise takes place in specific social contexts developed. Discourses moved from standard engineering (e.g., finding technical "solutions" to problems) to humanistic discourse (e.g., emphasizing human values, issues of ethics).

One point of inquiry in the sociology of science is the area of scientific knowledge, as inspired by Merton's (1968) claim that the sociology of science is "a subdivision of the sociology of knowledge." By the mid-1970s, the content of scientific knowledge became subject to sociological inquiry. One approach follows the Mertonian ideal of studying the social environment of knowledge which "springs from and returns to controlled experiment or controlled observation." The sociology of scientific knowledge (SSK) offers an alternative view: it argues for both the empirical examination of the social bases of scientific knowledge and the recognition of the social construction of scientific knowledge claims and technological artifacts (Knorr Cetina 1981).

Insights from the inquiry into the social bases of knowledge were extended to technology. The turn to technology within science studies is exemplified by the work of Trevor Pinch and Wiebe Bijker (1987) and the movement known as social construction of technology (SCOT). Social construction of technology (SCOT) theory, along with actor-network theory (ANT) (see, for example, Callon 2005), represents the constructivist approaches in the study of technology.

One axial assumption of constructivist approaches to science and technology is that as a technological artifact passes through different phases of design, production, marketing and consumption, it is shaped and reshaped by people who form alliances and networks. Through the relationships that are established between the social actors involved in the development of a technological product (e.g., policymakers, inventors, research and development [R&D] departments, designers, producers, marketers, and clients), an actor-network is formed.

Both SCOT and the Sociology of Scientific Knowledge (SSK) view the development process of scientific knowledge and technological artifacts as alternations of variation and selection whereby relevant social groups play a great part in determining which variant of the scientific knowledge or technological artifact or process will be adapted (Knorr Cetina 1981; Bijker and Pinch 1987). Over time, the scope of the constructivist approach to technology, which initially examines the shaping of technology in the hands of its creators, expanded to an examination of how users or consumers are shaping technology. Thus, from studies that look into how the refrigerator got its humming sound, or how the typing case turns out to be "QWERTY," attention shifted into how users first adapt to the presence of the microwave or the computer in the home. Most recently, the mobile phone and the internet stand at the center of the examination of the consumption of technology.

An understanding of the culture and practice of science and technology in the Philippines must, however, take into account the various settings that support the development of such culture and practice. Pertierra (2003) provides an account of the state of science and technology in the Philippines in terms of technology indices (i.e., middle rank in Southeast Asia in terms of telephone, computer, and Internet use), government knowledge bureaucracies (i.e., a gap between policy planning and implementation), world rankings of the country's tertiary institutions (i.e., relatively low rankings which suggest a weak culture of research in Philippine universities), presence of science and technology in the media (i.e., very limited audience reach), among others. He also offers a view of a Filipino epistemic culture characterized by television programs that trivialize knowledge, and a State that is far from providing Daniel Bell's "theoretical knowledge" as a source of predictable social outcomes. Non-scientists such as politicians and media personnel often share the same space as scientists, and expertise and competence are not given the role to resolve mainly scientific disputes. Certainly, Pertierra's account is but one of many, and there is a need to further chart the Philippine scientific and technological terrain.

A sociology of science and technology that encourages an examination of the culture and practice of science and technology in the Philippines will not only make it possible for us to answer the question I posed at the beginning of this Introduction. The daily activities and the social relationships being created by scientists, technologists, and users of scientific knowledge and artifacts can be the means of understanding the society which generates such culture and practice. In turn, knowledge of society can be the means of understanding this society's scientific and technological enterprise. Both explorations allow a fuller understanding of imperatives for the culture of science and technology to be present in everyday life.

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SCIENCE AND TECHNOLOGY IN THE PHILIPPINES AS CULTURE AND PRACTICE

Professional narratives of Filipino scientists and technologists provide a glimpse of the culture and practice of science and technology in the country. They feature trajectories that constitute the course of a career, usually made up of major events, contexts and mechanisms of such events (e.g., opportunities for education and training), and consequences for those who are involved (e.g., membership in various epistemic communities that provide access to social and cultural capital). These trajectories are not only biographical but also direct the analysis to building a model of the world of scientists and technologists.

At *The Symposium on Science and Technology as Culture and Practice* that the Philippine Sociological Society organized in March 2006, natural scientists, technologists, and sociologists gathered together to examine how professional biographies and narratives of Filipino scientists and technologists reflect the culture of knowledge acquisition, creation, and utilization in the Philippines, and how everyday life, the State and capital create the context for science and technology. It featured presentations by Dr. Estrella Alabastro, Secretary of the Department of Science and Technology (DOST), Dr. Conrado Dayrit, member of the National Academy of Science and Technology (NAST), and noted for his work on virgin coconut oil; Dr. Ma. Assunta Cuyegkeng, Professor of Chemistry and Vice-President for the Loyola Schools of the Ateneo de Manila University; Dr. Severino Magat of the Philippine Coconut Authority; and Fr. Delfin Felipe who developed a "Filipino Utility Vehicle." Three of the papers are included in this issue.

The Mertonian paradigm looks at how modern science functions as a structured social system, whose autonomy allows it to create scientific knowledge independent of social influences. Although science and technology is currently being understood as socially embedded, we learn from Merton that certain institutional arrangements are conducive to the practice of science. These are: communalism (publicly sharing information about one's research), universalism (disregarding personal and social characteristics of other scientists when evaluating their research), disinterestedness (truth above personal gain), and organized skepticism (withholding judgment on the validity of others' research). Conformity to these norms enables scientists to achieve their goal.

Estrella Alabastro's contribution highlights the importance of these institutional arrangements, not only within the laboratories of science. She discusses the need to strengthen our "National System of Innovation." National systems of innovation are

typically anchored upon the network of relationships that enable firms to innovate, and the role of the State in coordinating and carrying through long-term policies for industry and the economy. In her discussion, we see that the social construction of technology and actor-network theories (see Introduction) are empirically grounded in the national education system, industrial relations, technical and scientific institutions, government policies, national institutions, and cultural traditions, which together comprise a national system of innovation (Feeman 1995).

Ma. Assunta Cuyegkeng's professional autobiography illustrates that indeed a scientist's "choice of where to use one's skills and expertise is a product of socio-historical context and personal beliefs." The notion of the social constructiveness of scientific practice and culture allows us to appreciate that scientific knowledge and artifacts result from the purposive and directional effort of scientists toward the production of knowledge as defined by one's scientific community (Knorr Cetina 1981). Cuyegkeng asked the Filipino community of scientists, as practical, contextual, and economic reasoners, to be mindful of the historical, social, and cultural contexts of the scientific enterprise and of their role as agents of change and national development.

While Cuyegkeng's professional biography offers a glimpse of the scientist as a contextual reasoner, **Delfin Felipe**'s article—the first public exposition of his car project—presents the contexts of technological innovation in the Philippines. Felipe's account of his experience in building his alternative vehicle, DPROX (Disenyo Pilipino Rurban Overland Excursion Vehicle), illustrates Thomas Kuhn's concept of a "scientific paradigm." Kuhn argues that scientific and political revolutions share similarities: both happen when a "narrow subdivision" of a given community sense a malfunction in the system. Thus, knowledge is not merely cumulative and scientific production is not simply about adding more sophistication to a stable base. Stability is often subject to periodic rupture or revolutions. However, a revolution in the design of the jeepney was not forthcoming since the manufacturers, users, and relevant institutions never considered the jeepney status problematic.

One observation on the culture and practice of science and technology in the Philippines is possible at this point. The accounts by Cuyegkeng, Felipe, and Alabastro indicate that there is indeed a subculture of science and technology in the Philippines. However, this subculture is inhabited by only a few and is unable to triumph over the public, everyday culture. Creativity and ingenuity can prosper despite the lack of governance structures, but State-regulated policy and implementation mechanisms are needed to make the most of such creativity and ingenuity.

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NATIONAL INNOVATION SYSTEM: PROSPECTS AND CHALLENGES

Estrella Alabastro

INTRODUCTION

Thank you for inviting me to this symposium. The cultural dimensions of science and technology are indeed very important and we really need to fully understand them in order to harness science and technology for the common good.

I also understand that the basic objective of this symposium is to provide a venue for natural scientists, technologists and social scientists to get together and examine the context of knowledge acquisition, creation and utilization in the country. While the results of this symposium will help set a working agenda for social scientists that are interested in the context, processes and meanings of science and technology in the Philippines, they are invaluable inputs to us in government to enhance our efforts in strengthening public awareness of science and technology.

THE POLICY BIAS

The sociocultural aspects of science and technology have not been given adequate attention. This, I believe, can be traced to how policymakers view S&T (science and technology). Traditionally, the rationale for science and technology policies has largely been based on the economic concept of "market failures." Market failures occur when private firms and individuals do not adequately invest in S&T development, particularly R&D (research and development). Underinvestment by private firms and individuals in science and technology development is attributed to many reasons. Private firms do not see worthwhile private gains from doing so. They consider such investments as substantially high and risky, and taking long gestation period. Thus, the market failure view justifies government interventions, primarily to ensure that scientific and technological outputs, often viewed as public goods and services, are made readily available to the general public. This economic rationale has dominated S&T policymaking processes and in a way, crowded out sociocultural considerations.

However, times are changing. A new thinking on S&T policies is emerging. From market failure, the rationale of S&T policies is now on systemic failure view. Systemic failures arise from the lack of coherence among the networks of institutions, resources, interactions and relationships, political mechanisms and instruments, and scientific and technological activities that define, promote, articulate and encourage the technological innovation and diffusion process.

The basic premise is that innovation and technology development are results of a complex set of relationships among various people, enterprises, universities, and research institutions as elements of a collective system of knowledge creation and technology use.

To improve S&T performance, therefore, the key is to have a good and clear understanding of the linkages and interactions among various actors in the National Innovation System. The actors involved in innovation include institutions such as private firms, universities, research institutes, government agencies, social, economic and political institutions, and the individuals within these institutions, even political leaders and local government officials. Their relationships and interactions take many forms such as joint researches, personnel exchanges, cross patenting, purchase of equipment, memorandum of agreements, professional affiliation, personal relationships, among others.

In this light, science, technology and innovation are considered outcomes of a social process or phenomenon conditioned by cultural values. The systemic failure rationale therefore accords sociocultural factors to be necessary considerations in S&T policy-making processes. In fact, culture is often recognized as an important key to innovation.

SOCIOCULTURAL CONSIDERATIONS

Having said that, let me now focus on a number of sociocultural dimensions that we need to look into to promote innovation and science and technology in the country.

Let me cite first the stigma that our society attaches to failure.

In our sociocultural milieu, we are generally averse to risk – and we fear failure. To overcome the shame that accompanies failure, we have to create a culture that encourages calculated risks. We can learn from the experiences of other countries. They have successfully done this culture change in specific geographical areas, often referred to as innovation areas where practices and traditions have been changed purposively through lectures and mentoring activities by successful entrepreneurs, and through formal and informal social gatherings where scientists, technologists, venture capitalists, patent lawyers, financial experts, and other innovation players meet and deepen their relationships to understand and appreciate that failure is a good learning experience, and thus, eventually overcome the stigma of failure.

Another deterrent to the advancement of science and technology development is our inability to work well together as a team. At this time, when many of the challenges that confront us require multidisciplinary perspectives and inputs, this is a shortcoming that we have to correct, if not in our generation, in the next generation of scientists. The discipline of teamwork will have to be inculcated in young people, perhaps through new learning approaches in our elementary and high schools. I have often marveled at how well different groups of scientists and engineers in Thailand have effectively collaborated to bring new products and services in the market.

A good understanding of the linkages and interactions among the actors in the

innovation system enables policymakers to come up with more appropriate policies and programs, pinpointing leverage points to correct mismatches both among institutions and government policies that thwart technological and innovative performance.

A linkage that we should actively promote is that between our local scientists and Filipino scientists residing and working abroad. In a meeting with Senator Ramon Magsaysay Jr., Dr. Pedro Jose, an immunologist based in Georgetown University and an active member of the Philippine American Academy of Scientists and Engineers, shared the information that he has been given substantial R&D grants by the US government enabling him to hire three Filipino Ph.D. degree-holders from the Philippines to find a cure for high blood pressure among Filipinos through biotechnology. They are about to patent their research outputs. We should identify more Dr. Joses to help build up our R&D capacity.

The Bayh-Dole Law allows US universities to patent the results of publicly-funded research. I believe that the time has come for us to work for the enactment of a similar law to clarify IP (intellectual property) policies on publicly funded research outputs in the country. I am certain this will have significant positive effects on the utilization of research outputs and the commercialization of technologies generated by our academic and research institutions.

As I have said, we must increasingly network with Filipino scientists and engineers abroad. We must strengthen collaboration with a number of Filipino networks that have already been established. The Science and Technology Advisory Councils (STACs) with active members in the United States and Japan have been sharing expertise with both government and private sectors in the country. The Brain Gain Network (BGN) provides a database of Filipino professionals abroad. The members of the Philippine-American Academy of Scientists and Engineers are now in town making a round of our national leaders advocating an increase in the public funding for science and technology.

CONCLUSION

To jumpstart changes in our socio-cultural milieu that are necessary for the fast development of S&T in the country, we have to look to local science communities to provide the lead. An example is the very active repository of intellectual capital in the Diliman complex, which is made up of faculty members and researchers from UP. Diliman, Ateneo de Manila University, Miriam College, and agencies of the Department of Science and Technology (DOST) such as the Advanced Science and Technology Institute (ASTI), the Philippine Nuclear Research Institute (PNRI), and the Philippine Institute of Volcanology and Seismology (Phivolcs). If only the various groups in this community can show that they can work together to tackle a pressing national problem, I think this feat can be emulated in other places. To me, the most difficult hurdle that we should overcome is the inability of people in different disciplines to collaborate with one another. We must do something quickly to correct this deficiency.

PROFESSIONAL AUTOBIOGRAPHY: A PERSPECTIVE OF THE CULTURE AND PRACTICE OF SCIENCE IN THE PHILIPPINES

Ma. Assunta Cuyegkeng

INTRODUCTION

When I ask my students how they define science, they usually say that it is an "organized body of knowledge." I do not like this definition because it makes science sound so stagnant and like a set of encyclopedia for show. I prefer the definition that highlights science as a process. Science is a rational inquiry into our world (Garcia 2003) and seeks understanding that is derived from a logical structure and that produces mental models to help us represent the world. Because of the logical structure and the mental models, there is a clear effort to make this understanding objective or separate from the persona making the inquiry. Steven Rose (2003) describes this aptly:

> As humans trying to understand and act upon the world we inhabit, we work with several languages. Speaking of our own experience we talk personally, subjectively. The classical goal of science has been to eliminate this personal subjective quality of language and replace it with a voice of claimed objectivity.

However, the elimination of the subjective quality of language is not achieved simply with the writing or speaking style. It is further achieved through systems that promote verification of results and peer review. Ultimately, these attempts to objectify actually highlight the social nature of the scientific endeavor.

There is the realization that the scientist performs within the context of his/her own spacetime (i.e., within a historical, social, and cultural context). Hence, to minimize the effect of this context, the results need to be verified by peers and experts. Interestingly, these peers and experts themselves are within their own historical, social, and cultural spacetime; so that this has an effect on how materials are evaluated and reviewed. Thus, while we approach a situation of "claimed objectivity," there is always an interpretation involved, possibly in the context of a particular paradigm, mental model, available technology, or language. Allow me then to share with you my own journey as a scientist trying to find a voice of "claimed objectivity."

THE CONTEXT OF KNOWLEDGE ACQUISITION, CREATION, AND UTILIZATION IN THE PHILIPPINES

My own professional life story began in third year high school, shortly after martial law was declared, when I fell in

love with the idea that it was possible to see things in the most objective way possible through the world of chemistry. I thought that this was a way of seeing the world for what it really was – an attempt to unveil absolute truth. Perhaps, it was a reaction to the experience of people modifying stories to suit themselves or manipulating facts to deliver a desired outcome.

This belief in science led me to study chemistry at the Ateneo de Manila University and later in Regensburg, Germany, where my mentors reinforced my idea of science as a practice defined by integrity, rigor, and detachment. Knowledge creation and acquisition, in the context of my university experience, promoted these values to a great extent.

I learned from my mentors how to use that knowledge for truth and for service. In the academic context where I flourished, knowledge was used with the pride that comes with intellectual fulfillment after a challenging problem solving process. I also clearly remember occasions when my mentors used their chemistry prowess to do their own version of CSI as early as the 1970s, in order to help government agencies, industries, or consumers come closer to the truth. One clear memory was when our faculty members were asked to help identify what poisoned people aboard a ferry. All they had was the sack which contained the flour or rice. Noticing a stain, they decided to collect a sample of the stain and eventually identified the poison using Infrared Spectroscopy.

Upon returning from my doctoral studies in the mid-eighties, I also saw the strategic vision of my mentors, when they decided to focus on few but strategic areas of research. Because we were a small department, we decided to choose our niche areas for research. Analytical chemistry, natural products, and chemistry education were already clear choices then, because of the expertise of the faculty members. However, I learned to appreciate two things. The first was that the faculty chose to also go into polymer chemistry at a time when no academic institution was engaged in it, because they had a sense that this would be a growth area in the Philippines. They asked me to move into this area (because I was the newest, although I was not really trained for it) and gave me a lot of support so that I could retool. The second thing that I admired was that when they agreed on their strategic vision, they all worked towards it, even sacrificing their personal research interests in view of the departmental vision.

Clearly, the choice of where to use one's skills and expertise is a product of sociohistorical context and personal beliefs.

THE SOCIAL CONTEXT OF SCIENCE: THE NATURAL SCIENTIST IN SPECIFIC SOCIAL CONTEXTS, DYNAMICS, RELATIONSHIPS

Inasmuch as scientists try to unravel the mysteries of the world, scientists also need funds to run laboratories, develop human resources, and maintain facilities. I had to face this as a young academic trying to establish my research. Getting funds is very much at the mercy of government priorities, industry interests, and to a certain degree, of the scientific community's directions. Most scientists will go where the funding is, or will try to package their research to match

funding requirements. In some cases, there are scientists who can also influence the directions of science if they are savvy enough to market their research or if they have a track record for defining vision. In my case, environment and industry applications were the priority. At first, I chose to work on biodegradable polymers because this was a trend that matched the needs of the environment. However, after about two or three years of work, I gained a philosophical insight. Why was I changing the material to suit society's throw-away mentality, when the problem is with the culture itself? At that point, I decided that I would rather do research in adding value to one of our natural resources, carrageenan, and help the environment by teaching the youth about the effect of our lifestyles on the planet.

Aside from funding, there is the immediate scientific community to understand, especially in the Philippines, where relationships and alliances play an important role. After all, they are the peers who would review proposals, local publications, and awards. Actual scientific practice put content quality as the primary concern, but shortly after I got more involved in the professional and government organizations, there were a few times when I observed that affiliation and reputation could affect the experts' evaluation, and this is stronger in some disciplines more than others.

Eventually, as the structures of the Department of Science and Technology (DOST) were redefined and as academia and professional organizations aimed to make their programs world-class, there were clear efforts to address this. I saw how processes became better defined and there was a general move towards blind peer review. This is not unusual in science and technology (S&T) today in the Philippines, and it is accepted in today's generation of scientists that even well-awarded ones will go through such processes, just like those who are not.

There is also the element of political correctness. It is not unusual to distribute grants and awards to different geographical region; this is understandable, if the goal is to assist the regions in growth. This further illustrates that the social context has to be taken into consideration even in promoting scientific work.

As I matured in my scientific and administrative roles, I realized that, even at the level of knowledge creation and acquisition (a task for our universities), the dynamics of departments and schools can change the fabric of scientific inquiry. Personalities and factions can compromise the growth of scientific endeavor because opportunities like grants, support for conference fees, etc., are perceived to be given in favor of privileged groups. Clearly, these take a toll in terms of how much we can move forward in S&T in the Philippines.

THE FUTURE OF SCIENCE IN THE PHILIPPINE CONTEXT

Through my career, one of my concerns was the growth of future scientists of the Philippines. One direct contribution was through mentoring of budding scientists, so that they may be introduced properly to the world of research. I realized that my own understanding of the practice of science came largely from the example of my own mentors, and I, too, need to pass this on.

However, mentoring just a few students seems too narrow and even parochial, when we think of the bigger Philippine society. I asked myself why there were so few people who went into science, why naturally curious children suddenly lost interest in discovering the world. I asked myself why science teaching turns off many of our youth. In 1989, I started a workshop for teachers of high school chemistry, ChemTeach, where teachers would be encouraged to use fresh approaches. This took off from a program, ChemStart, which was started by my professor, Fr. William J. Schmitt S.J., who wanted to initiate the youth into the world of chemistry when they had no preconceived notions yet. I thought that a parallel program for teachers would further create a multiplier effect. Not satisfied, I eventually became involved in looking for ways to improve elementary science education in 1994. Since then, I have devoted part of my personal career in science education, because before we can even have scientists in our midst, they will begin as children who need the proper outlook in the practice and values of science. Because our teachers are generally not properly trained to do science, they end up with the boring bookish strategies or predictable cookbook experiments. My pre-occupation now is to provide opportunities for our scientists and science teachers to get to talk with each other, so that they may get a better appreciation of each other's role in helping science to grow in this country.

Finally, we need to help our young scientists realize that their competency is one of their contributions to national development. Whether they go into research to gain understanding of our world, or go into industry where their mental models may be translated into products, or go change our culture through their voice of claimed objectivity, they would have changed our nation for the better.

FINAL COMMENTS

My professional life has gone through profound changes and continues to do so, because of the changing social landscape. Science is a social endeavor; it is never performed in a vacuum. While truth in science comes from an observer's effort to understand a world that is out there, the meaning we put into our scientific endeavor builds upon the relationships we have forged as professionals.

With this perspective, I have tried to broaden the boundaries of my professional space by venturing into areas such as Science and Society as well as Science and Religion. Perhaps, this reflects a personal need to integrate the personal and professional aspects of my life so that I may see the world with different perspectives, and always be open to seeing it with new eyes.

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EXPLORING ALTERNATIVE CONCEPTS FOR A FILIPINO CAR

Delfin Felipe

FOREWORD

I am not an automotive engineer. I do not belong to the automotive industry, not a mover and shaker – just an aficionado. I just found a reason to build my car because the service vehicle that I was provided in 1994—a *Fiat Uno*—had no more spare parts, since Francisco Motors terminated its contract with ItalCar in 1996. In the process of maintaining that car, I was introduced to the native genius of Filipino mechanics and auto tradesmen. The competence of these workers was on the practical, not on the theoretical side. They learned their trades through apprenticeship – greasy, grimy, hands-on experience. The older workers never had a Technical Education and Skills Development Authority (TESDA) or a vocational school to train and certify them, but they were good. These are Filipinos who simply have a natural passion for making things work and making things run.

One has probably noticed that Filipinos who had experienced deprivation during the Japanese occupation (and I saw this in my own parents) never discarded anything that broke down. These had to be stored somewhere because *"Pwede pa 'yan!"* ("That will still do!"). It can still be repaired! It can have a second life! Take note that the experience of deprivation and poverty is the strongest motivation for recycling – a very important concept, even today.

WHAT ABOUT "A FILIPINO CAR"?

Now, what about a "Filipino Car?" Let us start with "*Filipino"* and then *"car."* The endless debate on *what is Filipino* has been raging very noticeably in the profession in which I was trained, namely, architecture. In that field of practice, the great mystery is that there are actually more opinions about what is Filipino architecture than there are architects.

Only one senior colleague and friend, Bobby Mañosa, seems to have made headway among design-build practitioners in pushing and developing the *bahay kubo* as being the fundamentally Filipino architectural icon. But making headway does not necessarily mean being accepted. He has stood his ground and made a niche for himself in the field of design and indigenous construction materials, but is sadly viewed with cynicism by others who have their own pet ideas, interests, and criticisms. Mostly criticisms.

Much to his credit, due mainly to his durable convictions and tenacity in research and development (R&D), I think Mañosa has made his mark.[1] Whether it will endure beyond the lifespan of his projects remains to be seen.

THE MISSING LINK TO HOPE

How did I make the leap from architectural design to automotive? The answer is simple. A car is just *a house with wheels*. Even a lawyer can say that. Also, my car was born of necessity, as my service vehicle was deprived of replacement parts since 1996. I am not assigned to a parish that can bankroll a vehicle, so I had to find more creative solutions. For the six or seven years that mechanics were maintaining my poor Fiat Uno, the constant refrain was: *"Sir, mahahanapan natin ng paraan*." ("Sir, we can still find a way."). They were telling me: *"Sir, may pag-asa pa 'yan!"* ("Sir, there is still hope to have that fixed!").

In my out-of-town sorties, I saw how the various trades were basically complete even in provincial motor shops, particularly in the dwindling *jeepney* fabrication small and medium enterprises (SMEs). There were engine mechanics, chassis welders, tinsmiths, auto-electricians, "specialists" in wheels, brakes, etc. There is no shortage of tradesmen. The glaring missing link in our native automotive industry is *creative and functional design*. There lies an empty niche, I thought.

A TALE OF TWO ICONS

Let us first take a look at two reputedly Filipino icons, one architectural, the other automotive. The architectural icon is the *bahay kubo* (although as I said, many would dispute that), and the automotive icon is the passenger *jeepney*. Although the bahay kubo may have preceded the jeepney by centuries, my opinion is that the jeepney has come to be more Filipino in the field of automotive than the bahay kubo has in the field of architecture. But tracing the history of these two gives us good reason to lament.

The bahay kubo, in fact, has not truly served the majority of Filipinos. Not many architects have picked it up as a symbol or as a paradigm for design. In the decades after World War II, it was quickly overrun by the *barong-barong,* because of the invasion of western building concepts and the rapid rural-to-urban migration aided and abetted by mass media [e.g., *OK lang tumira dito: "along da riles" na nga, "along da airport" pa!* (It is ok to live here: it is not only along the railroad tracks, it is also along the airport!)] and some US-schooled academics.

The bahay kubo really has no place in the urban area unless it undergoes a process of research and is developed into urban architecture. It is interesting to observe how the majority of Metro Manilans seem to be living out a rural culture within a supposedly urban setting. The fact is that they have not really been urbanized. And if the bahay kubo is not urbanized, it becomes a barong-barong.

The story of the jeepney is one of stunted evolution, again for want of R&D. From the Detroit and New York celebrity it once was in the 1960s, it has come to be an outdated disgrace – by the mere passage of time. Since its inception in 1953, little significant design work has been put into it. No comparable R&D and

very little *science* was added to the original thinking that was done by Clodualdo Delfin, Leonardo Sarao and Anastacio Francisco by their successors.[2] That is why the jeepney seems to be fading from the scene.[3]

The erstwhile "King of the Road," has also lately fallen into disrepute as a traffic menace and a source of air and noise pollution. It belongs to the essence of the jeepney to be loud and noisy, just as engine roar is characteristic of American hot rods and Harleys. The rumble has to be felt in the chest, if not in the ears. Pollution is not deliberate, but one wonders if smoke-belching might not be part of the show (like the smoke trail left by jet aircraft), considering that some models sport two tailpipes on opposite sides of the rear. In most cases it is simply because their diesel engines are not properly calibrated and maintained due to economic constraints.

To make matters worse, public utility jeepney (PUJ) drivers deliberately and habitually misbehave in the middle of the streets so as to irritate car-owners. They are making a statement which road rage prevents many motorists from grasping: "Even if I am poor, I am King of the Road!" (Notice how tricycles are also now emulating the loudness and the road greed of big-brother jeepney?).

The Jeepney and its European Cousin

Not many people are aware that our jeepney has a European cousin. Both share the same pedigree, having been born from the war surplus reconnaissance vehicle called the "government-P Willys" or "GPW" – affectionately called "Jeep" by US troops in World War II. Willys-Overland and later Ford Motor Corporation bagged the contract to mass produce the Jeep, churning out over 700,000 for the war effort, after which the US Army dumped a sizeable number of surplus GPWs in Manila (the Pacific Theater) and in London (the European theater).[4]

In the Philippines, we transformed the GPW into a public transport vehicle (registered as "public utility jeepney" or "PUJ") and added our artistic flair, primarily derived from *calesa* art. It was fine while it lasted. Today even the art is fading, as seen in the growing number bare G.I. and stainless steel jeepneys. The sheet metal is left bare for economic reasons. Stainless steel was introduced in coastal towns because ordinary steel corrode faster in salty air.

The British, on the other hand, developed it into a sturdy farm vehicle, whose name is now synonymous to toughness. It is the Land Rover: the meanest four-wheel drive vehicle by the turn of the millennium. Stylewise, it was not presentable; its initial countenance was ugly: like a face with the nose punched inwards.[5] But because it was loaded with R&D over several decades since its inception in 1947, it has evolved and even diversified into several world-class 4x4 vehicles.[6] In this way, the Land Rover moved away early from what might be called "surplus dependency."

Meanwhile, its Filipino cousin suffered nothing more than decoration (*palamuti)*. There was no R&D. No significant new science and technology was being put into the jeepney fabrication industry, not even by way of borrowing. While other "native" vehicles have

Table 1 World War II Surplus GPW Reconnaissance Vehicle: Facts

Country	Great Britain	Philippines
Inventor	Maurice Wilks	Clodualdo Delfin
Vehicle type	Farm Vehicle	Public Transport Vehicle
Common name	Land Rover	Jeepney
Leading manufacturer	Rover Co.	Sarao Motors, etc.
Evolution:		
1950s and 1960s	Land Rover	Owner and variants
1970	Range Rover	(Chariot)
1989	Discovery	(Wrangler)
1990	Defender	(Minicab)
1997	Freelander	(Joroshelly and XLT)
		(Legacy First)

emerged, they are not based on any significant R&D, and only follow the same surplus-dependent recycling and styling process. These are: (1) the domestic "owner type" jeep, (2) the Wrangler replica, (3) the minibus type "Chariot," (4) the "Minicab," (5) the *Ilonggo* "Joroshelly" and its *Kapampangan* counterpart, the "XLT," and (6) Norkis Motors' "Legacy First," a mini-single cab pickup. Of these, only two can trace its style and development ancestry to the Willys. And except for Norkis, there is little apparent intent for scientific design, and fabrication is totally at the mercy of skimpy economics and deficiency of political will.

The Fall of the Jeepney: Internal and External Factors

There are intrinsic and extrinsic reasons for the decline and fall of the jeepney. Let us examine the case of Sarao Motors in Las Piñas, which closed down in the year 2000. While it never had more than 300 employees, and it was churning out five jeepneys a day, because of 47 years of *"sipag at tiyaga,"* it was regarded as the dean of jeepney fabricators. Today, Sarao Motors is no more than a tourist spot, its shopworks minimized, only to service warranties.

When I visited Sarao in May 2003 with my drawings—hoping that they would fabricate my vehicle, the style of which I deliberately derived from the jeepney and "owner-type" jeep—I was bluntly told, "Sorry, we only do jeepneys." I had gotten the idea of evolving the jeepney because I believed it was in doldrums. I then concluded that what killed Sarao was not just the air-conditioned Toyota FX and the anti-jeepney bias of the Land Transportation and Franchising Regulatory Board (LTFRB), but also the inordinate attachment of Sarao Motors to its own product coupled with a chronic fear of change or innovation. I said to myself, *masyadong sarado ang Sarao, kaya sila*

nagsara! (Sarao is too close-minded, that is why they had to close down!)

What can sociologists do about this, I wonder? The solutions to this attitude problem lie in applied science, but surely sociologists can pave the way to retooling the paradigms of the native (automotive) industries. In general, we need to train Filipinos to be scientific innovators. We need to upgrade the mentality of Filipinos from being consumers to being producers. There is no economic growth purely from money changing hands, and certainly not from the madcap purchasing of imported goods. A healthy balance of trade requires that we produce and sell goods. If we have no goods to sell, we will end up selling our very selves. That is precisely why we have the OFW phenomenon, the social costs of which are exorbitant and long-term.

The native Filipino auto industry is a small and medium affair. It is not a "big business." So, it is a backyard thing, classified as a "cottage industry." However, if any native auto firm grows "too big for comfort," the big automakers feel compelled by the rules of competition to shoot it down.

Case No. 2: Francisco Motor Corporation (FMC) is hanging on for dear life. Anastacio Francisco was a *calesa* painter who apprenticed in Sarao's shop, and later set up his own Jeepney assembly operation. That became Francisco Motors Corporation – certainly not a pushover. What nearly killed FMC was a Ford/ Mazda maneuver. For many years until the year 2000, FMC had a contract with Mazda to assemble the B200 series pick up. But since Ford was going to launch the Ranger series in 2000, and wielded 30 percent controlling interest over Mazda, Ford prevailed over Mazda to stop B2000 production. Mazda then breached its contract with Francisco Motors, Francisco filed suit, and the case is pending in the Supreme Court. Bleeding, Francisco had to shut down its Asian Utility Vehicle (AUV) line as well – the *Anfra*. To add cyanide to the gaping wound, the Bureau of Internal Revenue (BIR) picked on Francisco Motors, publicly listing it among exemplary alleged tax evaders like Regine Velasquez and Richard Gomez – to send signals to the general public to "pay-your-taxes-or-else." Why single out Francisco, when there are hundreds of bigger tax evaders worth putting on the scaffold? Was it chosen by raffle, or was the BIR's choice prompted by "big brothers" in the global auto industry?

We should also admit that corruption within *Pinoy* private business enterprises is a blameworthy internal factor for their decline. Filipino entrepreneurs sometimes take too much liberties over their businesses, thus lowering their leverage and raising their vulnerability in the face of foreign competition. Connivance of government and foreign business interests constitutes an external factor. As the native auto mechanics put it in their own slang: *Toyota ang tumodas sa Sarao at Ford-Mazda-BIR ang tumutumba sa Francisco* (Toyota killed Sarao and Ford-Mazda-BIR knocked down Francisco).

VALUES IN SCIENCE, EDUCATION, AND TECHNOLOGY

Foreigners do not relish competition – especially not from Filipinos who have been typecast for the new world order to be consumers and service persons; we are

perceived as better off being caregivers and entertainers, not producers of economic goods.

So what do we need science and higher technology for, if we are not destined to be competitive producers anyway? What do we have and where do we obtain purchasing power to buy manufactured goods (the raw materials for which come from us in the first place)? We have no capital, we are already forfeiting our sovereignty over our natural resources, and it seems the only thing left to sell is *ourselves!* Cheap labor, the Filipino. *Mabuti na lang,* at least, *meron pa tayong coconuts!* (Good thing, we still have coconuts!). But even then, the coconut as a product cannot be attributed to purely Filipino inventiveness because—as Fr. Lynch might have put it—while we do the planting, it is God who provides the growth (Ref. 1 *Cor* 3:7-9). That is why agricultural people are generally closer to God, because they are closer to nature.

Earlier, while listening to Dr. Cuyegkeng, this thought occurred to me: *Interest in science presupposes an unquenchable curiosity about nature.* But when you are overexposed to artificial environments, with hardly any natural objects surrounding you (for example, in this auditorium, the only natural things are us and a few *palmeras*) you are handicapped. When we wake up in the morning, we do not see the sun rising; what we see is a light bulb. This is the bane of urbanites. The ones who really have the raw potential for true science are those who wonder at nature and are wholesomely and intensely curious about nature. And then they get into physics, chemistry, and biology. My point is that there is something wanting in our science education, because we are being raised in a technological environment before we can even appreciate pure science from nature itself.[7]

Does science and technology have to be antithetical to nature? That is the misconception of many. Media and the academe are rife with themes like *"Technology vs. Nature,"* and slogans like *"The greatest enemy of the environment is man."* I insist that it does not have to be that way! That only happens when one does not first respect nature and then emulate it later. Science needs to respect nature and technology needs to emulate it, because no matter how "close" we feel to nature, without a coherent respect and emulation, we end up abusing and violating it.

Actually, there is an ethic that underlies the fabrication of the jeepney. It was born at a time of scarcity and poverty, when common sense dictated that what others have made well should not be put to waste. Junking is not ecological. Recycling is. So, perhaps without even realizing it, the inventors of the jeepney were actually implementing—though in a rudimentary way—what is now called the "ecological ethic."

Jeepney fabrication has always been a "*4R*" process: *Rescue*, *Recycle*, *Rehabilitate*, *Resell*. This was the paradigm that led to its success, but by the 1960s when the time was ripe for two more Rs to be added, the jeepney makers defaulted. What was appropriate technology soon became obsolete. By the 1970s, the jeepney was threatened with extinction. These two missing Rs are

Research and *Redesign*, implying intense education in science and technology. What they were putting in was mere *Redecoration*, but you can only do so much with plastic surgery. The problem at this late hour is how to add these two essential components into the process.

WHAT IS UPBEAT ABOUT OUR "COTTAGE" AUTO INDUSTRY

We know that our native auto production cannot compete globally, but looking at the bright side, we find the following:

1. *Domestic demand*. Filipinos who are in the middle and lower-middle income brackets need affordable utility vehicles.
2. *Availability of parts.* The parts are available, thanks to the consumerist laws governing vehicle registration in industrialized nations.[8] We also have our own Motor Vehicle Parts Manufacturers Association of the Philippines (MVPMAP), although they presently serve mainly the foreign automakers.
3. *Acceptable competence.* Trades-men are abundant. They are spread out all over the archipelago. Many have had overseas exposure and training. The average Filipino autoworker's assets are practical wisdom, from experience, occasional competence, and ingenuity.
4. *Acceptable motivation.* There is still in the remaining backyard shops a basic urge to do what is doable, but most of all, an indomitable passion to make things run.

Having said that, let us look at what we really need to hurdle in order to get our show on the road. These are findings from my dealings with backyard autoworkers in the nine months spent fabricating my prototype vehicle.

WHAT AILS OUR "COTTAGE" AUTO INDUSTRY?

Occupational Intimidation. Are Filipino automotive assembly SMEs so culturally and economically battered, that they do not envision themselves as living beyond survival standards? From the cases cited previously, yes. There is lack of self-confidence. Do they not dream "big time?" Some who have access to radio/TV do, but are resigned to aiming only as high as proximate doables. The acquisition of higher technologies (e.g., TIG/MIG aluminum welding) is pipe dreams for them.[9] *Simple na lang, kuya, total naiwan na tayo ng lahat. Dito na lang ako.* (Let us keep it simple, big brother. Anyway, everyone else has left us behind. I will just remain where I am.)

Overseas Filipino Workers (OFWs) have returned from abroad with newfound skills, savings, and even equipment, only to find that the shops are closing down because jeepneys and AUVs are being elbowed out of the market. We need to raise their vision of development – what they can still become.

Lack of Trust. How do they regard the government? It appears that Filipinos regard government and elective office in the same way they regard pop idols and entertainers. The electoral exercise is viewed as no more than games and amusements. To what extent do they rely on government agencies? Only insofar as they can get the minimum needed to get their vehicles on the road. Government

is more of a hindrance than a help – a kind of necessary evil fact of life. Do they prefer to operate within an underground economy? Yes. Why? Because it is too darned complex and onerous to get bigger. *Kaya simple na lang* (That is why, let us keep it simple).

Lack of Capital and Equipment. Do they have capital? No. In the economics of the poor, a modified Darwinism prevails. They borrow from one another, then try to survive. Some opt to sell themselves (or spouse or sons and daughters) in the OFW market to raise capital. How modern is their arsenal of tools? Outdated, though still workable.[10] We need to educate workers in the basics of microfinance, especially the disciplines required in entrepreneurship.

Lack of Access to Technical Information. How do they learn how to build? Mostly by apprenticeship. Some have taken vocational courses in maintenance only – not design, nor assembly since Filipinos are not supposed to do these on their own. Is their knowledge scientific? No, their knowledge is more acquired through practice than theory, and more often than not, deficient. They know the craft, but not the science behind what they do. How updated are they in the trade? Only as far as they need to repair new models. We need to assist in the delivery of up-to-date work information in ways that laborers can understand.

Lack of Supplementary Education. Is their preparation for the industry complete? No, the little knowledge that they have is even now becoming compartmentalized prematurely, in accordance with western labor paradigms of specialization. What they need is systematic cross-training, not mere familiarity with related trades. The systematization of cross-training (e.g., small business management) can speed up the growth of the native auto industry. In order to grow, they have to learn how to grow. They have to keep asking "What next?" We need to foster a culture of continuing education among the workers.

Personal Underdevelopment Issues. Are there any personality issues affecting work attitudes? In the order of means to ends, Filipinos have come to regard work as a means to rest, not vice versa. And to rest means games and amusements. It means eating and drinking—really heavy drinking! And then there is *aliwan* (amusement). This is the formula for a no-savings economy. We need to provide the moral infrastructure for a sustainable culture of work.[11] Many SMEs fail because of personal issues concerning work ethics. Among native autoworkers, alcoholism ranks high.

Another subtle personal issue is Filipino tendency to sentimental attachment. We should avoid becoming overly fixated on our products, pampering them to the point of hindering further development. Incidentally, Filipino parents now tend to treat their children in the same way. Is it because there are fewer children per family to bear the brunt of more stunting affection, or less time to enjoy their offspring?

And then there is our national auto-condescension, a mark of no con-fidence.[12] Finally, there is a marked decline of the *bayanihan* spirit, meaning, the loss of the sense of nationhood and the common good.

MY UTILITY VEHICLE PROTOTYPE

Thanks to my initial naiveté about these industrial handicaps, I embarked on building a vehicle of my own design. Aside from needing a car, I had to prove to myself that it can be done, even in a backyard garage. The main design criteria were as follows:

1. *Smoothness* of ride – because of perennial floods and rough road conditions, big wheels and long wheelbase;
2. *Durability* of the jeepney – a 10-20 year life expectancy for economic and ecological reasons;
3. *Comfort and amenities* of a car – to be at par, at least, with prevailing auto safety and interior standards (e.g., airconditioning, coolbox, power steering, power windows and electronic locks, music, spaciousness over coziness; a lounge, a rolling office, a second home);
4. *Usefulness* of a pick-up – for occasional light to medium hauling;
5. *Ruggedness* of an off-roader – for rural as well as urban use, with 4x4 option;
6. *Availability* of parts – incorporate components replaceable/repairable anywhere in the archipelago;
7. *Flexibility* – convertible from passenger, to wagon, to pickup; and
8. *Filipino style* – an evolution of the *jeepney* style to connect emotionally with native automotive tastes.

I would call it "DPROX."[13] I had scoured Metro Manila, Cavite, and Laguna, for willing fabricators, but the tinsmiths (*lateros*) all turned me down.

I ended up with a motor shop in Novaliches, and it was only then that I realized that the reason why all the previous tinsmiths declined was their inability to translate from drawings to 3D (tridimensional). They were excellent craftsmen, but they had no training in the interpretation and visualization of shop drawings! They are *direct* sculptors, not sketch artists. They had always built from what they had seen in 3D and copied directly to 3D! The solution was to build a scale model and then teach them the basics of scaled measurement. Whenever necessary, I executed full-sized drawings on a bare concrete floor![14]

The fabrication team members were amiable local migrant workers who are reasonably competent and task-oriented. Married and with children, they were notably alcoholic.

SOME IMPERATIVES

Consumerist to productionist culture. There is a need to transform Filipino economic outlook from a consumerist to a productionist economy, and from an importing to an exporting economy. Sociologists, social psychologists, and political economists would do well to examine how to re-engineer culture towards these beneficial directions. Let us promote the idea that it is better to sell one's produce than to sell oneself.

Streamlined invention-to-marketing process. It is imperative that we discipline, streamline, and facilitate the R&D/ Invention > Registration > Prototyping > Testing > Investment > Production > Marketing process. Hello, Department of Science and Technology (DOST) and Intellectual Property Office (IPO)? Hello, Department of Trade and Industry (DTI)? Perhaps laws should be promulgated that

would minimize footdragging, selfish interests, and graft and corruption along this process. There deeds are nothing more than economic sabotage. Together with prevention, correct incentives should be given to functionaries whenever a worthy invention reaches predetermined milestones. Let the process be free of obstructions.

To its credit, the DTI has established the "One-Town-One-Project" (OTOP) program.[15] Unfortunately, the OTOP does not assist the R&D/invention, registration, prototyping, and testing segments. The other piece of good news is that last January, Papua New Guinea had actually launched its new line of "PMV"–the Filipino jeepney.[16]

It is important to distinguish the R&D undertaken by government, vis-à-vis those by private entities. On one hand, it would be unjust not to make available to the general public any and all progress attained using government resources. That is to say, it should be clear to any private entity that when it avails of government resources, it relinquishes exclusive rights to the consequent products of R&D.

On the other hand, it should be clear to government that in a private enterprise economy, its role is *facilitator* in matters that the private sector is reasonably competent to engage in. It must not, apart from few established exceptions, compete with or co-opt private enterprises. It is in more complex research and development that government can and should take a lead.

Transport Design Courses and Guilds. It is important to establish "transport design" as a degree course in universities and "automotive assembly" as a diploma course in vocational schools all over the country.[17] Transport design is the missing link in our native auto industry. This is disgraceful since Filipinos excel in fine arts on one hand and in the automotive vocational skills on the other. Such schools (or special annual courses) should bring together the science of academics and the practical wisdom of tradesmen. Needless to say, the Department of Education needs to raise the level of technical sophistication of arts and crafts subjects in elementary and secondary schools. Design guilds can then be established, so as to keep an up-to-date pool of automotive design professionals loyal to the native industry.

Confidence Building and Strategic Alliances. We should address the general demoralization of native automotive SMEs. These can be done both in a positive mode and defensive mode. One reason why Filipino SMEs are what economist Bernardo Villegas jokingly calls *"Bentots"* (i.e., retardate) is due to lack of updated education in science and technology pertinent to their respective fields. This includes basic business education. To resolve this, the following must be addressed:

a. *Unite academics and assemblers.* Blessed be the day when the academics of the University of the Philippines, Mapua, De La Salle University, Don Bosco, FEATI (Far Eastern Air Transport Inc.) University, and the jeepney-AUV assemblers of Balancas, Bacoor, Imus, Dasmariñas, San Pablo City, Valenzuela, Talavera, Lucena, Mabolo, Davao City, among others, can reach out to each other in a fusion of theory and practice.

b. *Push vocational training from maintenance to assembly.* Vocational schools need to go beyond giving automotive maintenance courses and venture boldly into automotive design, assembly, and production courses! So with Mapua and technical schools like Don Bosco and others. Dualtech systems, it seems, mainly serve established multinationals by way of X-deals. More courage and determination is demanded before we can cross the threshold of consumerism, into productionism.

c. *Settle intellectual property (IP) issues.* The adoption of existing science and technology, organic design, reverse-engineering, the settling of intellectual property issues – these are all pending in the industry. Assuming there are willing native investors, where do we get the technology? We have the science, but are squeamish, nay fearful and intimidated, about technological intellectual property infringement. When does R&D become industrial espionage or piracy? Does reinventing the wheel involve an act of piracy or infringement? Why are we intimidated just because others have done certain things ahead of us? Why can we not get ahead of them in fields where we can?

We have all heard the catch phrase "Think global, act local." I say local action means letting Filipinos work with fellow Filipinos. If we do not "hire" one another in a fellowship of cooperation, we shall end up being hired by others in an economy of competition, where we are divided and conquered. This is how we have ended up selling our very *selves*, instead of our produce.

Kaya pa nating hanapan ng paraan! May pag-asa pa 'yan! (We can still find a way. That still has hope!)

NOTES

1 Visit www.manosa.com. See also "Designing Filipino: The Architecture of Francisco 'Bobby' Mañosa, "available at Powerbooks and National Bookstore.

2 Leonardo Sarao was an enterprising *cochero* (*calesa* driver) who found work in an automotive bodybuilding and repair shop. The first Sarao Motors jeepney rolled out in 1953. Anastacio Francisco was a calesa painter who was later employed by Sarao, and who struck out on his own to found Francisco Motors. The earliest passenger jeepney is said to have been conceived, built, and driven in 1945 by Clodualdo Delfino, a musician-entertainer who needed to make a living immediately after liberation.

3 In October 2000, when Leonardo Sarao broke the news to his staff of almost 300 that Sarao Motors—once the biggest jeepney-makers in the Philippines—was ceasing production, most broke down in tears. It was probably the hardest speech the 78-year-old Sarao has ever had to make. But he had no other viable choice as the 47-year-old transportation company had been bleeding since 1995, mainly, he says, due to changed government regulations. "Our sales of jeepney units plunged because the Land Transportation Office (LTO) cancelled the issuance of

franchises to jeepney lines, but let other public transportation vehicles such as taxicabs continue to get theirs," says the hoarse-voiced founder of Sarao Motors. (www.cargonewsasia.com/timesnet/data/ab/docs/ab2714.html).

4 History: The Bantam Car Company won the opening round of the contest to satisfy the US army's 1940 specification for a light four-wheel drive but Willys-Overland won the battle and, some would say, the war. To ensure supply in wartime, the Army decided on a second supplier – Ford. Between 1941 and 1945 Willys and Ford built about 700,000 jeeps. In Great Britain, after World War II, Rover desperately needed to resume car production. Steel was in short supply and exports got first preference for all raw materials. Maurice Wilks had been using ex-army Jeeps on his farm and realizing that there was no real alternative to them decided that Rover would provide one. The first prototype Land Rovers (1947) were actually built on Jeep chassis. The bodywork was made of an aluminium alloy called "Birmabright."

5 In the language of Filipino auto workers, the front of a vehicle is called *"ulo (ng sasakyan)"* or head (of a vehicle).

6 The term 4x4 means that out of the four wheels, all four can be powered by the engine, as opposed to 2x4, where only two are powered while the remaining two are idle.

7 I graduated from Philippine Science High School, and it was not bad there. What saddened me though was that architecture was not included among the courses we were allowed to take in College, so I had to give up a National Science Development Board (NSDB) scholarship when I shifted from electrical engineering to architecture. But it is not true that architecture is not a science just because it involves a great deal of art; it is science and humanities.

8 We are flooded with surplus parts because registration of vehicles in industrialized countries like Japan is restricted to no more than five years. Enterprising *Pinoys* have, since the 1980s, been cannibalizing "expired" Japanese cars for recycling in the Philippines. In the surplus car parts stores dotting the country, the vocabulary is akin to wet markets.

9 The motorshop owner who agreed to fabricate my vehicle used to cannibalize Japanese cars in Yokohama junkyards that looked more like parking lots. All he wanted in life was a new TIG welder. He was a good mechanic and had a workable team, but he did not know how to operate a business.

10 One of my objectives in building a car from scratch was to prove to myself and others that the Filipino can build a decent car in a backyard garage. If it is any consolation, Henry Ford did exactly that in a barn, even without any academic degree in engineering.

11 This is opposed to the Biblical model of work vis-à-vis rest. In Genesis, we gather that the use of human faculties for the care of the environment and for human sustenance is called work; and rest is for the sake of work, not vice-versa.

12 Sen. Alfredo Lim made sense when he suggested that the government sell all its luxury vehicles to raise badly needed funds. The suggestion of the former top policeman, NBI chief, and Manila mayor that government officials should consider going to work on owner-type jeeps should not be taken as a joke. A reliable owner-type jeep sells for as low as P80,000 while the sport utility vehicles (SUVs) that our government officials and their bodyguards love to use cost upwards of P2 million apiece. Lim also shot holes at the argument that officials on owner-type jeeps would be very vulnerable to assassination attempts when he said that it is much easier to jump off or return fire from a jeep than from an SUV or a car. What Lim wants to impress on government is that there is no monopoly of ideas on how the government could save money. Yes, the government needs to save and scrape the bottom of the barrel first before thinking of slapping us ordinary people and barely-struggling corporations with more taxes.

[http://www.manilatimes.net/national/2004/sept/06/yehey/opinion/20040906opi8.html]

13 Now a registered trademark, it is an acronym for *Disenyo Pilipino Rurban Overland Excursion Vehicle*.

14 For further information on the prototype, email: disenyo.pilipino@gmail.com.

15 In 1997, the DTI launched the DRIVE Program – Developing Rural Industries and Village Enterprises. Secretary Pardo (http://www2.mbc.com.ph/cgi-bin/mbc/loadspeech.cgi?speechId=1&speakerId=74) says:

"As our centerpiece pro-poor, pro-countryside pro-SME program, DRIVE is DTI's response to the challenge of grassroots empo-werment – by providing greater opportunities for investments, business and livelihood, jobs and self-employment. This is actually a "one-barangay-one product" program which encourages companies to focus development on specific products and maximize resource utilization.

We launched the Unlad-Buhay skills-building program – actually, also under the DRIVE umbrella. Unlad encourages home-based industries like food processing, weaving, candle-making, garments, toy-making, and décor-making.

We established a Philippine Branding System for our local products to induce a marketing cycle of awareness, trial and repeat. This system will employ advanced technology to set a standard for excellence. It will help our products become more competitive in the world market.

DTI remains committed to an integrated approach to development that is focused at developing and improving industrial estates and parks and special economic zones.

Our plan is to further litter the countryside with economic zones (industrial and agro-industrial estates). We will increase their number from the present 56 to 109, or 53 more lynchpins for countryside growth.

From all these action-driven initiatives, note that government in general, and we at DTI in particular, mean business. We dare shake up the status quo, we are rating risks – treading in areas where others before did not dare to tread."

16 One wonders why such a celebrated event has been shrouded in confidentiality. Some suspect it is because bilateral and multilateral X-deals have been sealed under the table. Others say making too much noise could alert the big automakers, which may want to nip such exports at the bud. See also http://www.newsflash.org/2004/02/pe/pe002871.htm and http://www.postcourier.com.pg/20060202/headlines.cgi.

17 Some key institutions worth checking out are: Art Center College of Design, Pasadena, CA, USA (http://www.artcenter.edu/carclassic/about.faces; http://www.artcenter.edu/accd/programs/undergraduate/transportation.jsp), Institute of Applied Arts and Design, Torino, Italia (http://www.iaad.it/eng/dipartimenti_tra.html), and Coventry School of Art and Design, UK (http://www.corporate.coventry.ac.uk/cms/jsppolopoly.jsp?d=1921&a=12703). In the Asia Pacific, there are Monash University (http://www.artdes.monash.edu.au), Tokyo Communication Arts Car Design School (http://www.tca.ac.jp/%7ecardesign/eng), and Hong-Ik University (http://www.hongik.ac.kr/col4.htm#3).

STUDYING SCIENCE AND TECHNOLOGY IN THE PHILIPPINES AS CULTURE AND PRACTICE

The sociology of science and technology is an interdisciplinary field. At the first instance, it calls for the bridging of C.P. Snow's (1959) "two worlds" of the natural sciences and the humanities (and the social sciences). The professional and intellectual concerns may be separate, but both inhabitants of the "two worlds" share an "everyday life-world," where the main concern is to adapt this world to human needs. Moreover, another type of interdisciplinarity is required in understanding how science and technology adapt to or alter existing life-worlds. This type involves linking disciplines within the social sciences and fields in sociology.

Gelia Castillo addresses the interdisciplinarity question within the work being done in the social studies of agricultural systems. Her article, written in 1990 for a training of trainors workshop on research tools for farm and household analysis, examines the science and technology being used in agriculture and food production. It is an excellent illustration of how sociology of science and technology can be pursued from the point of rural sociology, where we typically associate Castillo's body of works, and how sociology of science and technology becomes an exploration with irrigation engineers and technicians, postharvest technologists, agricultural scientists, economists, feminist researchers, among others. Castillo introduces eight typologies of interdisciplinary work in agricultural research and makes the point that "more than one component, one factor, one dimension, one aspect, and therefore more than one discipline is often called upon to carry out research programs or projects…" However, as many of us must have already come to know, interdisciplinarity may exist as a discourse but is difficult to practice. Castillo highlights the importance of leadership, the culture of the research team, and the funding support for interdisciplinary research.

In the next article, **Raul Pertierra** examines the relationship between another two seemingly "separate worlds" – everyday culture and science – as manifested in the world-views of the Filipino youth. Pertierra points out that while the youth lack encounters with the practice of science and are largely unaware of the achievements of Filipino scientists and government scientific institutes, they are much more optimistic than the older generation about the future of science. They enjoy their studies of science, are users of new technologies (i.e., internet and mobile phones), and are exposed to a globalized world, where science and technology are visible in everyday life. For Pertierra, it will be reasonable to expect the youth to be key in the development of a culture of science even though the country's historical, social, political, and cultural environment where a scientific culture is expected to thrive is complicated at best.

In addition to its conceptual contributions, the article also demonstrates how one can proceed with a contextual analysis of quantitative data. In studying students from well-equipped universities and schools in the Philippines, Pertierra does not make claims of the representativeness of the sample, preferring to claim the exemplarity of the samples instead. His sample is arrived at on the basis of concepts that correspond to activities, actors, and meanings in a particular setting. In a country where education and sciences resources are unevenly distributed in space, well-equipped universities and schools are more likely to develop in its students a culture of science and technology.

While the survey can ascertain prevailing world-views in a given population, scientific practice, culture, and ethos of the laboratory or a small community of researchers lend themselves better to direct observations (Latour 1987). Providing an example of how culture and practice are best observed *in situ*, **Alinaya Fabros**, worked as a call center agent in order to study global outsourcing in the Philippines, and the work conditions and experiences of Filipino call center agents. Fabros locates the various forms of reflexivity that call center agents exercise in their work within a "global economy of signs and selves." This formulation of the phenomenon allows her to study both micro- and macro-social orders. On one level, she employs social constructivism in examining how call center agents shape their everyday realities at work and outside of it. On another, she explains the macro conditions under which particular forms of reflexivity and ideas are formulated, communicated, and tolerated or controlled. These conditions are based on the global stratification system, where sets of positions are linked together in patterned ways of influence and control of work and production to achieve increased levels of productivity, competitiveness, and profitability.

Fabros' decision to study call center agents in action closely follows not only Latour (1987), but also Goffman (1959) and the study of actors' performances in the scene called life. Both Latour and Goffman encourages the examination, not only of finished products and front stage-performances (e.g., technical support services delivered by agents whose job description requires both technical competence and people-skills), but also the product in-the-making and front and off-stage performances (e.g., training of call center agents, situations before or after call center agent attends to a client).

With a similar goal of understanding science-in-action, **Marcia Czarina Corazon Medina** examines the process of knowledge production in the natural sciences as this is being shaped by the introduction of online journal databases in university libraries. She looks at how graduating seniors in physics, biology, and chemistry, and their thesis advisers, make use of such resources in creating scientific capital within the

epistemic community they are in (e.g., thesis panel, working group). Following Bourdieu and Passeron's (1975) formulation, Medina points out that thesis citations of leading-edge researches and ideas which are readily available in library online databases accord symbolic capital to students citing them. Through effective use of these resources in one's thesis (e.g., to improve a research design, to find a problematique, to develop a review of literature that is up-to-date), students gain scientific competence and social authority within their epistemic community. Yet, as Medina points out, this form of knowledge production is shaped by the decision-making processes in the epistemic community (e.g., which journals are to be cited) and by the perennial challenge faced by universities: the cost of providing these resources to students.

These four articles combine to provide an idea of the promise of and need for a sociological study of science and technology in the Philippines. What are possible empirical areas of inquiry? Based on an inventory of experts in the core technology areas of biotechnology, advanced materials science, microelectronics, information technology, photonics, and instrumentation/robotics, the Technology Forecasting Committee created by the Department of Science and Technology more than a decade ago identified science and technology-intensive areas that have potentials in the country. These are technologies related to high-temperature superconductivity, advanced materials technology, thin-film deposition technology, advance satellite technology, microelectronics, and information technology which have consequences on agriculture, manufacturing, communication, transportation, and energy generation (Yanga 1999). Linking science and technology to our development needs, improving the public image and acceptance of science and technology, and developing structures for scientific work and technological innovation are perennial goals. Our society has just only begun to be aware of the consequences of information and communications technology on the political, economic, social, and cultural aspects of Filipino life. In the meantime, European and American sociologists of science and technology have started looking into the social and ethical implications of biotechnology and nanotechnology. The sooner we enrich our understanding of existing issues of science and technology, the better prepared we will be in engaging the futures of science and technology.

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Editor

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INTERDISCIPLINARY WORK: PATTERNS AND PRACTICALITIES

Gelia Castillo

This paper presents patterns and practicalities associated with an interdisciplinary mode of doing agricultural research. Interdisciplinary work requires that more than one component, one factor, one dimension, one aspect, and therefore more than one discipline is involved in carrying out research programs or projects. Approaches to interdisciplinary agricultural research can be categorized into eight typologies: conceptual; multicomponent; systems-oriented; consultative; hypothesis-testing; interactive, focused, problem-solving; action-research-in-action, and "hybridized". While there are clear gains from its pursuit, interdisciplinary work poses clear challenges: it entails relatively higher costs in terms of time, research staff, and skills requirements. It particularly relies on research leadership, support from funding agencies, and the ability of members of the research team to avoid professional enthnocentrism in their work.

This is not an essay expounding on the beauty and rightness of interdisciplinary research. Because the rhetoric on the subject is robust; the demands are great; and practical tips on how to do it in real-life situations are rare, concepts on what constitutes interdisciplinary research are as varied as the researchers engaged in it. Interdisciplinary research projects differ in nature, intensity, scale, complexity, level, and aspired for outcomes. This paper is an attempt to portray patterns of interdisciplinary work and practicalities associated with this mode of doing agricultural research.

PATTERNS OF INTERDISCIPLINARY WORK

Interdisciplinary (based on Webster's definition) means involving or joining two or more disciplines or branches of learning. But the prefix inter conveys a nuance not evident in the above definition. Inter means between or among, with or on each other (or one another), together, mutual, reciprocal. Multidisciplinary, on the other hand, means combining the disciplines of many different branches of learning or of research. This nuance is provided by the prefix *inter* and *multi* simply means many. Such subtleties when applied to the conduct of research may not be very subtle, operationally speaking.

Interdisciplinary work (accent on work) is probably both a product and a stimulus or even a simultaneous companion of concepts like: integration, holism, coherence, comprehensive, synergism, multisectoral, sustainable, environment, farming system, ecosystem,

land-use patterns, participatory, quality of life, poverty, women-in-development, user's perspective, etc. The substance behind each of these is more than one component, one factor, one dimension, one aspect, and therefore more than one discipline is often called upon to carry out research programs or projects which emerge from any of these concepts.

Publications with titles like: "Trees, Food, and People: Land Management in the Tropics" (Bene, Beall, and Cote 1977); "The Technology Triangle: Linking Farmers, Technology Transfer Agents and Agricultural Researchers" (Merill-Sands and Kaimowitz 1989); "Management of the Potato Tuber Moth by Tunisian Farmers" (von Arx et al. 1988); "Integration of New Rice Technology in a Mindanao Village" (Mallonga 1988); "Seed Potato Systems in the Philippines" (Crissman 1989); "Consequences of Deforestation for Women's Time Allocation, Agricultural Production and Nutrition in Hill Areas of Nepal" (Kumar and Hotchkiss 1988); among many, imply some kind of interdisciplinarity in the underlying research. Without claiming an exhaustive survey of relevant materials, a typology of interdisciplinary agricultural research projects is attempted here in order to provide us a variety of scenarios involving social scientists. The categories in this typology are not mutually exclusive. They are meant to illustrate the predominant operational mode manifested in each type.

Conceptual Interdisciplinarity

The approach involves two or more disciplines examining the dimensions of a complex problem through dialogues at a much more abstract level.

Example:

The United Nations University which had a five-year effort on an inter-disciplinary dialogue on world hunger bringing together social scientists (Human and Social Development Programme) and nutritional scientists (World Hunger Programme) reports the following:

1. "Real interdisciplinarity is difficult to achieve" – all the more so when the effort involves scholars from many cultures and schools of thought.
2. In general terms, the social scientists argued, on the one hand, that "hunger and malnutrition are merely the most obvious symptoms of a much more complex set of societal issues which must be resolved before world hunger can be eliminated." On the other hand, the nutritional scientists expressed a concern for what could or should be done in the meantime, while such fundamental societal changes were coming about, for the millions of people who are hungry now.
3. The general thrust of the social scientists is to emphasize the holistic approach - a process by which a large number of variables are considered simultaneously... Whereas the World Hunger Programme is oriented toward the identification and melioration of specific needs (e.g., nutritional deficiencies, postharvest food losses), the Human and Social Development Programme proposes that few, if any, effective long-term developmental consequences can be obtained for viewing and acting upon such needs apart from the broader context of social, cultural, economic and political issues with which they are inextricably bound.

4. The critical question left unanswered is: "How does one enter into the reality?" Holism is a concept with an infinite capacity of extension and meanings but it needs to be operationalized. Real problems are "the expression of actual processes in given conditions and have to be tackled with action rather than words..." This "reality check" is a constant requirement which assesses the translation of theory into practice.

Multicomponent interdisciplinarity

This type of interdisciplinarity refers to research programs characterized by multiple components and several disciplines within a program which have little or no interaction between and among them except the recognition that these components are logically related to each other.

To illustrate, a research program can cover several aspects of the sweet potato from production, distribution, utilization, and impact involving relevant disciplines including socio-economics but each component has a separate identity with minimal input from each other and no common goal which every component must contribute to. For example, is the goal to transform sweet potato subsistence production into commercial production? As one plant breeder argues: "We should not glorify traditional and subsistence production." Do relevant users want sweet potato to continue performing different functions such as subsistence, soil erosion control, cash income, security, etc? Can socio-economics and anthropology contribute to plant breeding objectives? For example, what role does indigenous knowledge play in the agricultural scientists' research agenda?

In the past, so-called multi-disciplinary research programs meant several independent and separate projects in one program. The only times they come together are in the project proposal and in the pages of the project report. This state of affairs is changing, albeit slowly.

Systems-oriented interdisciplinarity

This approach attempts to arrive at an analytical description and diagnosis of the system showing the inter-connectedness between different parts of the system. It helps locate diagnosed problems in their relevant physical, biological, and social context. Participation in and/or exposure to the analysis and its outputs enable researchers in narrowly-defined specializations to acquire a farming system or agro-ecosystem perspective, including sensitivity to gender issues.

Gordon Conway (1985), a prominent advocate of agroecosystem analysis, argues that "farmers out of necessity adopt a multidisciplinary, holistic approach to their work and it would be logical that this should also apply to the design and implementation of agricultural research and development programmes." He reasons further that "many, if not all of the problems are essentially systemic in nature. They are linked to each other and to the performance of the system as a whole." The agroecosystem analysis begins by

> "defining the objectives of the analysis and the relevant systems, their boundaries and hierarchic arrangement. This is followed by pattern analysis, the system being analyzed by all the participating disciplines in terms of space, time flows and decisions. Those patterns are

> important in determining the important system properties of agroecosystems, namely: productivity, stability, sustainability, and equitablity. The outcome of the analyses is a set of agreed key questions for future research or alternately a set of tentative guidelines for development."

Another systems-oriented type of interdisciplinarity is farming systems research (FSR). Schubert et al., for example, focuses on the household rather than the farmer in his definition:

> "A farming system is a set of interrelated farm enterprises and household activities managed by members of a farm household in order to achieve their goals within the restrictions of their resource endowment and within the limits of the physical, ecological, and socio-economic environment of the farm."

There are three main subsystems: the farm system, the household system, and off-farm enterprises and activities. These systems are very closely connected so that a change in one subsystem has consequences for the whole farming system. Associated with these subsystems are particular cropping calendars, cultivation practices, labor requirements, food availability, and cash-flow pictures. The analytical description of the system shows the production-consumption linkages, understanding of which is essential, if the objective is to change the production system (Schubert et al. 1986). Using the farming systems approach, gender issues have been considered by Thelma Paris (1988) at the various stages of the technology development process specifically in the design, dissemination, and extension phases. The basic elements for achieving this are:

- analysis of women's productive activities within the farming systems including their roles in the household and agricultural production;
- identification of existing, emerging, and future technology options conducive to the expansion of women's productive capacity;
- greater understanding of the factors constraining or supportive of women's more productive participation in farming system such as access to information, organization, and productive resources, access to, and control of one's resources; and
- application of this understanding throughout the farming systems research process; and pilot testing of promising technologies.

A research team is almost always a feature of the systems-approach. As a matter of fact, Conway (1985), assumes the existence of a team in his agro-ecological analysis:

> "The goal of multidisciplinary analysis is to achieve an interaction between the disciplines that produces insights which significantly transcend those of the individual disciplines. Arranging the working environment so as to promote ease of communication among the disciplines is important. Experience suggests that the generation of good interdisciplinary insights also requires organizing concepts and frameworks and a relatively formal working procedure which encourages cross-disciplinary exchange."

Consultative interdisciplinarity

Some research projects are predominantly social science (e.g., economic anthropology, sociology) but consult with agricultural experts for specific aspects of the research problem.

For example, Gascon's (1989) study of women's technical knowledge and participation in rice farming used rice scientists in developing the technical knowledge test which consists of a series of questions on basic management practices judged to be critical in achieving maximum input efficiency. It included the following categories of technological practices in rice farming: varieties and seed management, fertilizer use, insect and weed control, and other pre- and post-harvest management practices.

Among the findings of this study are: the main factor that influenced the participation of women in farm tasks was their expectation for higher income; estimates of women's technical knowledge showed that through husbands' technical knowledge, women improved their skills and technical know-how in farming; a reduction in women's home production time gave them more chances to develop interest in new rice technology; and participation in economic activities proved to be a determinant of wife's technical knowledge. The study also found out that participation knowledge in the rice production system proved to be a significant determinant of wife's technical knowledge. However, its impact is not sufficient to guarantee the improvement of wife's knowledge in rice technology without the proper program designed to assist them in acquiring technical skills in rice farming.

What is worth noting is that an average of 65 and 52 percent of the questions were answered correctly by husband and wife, respectively. In general, this performance is not encouraging when one considers the great exposure the community has had to rice production information but women performed well considering that they are never deliberate targets of agricultural information. Because of the rice scientists' contribution to the content of the technical knowledge test, the social science study acquired greater significance not only for women-in-development but also for technology for development and extension.

Hypothesis-testing interdisciplinarity

When well-defined research problems of an interdisciplinary character emerge from a system-like perspective when the variables are clearly identified, when the expected relationship between them are articulated, and when the indicators are operationalized, a hypothesis testing stage has been reached with more than one discipline participating. Although each discipline is assigned a very specific task in its area of expertise, all their contributions are essential to the substance of the hypothesis to be tested.

One example of this type of interdisciplinarity is Abansi et al.'s (1990) study using the hedonic pricing model to evaluate consumer preference for rice quality. Consumers were categorized by rural-urban and by income class. Physical and chemical considered important determinants of rice price were whiteness, transluscency, grain length, foreign matter content, head rice recovery, apparent amylose content, and alkali spreading value. Both urban and rural consumers were price responsive to changes in quality characteristics. Cooking and eating qualities like texture and softness of cooked rice were found to exert the

biggest influence on the price paid by both groups. However, higher income urban consumers attached higher implicit values to quality characteristics than rural consumers. Low-income groups prefer high amylose content rice which "guarantees" greater volume expansion; thus allowing them to feed more people with relatively less rice. High-income consumers expressed preferences for higher head rice recovery but lower amylose content. For this group, there was an inverse relationship between price and amylose due to the presence of high-priced traditional varieties with intermediate amylose content.

While this study was basically an economics research project, the physical and chemical characteristics of the rice samples were analyzed at the cereal chemistry laboratory of the International Rice Research Institute. Without this analysis of the preferred rice qualities, the results would have been socially interesting but would not be of much specific use to other agricultural scientists. Because of the physical and chemical results which are associated with socio-economic characteristics of consumers, the project investigators could draw implications: for rice research on breeding, cultivation, and postharvest systems to produce qualities which better satisfy consumer needs (Abansi et al. 1990).

Another example of hypothesis-testing interdisciplinarity is Pingali et al.'s (1990) study on pesticide use, safety practices, and health costs, which is led by an agricultural economist with collaboration from a medical doctor and some inputs from entomologists. The results indicate that farmers and agricultural workers face chronic health effects due to prolonged exposure to pesticides. Pesticide-related health costs and associated productivity losses are already significant and can be expected to increase with increasing pesticide use. Unsafe pesticide handling practices are as important a determinant of adverse health effects as the total quantity of pesticides handled. The returns to generating awareness among farmers and pesticide applicators and the importance of safe pesticide use can be quite significant, especially in reducing overall health costs for the farm household. Research results also indicate the role of integrated pest management strategies that minimize pesticide use in reducing health costs.

Interactive, focused, problem-solving interdisciplinarity

Agricultural research projects which ultimately aim to develop relevant and effective technology for users have begun to consider the involvement of social scientists in the technology generation process. Their role is not only to help assess potential acceptability of the technology or to evaluate its success or failure after it has been introduced but as a working partner in the technology development process. Unlike other types of interdisciplinarity, this one is not only interactive between agricultural and social scientists but also continuous and focused on solving a particular agricultural problem. It seeks not just to understand, identify and define the problem but to solve it.

An excellent example of this is the work of an interdisciplinary team (anthropologists and postharvest

technologists) in developing postharvest technology at the International Potato Center (CIP) [Rhoades 1984]. The project came about after potato stores in Peru which were technically sound and extremely well-designed according to storage specialists were hardly ever used.

The research team approached the problem of storage from the farmers' point of view. Farmers claimed that the difficulty was not with their storage technology but with new "varieties" that produced long sprouts when stored under traditional methods. The long sprouts had to be pulled off before planting and this was considered by farmers to be labor costly. As a result of this anthropology-technical science dialogue, the team concentrated on a new method of storing improved seed potatoes in the farm by applying a technique which CIP has been experimenting with for some time. Under experiment station conditions, naturally diffused technique aids in the control of sprout growth and lessens pest and diseases damage. The question was whether this design was relevant to farm conditions and acceptable to farmers was examined through continued ethnographic research and on-farm trials with farmers acting as advisers. After considerable modification based on farmers' advice, the team developed rustic seed store model. Upon seeing that diffused light storage reduces sprout elongation, farmers expressed interest but were then concerned about the cost of seed trays. In response, the team built simple collapsible shelves from local timber and used them in a second series of on-farm trials. The results were again positive but this time farmers were able to relate more closely to the rustic design of the stores.

The prototype rustic seed store was promoted in 25 countries by national programs but virtually every farmer developed his or her own unique design based on the diffused light principle. Anthropological follow-up in adoption areas demonstrated clearly that "technology" as a unique physical "package" was not being accepted. The diffused light principle was being translated into an amazing array of farmer experimental and adapted versions of potato stores with their own cultural flavor.

In this particular case, the anthropologist and the postharvest technologist applied their respective technical and sociocultural knowledge, skills and methods in an interactive manner to find a solution to some of the potato seed storage problem. In the process, they learned a great deal from each other and about the technology itself.

Another example of interactive, focused, problem-solving inter-disciplinarity is the potato tuber moth research program in Tunisia which involved the following:

1. Determining seasonal population patterns,
2. Assessing economic damage to stored potatoes,
3. Experimental research to identify promising control components, and
4. On-farm research to:
   - document levels of pest damage and control practices farmers' fields and stores, and
   - test the effect of new or improved production components on yields

and net returns in comparison with the farmers' current practices.

The research team composed of entomologists and economists did their research in the experiment station, in the laboratory, in farmers' fields, and in wholesale and retail markets in a joint effort to understand the problem and find solutions. The researchers conclude that:

> "the development of decision rules, based on entomological research results and the farmers' socio-economic constraints, can help the extension service to disseminate an improved integrated pest management program. This will require information on the pest, crop and market situation, based on routine observations by entomologists and economists" (von Arx et al. 1988).

Action-Research-in-Action Interdisciplinarity

The process of working out implementation strategies in agricultural development programs which have both technical and social components require research not only before and after the action is taking place. As a matter of fact, research guides the action. The action-research-in-action type of interdisciplinarity involves technical experts, farmers, social scientists, and policymakers.

An example of this is provided by the Philippine National Irrigation Administration's (NIA) experiment on participatory communal irrigation as reported by de los Reyes and Jopillo (1986):

> "The usual irrigation development strategy focuses on the construction of the physical irrigation system and becomes concerned with the development of the social organization of the system only upon completion of construction. NIA's approach in contrast, addresses the development of the irrigation organization before the start of construction. For this purpose, NIA fields full-time organizers to a project area months before the agency expects to begin construction of the irrigation system. These organizers, called irrigation community organizers or ICOs, work with farmers to develop and strengthen their association. They prepare farmers for working with engineers in planning the layout and design and construction plans of the irrigation system. Thus a key characteristic of NIA's approach is the participation of farmers in the development of their irrigation system from the design phase up to the actual construction. Once the construction assistance is completed, NIA turns over the improved irrigation system to the irrigators' association. This turnover bestows formal recognition on the association as the system owner which from then on becomes responsible for system operation and maintenance."

The research part of this approach includes community and social profiling, continuing process documentation of what is going on which feeds into the actions taken, and evaluation studies to assess the effects of the intervention on the irrigator's associations. The entire approach involves farmers, irrigation engineers, policymakers, community organizers, and social scientists.

The empirical findings of the evaluation study showed that compared to the non-participatory projects, those which were participatory achieved more of the intended results such as: larger irrigated areas, greater productivity,

stronger associations, improved water distribution, better compliance with government policy and improved relationship between farmers and the government (de los Reyes and Jopillo 1986).

"Hybridized" Interdisciplinarity

Through training, personal inclination and interest, exposure to, and experience in more than one type of subject matter and more than one discipline, some professionals acquire hybridized interdisciplinarity. This means that they are able to function with a systems – or at least a broader perspective than social science alone or agriculture alone.

Examples of this hybridization are agricultural anthropologists, ecological anthropologists, agricultural economists, agricultural sociologists, etc. One requirement of social scientists who will be engaged in agriculturally-related research is to understand enough about agriculture so that there will be a common basis for interaction.

Raintree's (1989) study on the socio-economic attributes of trees illustrates this kind of hybridization. His paper posits a set of relationships between the biophysical attributes of trees, on the one hand, and the socio-economic attributes of trees, on the other. Socio-economic attributes of particular trees refer to "those biophysical attributes which make them useful or useless, adoptable or non-adaptable, beneficial or harmful, relevant or irrelevant, etc., to different users in different socio-economic settings."

It is probably fair to say that Raintree would not have thought about this concept if he did not have the professional background as an ecological anthropologist and the exposure to and understanding about different functions of trees in different contexts and for different groups of people.

As a second example, after his experiences working with experiment station scientists at the International Potato Center, and farmers at the field level, Rhoades (1982) arrived at seven basic questions to be asked in connection with farm trials:

- In the problem to be solved important to farmers?
- Do farmers understand the trials?
- Do farmers have time, inputs, and labor required by the improved technology?
- Does the proposed technology make sense within the present farming system?
- Is the mood favorable for investing in certain crops in a region?
- Is the proposed change compatible with local preferences, beliefs, or community sanctions?
- Do farmers believe the technology will hold up over the long term?

A third example of hybridized interdisciplinarity is Michael J. Pott's (1983) paper which documents the:

> "historical development of the potato crop as an example of a typical vegetable crop in Southeast Asia and shows how this development has affected the cropping practices used today before many practices are superseded and totally forgotten as the older generation of settlers die out. It also serves to illustrate the importance of this information in formulating development projects and should serve

> as a basis for the development of other crops, both in the Philippines and elsewhere in Southeast Asia, where similar circumstances arise."

The paper includes the historical development of Benguet Province, agricultural patterns, farm units, labor-cultural practices, marketing, financing, economics, and consumption. Potts is an agricultural scientist who is sensitive to social issues and has worked in Benguet for several years.

PRACTICALITIES IN INTERDISCIPLINARY WORK

Despite its current "glamour," interdisciplinary work has its cost. It is not cheap in terms of research staff, time for meetings, dialogues, arguments, and skills required in pulling it off. This cost must be offset by the gains. In assessing the potential benefits and costs, the following issues might be worth looking at:

Leadership. Who writes the proposal and provides the guiding hand? Who writes the report and how are others credited especially when the process is so interactive that the output is above and beyond the sum total of the identifiable individual contributions from each discipline? As Rhoades points out:

> "Each discipline interprets the problem in its own way and perhaps overstates or misstates the position of the other discipline. Professional ethnocentrism in agricultural development is still more powerful than we like to admit."

The research team and its dynamics. What is the composition and size of the research team? Where would the members be recruited from? Some elements which could contribute to the realizability of an interdisciplinary undertaking include:

- Crossdisciplinary learning
- Common definition of the problem
- Mutual professional respect (Social scientists tend to be self-righteous in thinking that concern about the human factor and human welfare is their own special turf.)
- Catalytic rather than "explosive" chemistry of personalities or at least an ability to return to relative harmony after each major or minor "explosion." Some call this "creative tension." Identifiable outputs from the interdisciplinary exercise which are beyond what each discipline would have produced by itself.

Interdisciplinary sponsor. An interdisciplinary project will find support only if the sponsors are also interdisciplinary in orientation. Otherwise, a research project has to be broken down into different components to obtain funding from different divisions or sections of the same funding agency.

Possible outcomes from inter-disciplinary work. What have we gotten, so far, from interdisciplinary work in agricultural research:

- Consciousness-raising with respect to the role of other factors in order to provide specialized disciplines a broader, perspective, if not a holistic one;
- Descriptive-analytical diagnosis of existing systems;
- Identification and specification of problems within the agricultural system which lend themselves to more specialized disciplinary research;

- Hypothesis-testing in an inter-disciplinary fashion;
- Development of technologies which have a better fit to user's needs;
- Increased skill in applying the system-diagnostic procedures to variable scales such as:
  a) micro (household management unit),
  b) meso (local community or ecosystem, neighborhood, small watershed, village),
  c) macro (region, country, eco-zones), and
  d) judicious "borrowing" of research methods (e.g., qualitative, quantitative).

It has been said that while an economist can teach the anthropologist how to count, the latter can show the former what to count. At the start of any research project (whether biological science or social science), an introduction to anthropological field research methods is useful because they offer a systematic way of getting acquainted with field realities. But perhaps there is a great deal of wisdom in the admonition that: "the best type of interdisciplinary thinking is one that takes place within the same skull."

NOTES

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The Role of Everyday Culture for a Scientific Orientation in Philippine Society: Are the Youth Any Different?

Raul Pertierra

This paper discusses the attitudes of Filipino youth towards science and technology. While the sample is derived mainly from elite educational institutions, the paper is more concerned with exemplarity rather than representativity. Moreover, the paper contextualizes these orientations around the culture of everyday life. It seeks to relate ordinary, often unperceived notions of culture, to attitudes towards science and technology. Notions of competence and achievement, ideas about nature and the environment, expectations of trust, risk, and the future determine the possibilities of developing a culture of scientific research and technological development. Globalization and the new communications media are increasingly pervasive forces in Philippine society. The youth are most affected by these new trends and orientations. Their response to these challenges will affect the future of science and technology in the Philippines. This paper, thus, explores how the culture of everyday life is adopted as well as transformed by the youth in the process of incorporating contemporary practices and responses to modernity.

INTRODUCTION

The aim of this paper is to investigate the cultural construction of knowledge in Philippine society. In particular, it looks at the cultural valuation of scientific practice. I want to explore the relationship between the everyday cultural construction of knowledge and the practice of science. While this relationship is undoubtedly complex, involving the State, the economy and a myriad of institutions from the family to universities, my interest is to expose some overriding cultural assumptions linking local everyday life to the production and dissemination of scientific knowledge.

This paper, thus, explores the conditions for a culture of science in the Philippines. It looks at science as an ultimate cultural value and its practice as an example of the pursuit of cognitive excellence. My interest is to investigate cultural assumptions linking everyday life to the generation of scientific knowledge. This generation of new knowledge is based on the valorization of science. It accepts global standards and insists on contributing to the expansion of science as part of a universal civilizing process. It assumes a degree of reflexivity interested in duplicating and extending the scientific accomplishments of others. A culture of science is globally oriented.

DEFINITIONS AND USES OF CULTURE

The use of culture in recent times has undergone several significant transformations. In its most basic anthropological sense, culture is the framework for organizing the world and our position in it. It is a set of principles that locate and orient human beings within their existential realities. Because culture has to adjust to given realities, its principles are never totally consistent or uniformly applied. Lived-culture is therefore frequently ad hoc, inconsistent and accommodative. Some see culture as a post-hoc reflection of established practice rather than a set of well-defined and consistent rules.

By extension, a culture of science consists of principles and practices whose aims are to explore the natural world in order to bring it under human control. Notions of the natural world and demands to control it are themselves products of culture. Using a western model, science is seen as involving theoretical and empirical knowledge dealing with the world as brute facticity, and using this knowledge both as a value in-itself (an intrinsic cultural value) as well as a tool for the control of nature for human ends. Hence, science consists of understanding the natural world as an end value as well as applying this knowledge instrumentally as forms of technology.

Science in its employment as technology is a feature of all societies even if it is more developed in some than in others. But science as a form of comprehending nature as an ultimate value is a recent feature and was best expressed in western society in the 18th and 19th centuries. It is a product of the progressive secularization of European society and associated with the growth of capitalism as well as the spread of colonization. Hence, a culture of science is derived from a broader European secular tradition that views nature (and by extension society) as ultimately amenable to human understanding and control. How well a culture of science can flourish in other (non-western) societies is an empirical question. My interest is to explore the compatibility of a culture of science within the features of everyday Philippine life. Do the features of everyday life support or hinder a culture of science?

SCIENCE AND THE YOUTH

The students interviewed and surveyed for this paper come from leading schools and universities and, therefore, are not representative of the general population. Nevertheless their attitudes and expectations regarding science give us an insight into the future of technology in the country. Furthermore, since this paper explores the cultural assumptions of everyday life and their relevance for science, the youth may well reveal new cultural approaches to modernity. The rapid acceptance and creative use of the new media, such as cellphones and the internet, by young Filipinos give us an indication of major cultural transformations affecting everyday life. Whether these transformations will have a significant effect on local scientific and technological practices remains an open question.

SCIENCE AND GLOBAL CULTURE

Globalization is exerting increased pressures for the Philippines to improve

its technological expertise. While the rhetoric on the importance of technology is extensively circulated in the media and even among politicians, there is very little investment in the scientific infrastructure of the country. The government's frequent claims of making the Philippines the region's information technology (IT) center by 2004 is mainly rhetorical. Any objective assessment of the country's scientific expertise points in the opposite direction. The index of scientific publications is one of the lowest in the region. In the period 1981-1992 the Philippines contributed four percent of the refereed science publications in Asia. Singapore with a population under four million people contributed 10 percent (Lacanilao 1994). Since then Singapore has doubled its number of publications from 502 to 1270 while the Philippines increased from 209 to 224 (Lacanilao 1999). Even the less ambitious notion of providing lower and middle-range IT workers (Ramos Report 1997) such as call center operators is constrained by the low quality of English language competence of most students.

Nevertheless, the regular comparison of the Philippines with its more advanced neighbors may be expected to result in practical changes to educational practices affecting science. Most universities and colleges now regularly admit the importance of research and require their faculty to complete graduate degrees. Secondary schools offering international curricula for their Filipino students are growing and even public schools are entering into linkages with overseas foundations to provide access to advanced technologies. None of these trends are likely to result in significant change unless the underlying culture of knowledge construction changes correspondingly.

Most of our young informants enthusiastically use their mobiles and the internet in everyday practice. Some see the potential of these media to expand their knowledge base but others use it mainly for entertainment and distraction. These diverse uses are neither incompatible nor contrary to knowledge construction but they indicate that other changes in orientation have to be present for these media to achieve social transformations. So far we only have evidence for changes in private attitudes rather than in collective orientations but it is too early to assess the full implications of communicative technologies (Pertierra 2006).

THE INTEREST IN SCIENCE

There are many practical, historical, economic, and political reasons for the lack of interest in science. The relatively low salaries and social status of scientists as well as their lack of influence in public life, discourages the pursuit of scientific competence. Why is this competence given little social or cultural value? Is this because scientific knowledge depends on objective and impersonal criteria rather than on the personalized networks Filipinos normally use for success? Moreover, scientific competence is achieved rather than ascribed, this latter being the favored approach of most Filipinos.

The Filipino disinterest in science may be traced back to the Spanish colonial period. While some aspects of science were practiced by the Spaniards (e.g., meteorology, botany, agriculture,

medicine), Filipinos rarely had the opportunity to develop a serious competence in it. Certain aspects of scholarship (e.g., humanities, theology and ethnography) were comparatively developed in the Philippines under Spanish colonialism but science and technology were generally neglected. This reflected the poor state of science in the motherland. In addition, while Filipinos were eventually allowed to engage in advanced studies at the end of the Spanish period (1850-1896), access to an adequate training was limited to the Universidad de Santo Tomas in Manila. Only wealthy Filipino men or exceptionally talented ones had access to a higher education. Like their colonial masters, they generally preferred humanistic training above technical expertise.

Rizal criticized this lack of interest in natural science on the part of Spanish colonial officials, when he was a medical student at the Universidad de Santo Tomas in the 1880s. In contrast to this Spanish indifference, the Americans characterized their colonial regime as one founded explicitly on modern science (McFerson 2002). A serious program of compulsory vaccination and a greatly improved system of sanitation marked their governance (Anderson 2006). They conducted original research in the fields of tropical medicine, agriculture and anthropology. These three areas are more intimately linked than generally assumed. They all rely on instrumental approaches to nature and society. In addition, the new colonizers introduced more democratic practices, including the expansion of government structures. The civil service was greatly expanded, providing opportunities for an emerging class of educated people. The increased democratization of society required an equivalent expansion of structures of knowledge. Not only were future citizens expected to be better informed than colonial subjects but a modern workforce also had to be more technically competent. However, despite these apparently beneficial colonial orientations established by the Americans, Philippine science has not flourished. Is local culture partly to blame for this lack of interest?

One of the first acts passed by the Philippine legislature (1933) when it took over local funding was to severely reduce the allocation for scientific research (Caoili 1991). The Bureau of Science, established in 1905 established an international reputation for basic research and its directors went on to establish high reputations in leading American universities. Andrew Sellards, Richard Strong, and Victor Heiser made important discoveries in epidemiology and public health (Garcia 2003). After Filipino politicians depleted funding, the Bureau of Science became a victim of the policy of decolonization. Basic research was seen as irrelevant to the needs of an emerging independent colony. The young nation-state failed to see the link between political and cultural modernity. The particular requirements of a knowledge regime and its special affinities with an egalitarian democracy are still not fully appreciated a century after the founding of the Bureau of Science.

SAMPLES AND INFORMANTS

In this study, 80 university science majors and 80 secondary-level students

were interviewed to identify cultural assumptions, expectations, or values relevant to scientific research and practice. While our initial informants were based at the University of the Philippines and the Ateneo de Manila University, we also interviewed students in other institutions such as De La Salle University, University of the Philippines in Los Baños and Iloilo, and San Carlos University in Cebu, to ensure that their perspectives are not just institutionally bound but represent common cultural orientations. The secondary-level students mostly came from De La Salle Greenhills and Manila Science High School.

While our sample was limited, we believe it has an acceptable degree of representation. Unlike other studies of scientific practice that look at the culture and ethos of the laboratory or a small community of researchers (Latour 1986), we are more interested in identifying cultural attitudes pervasive among Filipinos, including scientists and students. In other words, we are interested in seeing how the culture of everyday life operates (largely unperceived) and affects attitudes towards the construction of knowledge of the natural world.

The final results of this project will assist not only in understanding the role of science in Philippine society but also in formulating practical structures for its expansion and development. This has implications for education at all levels, from primary schools to graduate programs. The poor performance in science and mathematics of Filipino students (Third International Science and Mathematics Study 1999 – Filipino children scored the lowest in Asia) compared to their global counterparts is a major concern. Apart from economic and pedagogic factors, there may also be underlying cultural factors that affect their performance.

SCIENCE AND YOUTH: ANY DIFFERENCES?

We surveyed science students in several schools and universities to ask their views on aspects of science. The following results represent areas of high consensus among respondents. The students came mainly from prestigious and well-equipped schools and universities; hence they are not representative of the general student population. Since my interests focus on cultural orientations, I was more interested in exemplarity rather than representativity.

SURVEY RESULTS

1. Students agree overwhelmingly that gender is irrelevant for an interest and competence in science (89%).
2. They agree that science courses are demanding (90%).
3. They also think that Filipinos are naturally good in science, as they are in music and the arts (88%).
4. They enjoy studying science (87%).
5. They agree that science has a good future in the Philippines (83%). But they also complain about the lack of government support for science, the lack of jobs, poor training and low salaries. These incongruities also surface in other ways. Hence, while students (85%) are satisfied with their science teaching, they are much less impressed about their science laboratories (55%).

6. Most students (65%) agree that television is the most effective media to present science, with the internet a close second. Radio and newspapers score very poorly in their assessments of the presentation of science. Evidently these respondents represent a visual and digital generation. But many also admitted that they develop their interest in science by reading.
7. As expected many (50%) respondents claimed that their family encouraged them to study science but the influence of teachers (13%) and personal decisions (19%) also played significant roles. While these results indicate the influence of the family in shaping decisions to study science, there are signs that young people are increasingly weighing their options beyond family influence. However, the significance of the family in providing cultural capital is very strong. Values of achievement are part of this cultural capital.

There are also some interesting differences between university and secondary students. University students (93%) are more emphatic than secondary students (87%) about equal gender competence. However, university students (84%) enjoy studying science less than secondary students (91%). Evidently some enthusiasm for science is lost in the transition from secondary to tertiary schooling. Moreover, although both groups equally agree (57%) that ethnicity is also irrelevant for science; their agreement is considerably less than it is for gender. Ethnicity and gender attitudes appear to reflect more general societal views. A significant number of students from both groups (18%) also accept that gender may be relevant to an area of science such as women/biology or geology/men. It seems that while gender equity is accepted, gender roles are still significant. As others have observed (Wajcman 1991), it is not the case that gender determines an interest in science but rather that science expresses itself in terms of gender. This may be the effect of gender segregation in some secondary schools. The case of ethnicity is more complicated and may be due to social segmentation rather than cultural orientation. This indicates that ethnicity in the Philippines is as much an instance of class as it is an expression of culture.

There are also other interesting differences. Secondary students (93%) are more certain than university students (79%) about maintaining scientific objectivity in relation to religious belief. Yet secondary students (57%) are less certain than university students (65%) that science can explain miracles. Both groups (81%) admit the importance of precautionary rituals (e.g., making the sign of the cross) in everyday life. It appears that a university science education creates a degree of cognitive dissonance about the relationship between science and religion. This is supported by the admission of their possible conflict – university students (52%), secondary students (46%). University students (74%) appear to have a greater secular awareness about the relationship between natural disasters and reputedly divine causes than secondary students (56%). This possible growth of a secular consciousness will have to be further explored for confirmation. Since science is a conscious choice at university level rather than a requirement at secondary school, this

divergence may reflect the rise of a professional orientation towards science. However, as our data from university faculty indicate, professionalism does not necessarily result in a developed secular consciousness. Many university professors readily admitted the integration of their religious and scientific views. Private religious beliefs and the public world of science are not seen as separate domains. This conflation of the private with the public sphere is a major feature of Philippine culture.

The question about the disenchantment of nature is explored further in this project. Suffice it to say that, as expected, students share many of the general cultural orientations about nature. In their view nature is animated and operates according to its own interests. Human beings have to show respect to these environmental spirits or risk illness. Students participate in protective rituals but are evenly divided about the explanatory powers of science regarding miracles. There is a tendency for males to be more positive and secular about these matters.

All students agree that science and technology can bring many benefits to the country. Among these benefits are improvements in health, in agriculture, industry, disaster prevention and environmental resources. However, students are generally unaware of any special programs in science and technology, can rarely name prominent scientists, much less organizations and seldom belong to clubs or groups promoting science. Since the students interviewed are science majors (except for secondary students), their lack of familiarity with the practical applications, uses or organizations of science and technology is surprising. A major government bureaucracy such as the Department of Science and Technology barely rates recognition by most students. There is an almost total absence of role models taken from science or technology.

Another unexpected result is the low preference in using science and technology to prevent natural disasters and environmental degradation, despite the fact that these topics are frequently in the media. Students generally share broad community views about an animated nature and see disasters as moral lapses deserving retribution rather than as a natural event amenable to technical control. In this sense, new age views of nature transmitted by popular culture merge easily with traditional Filipino beliefs. On the whole, there is vagueness about the practicalities of science and technology other than in the pursuit of personal careers. It is as though science and technology is seen mainly as a career possibility rather than a societal resource. For this reason, ICT and other high profile applications of science are the most frequently alluded to when asked about future prospects. This personalization of knowledge seen as a strategic gain rather than a cultural good is a reported feature of Philippine academic life (Lacanilao 1994).

Students, both at secondary and tertiary levels, are much more optimistic about the prospects of science in the Philippines than their teachers. This is presumably because these students have not yet entered the hard world of work and experienced the low priorities given to science in the government and private sector. But this optimism is possibly part

of a general awareness of the necessity to harness science for problems such as global warming.

THE CULTURE OF SCIENCE

The views expressed by our student informants often conform to major aspects of Filipino culture. How consistent are these aspects with a culture of science? While the above-mentioned historical, economic and political factors go a long way in explaining the parlous condition of science in the Philippines, they do not completely explain it. An important missing ingredient is culture. While culture is a product of practical, historical, economic and political conditions, it cannot be reduced to any or all of them. Culture also shapes notions of the practical, the historical, the economic and the political. These latter are also implicated in a view and conception of the world. Many Filipinos complain about the undeveloped social interest in the pursuit of excellence (Lee-Chua 2002). A culture of achievement is not strongly developed among Filipinos. Simply getting by rather than attaining extraordinary results seems to be the prevailing attitude. Amateurism rather than a developed specialization characterize most walks of life, from sports to science.

CULTURE OF SERVICE RATHER THAN EXCELLENCE

Many Filipinos eagerly study nursing and other service oriented courses because they see these skills as leading to employment overseas. Having succeeded abroad in their respective fields, many of these workers return to their original villages to invest their overseas savings (Pertierra 1992). They open small stores, invest in tricycles and passenger jeepneys, or loan their savings at high interest rates. Others spend their savings in political campaigns. In other words, they engage in familiar forms of rent-capitalism, where personal contacts and social skills are favored over technical or professional competence. Their experiences abroad are seldom developed to diversify local skills. Instead they revert to traditional forms of petty commodity production and exchange. Many studies have shown that while the personal lives of these migrant families may have improved, there is virtually no gain to the community as a whole (Griffiths 1978). In fact, overseas labor often widens the gap between those who can invest in this activity and those who are too poor to go abroad (Pertierra 1992).

NATURAL AND CULTIVATED SKILLS

The view that Filipinos are uninterested in science is prevalent (although many of our informants disagreed with this perception) and contrasts with the equally strong perception of the Filipino's musical and social skills. But the latter are seen as naturally imbedded in Filipinos rather than achieved through a long process of disciplined learning. Networking and negotiating skills are necessary for everyday Philippine life. Most Filipinos learn these skills as an ordinary aspect of cultural life. The variations on the notions of *pakikisama* and *pakikipagkapwa* (Enriquez 1990) indicate a nuanced orientation towards others. This orientation includes performance skills such as singing, dancing, oratory, and

other abilities to entertain, amuse, praise, or disparage.

The importance of the middle class for a culture of excellence is well established but their socio-critical function in the Philippines is severely constrained by their economic dependency. The structural weakness of the Philippine middle class prevents it from exercising a steering function in the nation's cultural life. Instead, this steering function is dominated by the elite's understanding of culture, a view which sees it as a form of display. By contrast, the middle class views culture as involving an understanding of the fundamental artifactuality of social life and hence of the limitless possibilities for constituting human society. A view of culture which sees it not only as negotiable but also as arising out of rationally defensible criteria involving cognitive and technical judgments, encourages its public discussion rather than simply its private accumulation or consumption. Culture is simultaneously an appreciation of the existing human condition as well as an expression of its counterfactual possibilities. It is this latter concern which members of the middle class are best able to explore. Until their members play a more significant role in its constitution, the Philippines will remain not only a bastion of an uninformed elitism but also trapped in populist misconceptions. It will not be able to generate a culture of excellence in the sciences, the arts or sport.

CULTURE AS EXEMPLAR AND MODEL FOR LIFE

A paradox of modernity is that while cultural relativism has become an acceptable perspective, the notion of culture as exemplary practice is also firmly established. This does not only concern areas in the arts and the humanities but also in the natural sciences. The notions of elegance and minimalism apply as much to mathematics and architecture as they do to painting and literature. In this sense, culture now becomes the pursuit of autonomous values expressed in science, law and aesthetics. It becomes synonymous with civilization and is contrasted with brute and untamed nature. The latter now comes under the instrumental control of culture. This not only involves enjoying the "fruits of nature" but also altering its genetic content to conform to our desires. Knowledge for knowledge's sake becomes an end in itself, irrespective of its social and moral consequences.

Filipinos rarely see nature simply as brute facticity, open to human manipulation. Instead, nature is often seen as animate with its own autonomous ends. Humans must take cognizance of this autonomy or risk the consequences (Zialcita 2002). Is this view of nature compatible with a scientific and technological orientation? I discuss the implications of these orientations later. At this stage, I simply point out the connections between conceptions of the natural order and an instrumental orientation towards it.

CULTURE OF BRICOLAGE

What are the main features of a national culture in the Philippines? Whose interest does this national culture serve? Does it pursue excellence and other exemplary values or is it content

with an immediate instrumentality? Does it see itself as equal among sovereign cultures and therefore obligated to contribute proportionately to the world's achievements in civilization and technology?

It seems that the country sees itself as derivative and limited to reproducing existing cultural forms. Is Philippine culture simply bricolage, content with producing the jeepney and endless variations of traditional handicrafts or is it capable of more original and significant achievements? Can a culture of bricolage inspire and inform local science and technology? The initial creativity of the jeepney has not been developed much further, except for minor variations. This phenomenon of internal elaboration rather than external growth is known as cultural involution (Geertz 1971). This refers to a growing elaboration of a given theme such as the complex patterns of Indonesian batik or European rococo, rather than the development of radically new themes typical of modern art. The two approaches may be combined but this requires a reflective awareness of both practices. Filipino technologists have not applied their engineering skills to develop the jeepney into a more appropriate vehicle. Instead, locals have simply adopted another vehicle, the FX-Revo to serve present transport needs.

CULTURE AND SOCIAL INTERESTS

Since culture is a product of contestation, its reproduction depends on the social interests that it represents. The notion of knowledge in the Philippines as a personal and local asset, to be guarded against interlopers rather than a public resource for the general good, is one such social interest. It explains the preponderance of patrons and factions even in academic and professional associations dedicated to a common body of scholarship. This politicization of knowledge invades areas of technical expertise and prevents their autonomous development.

Lacanilao (1994) has discussed how this politicization of knowledge as a scarce resource to be shared only among selected participants prevents the general development of expertise. Personal ties rather than professional competence determine the structure of opportunity for scientific development. Higher degrees are seen mainly as an exercise in accreditation instead of as a preparation for further research. Once completed, theses are generally not published and hence do not contribute to the public world of scientific knowledge but only to a personal career. Scientific competence is constrained by wider cultural interests preventing its full development.

A CULTURE OF MULTIPLE REALITIES

A common Filipino view of nature often involves a conflation or interpenetration of multiple realities. Red tide is not just the accumulation of microorganisms; it is also an imbalance of moral interests between human and non-human agents. Bankoff (2003) reports that many natural disasters in the Philippines have been associated with supernatural warnings about incoming catastrophes such as deluges, volcanic explosions, earthquakes, and typhoons. The notion of a material world governed by discoverable laws instead of by fate,

chance or the unpredictable dictates of supernatural powers is still uncommon even among educated Filipinos. This attitude towards an unpredictable and capricious nature is paralleled by the experience of the world of culture. In the latter, status, privilege, or power most often determines a social outcome rather than competence or entitlement.

CULTURE OF DISENCHANTMENT

The notion of the disenchantment of nature as a condition for the rise of modern science was one of Max Weber's (1978) main sociological interests. The progressive de-animation of nature and its replacement by abstract, universal laws was a major feature of the Enlightenment. The interpenetration of the sacred and the secular were slowly disentangled. This eventually resulted in separate domains. The public and secular world of science dealt with empirical phenomena governed by discoverable regularities and abstract theories. This knowledge had to be publicly validated and any restrictions on its pursuit were strongly resisted.

Alongside this public, secular world was the private sphere, consisting of deeply held beliefs about a reality whose existence was no longer commonly shared. Religion, until then a public reality, was consigned, after generations of fruitless and irresolvable conflict, to this private sphere. Universities, hitherto repositories of knowledge of the sacred, shifted their attention from theological argumentation to science and public administration. Unexpectedly, both spheres flourished, each enriching the other. Natural science was complemented by the flowering of a critical, aesthetic reflectivity in areas of life such as art, music, literature and religion. The rise of the social sciences was one expression of this new reflectivity which partly bridged the two separate domains (Pertierra 1997).

This process of secularization and disenchantment took place over several centuries, starting with Galileo's lunar observations, Newton's laws of gravitation, and Laplace's treatise on celestial mechanics. The last example prompted the famous exchange with Napoleon Bonaparte, himself an avid student of science, who asked Laplace what role God played in his explanatory schema. The latter replied that he had no need for such a hypothesis (Laplace.pdf 2003). Nature had been completely disenchanted.

THE PRAGMATICS OF CULTURE

The importance of technological innovation for a country such as the Philippines is obvious. Its rapid population growth, the corresponding loss of natural resources, urban agglomeration, pollution and the lack of viable employment can only be resolved through creative social, cultural and technical means. This paper suggests a reappraisal of these solutions by an improved understanding of the role of culture in assisting technical progress. If one can identify cultural complexes that either assist or impede technical and scientific orientations, one is in a better position to suggest appropriate remedies.

An editorial of the Philippine Daily Inquirer (20 October 1999) asked:

> "as a nation, then, are we forever consigned to backwardness and pre-modernism, bound to commit errors of

judgment and short-sightedness because we have failed to develop a scientific attitude that can explain the world and predict its vagaries?"

Only if the world is perceived in certain ways (e.g., unambiguous realities, regularity and predictability, falsifiability, disenchantment) is it likely to result in a scientific attitude. While culture is only one element that shapes this perception, its salience is undeniable. Many of the world's vagaries may be avoided by a better knowledge of its governing structures. Globalization and the new technologies, with their capacities and necessities for coordination, only exacerbate the imperative for a scientific orientation.

THE CULTURE OF RISK AND TRUST

The concepts of risk and trust are cultural constructs that depend on particular structures of validation (Giddens 1999; Luhmann 1979). Pre-modern societies generally limit these concepts to familiar situations while modernity extends them to unfamiliar and novel ones. While pre-modern societies can deal with new emergencies, their notion of culture is embedded in a particular mode of life that sets its own limits. Only when culture becomes aware of itself as a lens through which we see the world, does it become possible to conceive of alternate perspectives of the world. These different perspectives allow us to imagine and prepare for new contingencies.

The imagined future enters into the conception and response to the present. The future becomes present-constitutive. Expectations of the future rather than experiences of the past construct the present. This future determination of the present raises problems about assessing risks. Actuarial science is a practical response to calculating risks posed by future expectations. New risks entail corresponding structures of trust.

Associated with these concepts of risk and trust are new understandings of the future as predictable or controllable. Time no longer passes in cycles, where the past replaces the future into the present. Instead the future is seen as an open horizon full of new possibilities whose achievement may be comparatively calculated. As the future approaches, other futures emerge with their own horizons of possibility.

FILIPINO SELF-IMAGES

Aguilar (1997) has argued that Filipinos often see the country as a small, weak "feminine" entity easily preyed on by foreigners and therefore requiring protective measures. The Philippines is portrayed as emotionally immature, unable to seek its own destiny in a world of predators. In fact, the country is as big as the U.K. and with a population larger than Germany's. This perception contrasts strongly with Singapore's view of itself as a technological and economic powerhouse in the region. The Philippines will have to change its self image before embarking on a path of economic development. Aguilar argues that this self image is shared across the political spectrum, from left to right, indicating that it is part of a broader cultural orientation. The project of decolonization resulting in the withdrawal of funding for basic scientific research by the Philippine Legislative

Assembly in 1933 shows how entrenched is this perception. The politics of anti-colonialism is extended to include science as part of the project of domination.

Part of this perception of weakness and unimportance is the country's inability to fully participate in the achievements of modernity, of which science and technology are its leading indices. Only in the sphere of political participation and democracy is the Philippines' an exemplar of modernity for its neighbors. Even its accessible educational system and gender achievements have not translated into technical competence. Recently, the expansion of overseas labour has also produced an image of the country as a rich repository of English-speaking IT workers (NITC 1997). Some see the Philippines as a world-center for the production of computer software, particularly of anti-virus programs. While opportunities exist in IT, the major attraction in employing Filipinos is the relatively low wage structure rather than high technical expertise (Saloma-Akpedonu 2006). There is an expansion of IT services and associated industries such as call centers but their long-time viability is still uncertain. In the meantime, educators complain about the rapid deterioration of academic and technical standards. The magazine Asia Weekly compared the facilities and resources of universities in Asia in 1999-2001. This revealed the poor state of advanced education in the country.

TECHNOCULTURES

We seem to be on the cusp of a new age! Astonishing claims are being made by social theorists. According to Barlow (1995:36):

> With the development of the internet, and with the increasing pervasiveness of communications between networked computers, we are in the middle of the most transforming technological event since the capture of fire. I used to think that it was just the biggest thing since Gutenberg, but now I think you have to go back further.

The invention of movable print in Gutenberg in the fifteenth century was the impetus for modernity, with its reflective and abstract textuality (Pertierra 1997). The internet makes it possible to return to a more intimate orality on a global scale, with its chat groups and informal networks. The limits of community are confounded when the local, diasporal and global intersect. These new intersections produce distinct hybridities embodied in transformed corporealities.

Barlow makes an even bigger claim, equating the internet with the domestication of fire, the very beginning of human culture. Following him, one assumes that the electronic revolution will transform the human either into the post-human or at least into the cyborg. The routine incorporation of dacron, steel, and electronic devices (e.g., cochlear implant, pacemaker, silicon breasts, aluminum joints, artificial hearts, and synthetic lenses) into the human body transforms it from an organic unity into a techno-formation. The seamless merging of human and machine generate problems for an earlier understanding of culture as distinct from and opposed to nature. In the cyborg, the dialectic between culture and nature is fully established and transcended. Culture not

only informs but also constitutes nature, which in its turn disinforms culture. Brute facticity and human purposiveness merge into the human-machine. The classical distinction between science, as the disinterested pursuit of knowledge, and technology, as its instrumental application, disappears. The post-human subject combines the immediacy of a tool with the effectiveness of a machine. For these reasons, social theorists (e.g., Kirby 1997) are presaging the end of the corporeal and the birth of the post-corporeal or the replacement of the human by the post-human. Others make equally astonishing claims: "We're going to be Gods, we might as well get good at it" or "In another thousand years, we'll be machines or gods" (Gray 2002).

These claims may be premature for the Philippines, with its low rate of internet penetration (8%) even if this usage is much higher for cellphones (50%). Nevertheless, new forms of technoscience have enormous potentials for social and cultural change. Organically modified crops now include human, baboon and tomato genes in weird combinations. Cyber space and virtual reality are new ontologies, often subverting the former continuum of space-time. The global merges with the local into the glocal, disrupting identities based on territoriality such as the nation-state. Homogenous and territorialized cultures are rapidly hybridized, while diasporas are localized. While these claims are exaggerated for a poor society such as the Philippines, their implications are already being felt. The introduction of the internet and the astonishing response to mobile phones gives us an idea of their possible consequences. Naturally, the youth are in the forefront of these changes and technologies.

YOUTH AND THE NEW MEDIA

We interviewed a group of students from an elite university on their use of the internet. These students, all of whom enjoyed easy access to online resources, explained their experiences as follows:

> We think that the internet constrains the cultural skills of people. Too much use of the internet, specifically online chatting causes a person's social and communication skills to deteriorate…Cyberspace is slowly replacing the real world. Cyber-culture weakens interpersonal relations, particularly within the family. Since they mostly meet strangers in cyberspace, people experience emptiness, depression and emotional frustration. High quality relationships are not developed in virtual reality because there is no sincerity.

Through the internet, people get to meet others they would never encounter in real life. They may not interact physically but it is still better than not having the experience. Because of the internet, people can see the world in different perspectives. They are able to know different things such as having complete access to the news. It does not make us less social when we surf the net. In fact, we can gain new friends through email or chatting (Pertierra 2006: 465).

Their comments are ambivalent and indicate unease in replacing the "real" world with its virtual equivalent. The latter does not guarantee the privileges and advantages that the former provides. In contrast, provincial students with more limited resources were less ambivalent than their city counterparts. The latter saw

online resources as more instrumental and as supplementing their poorer material conditions. The internet opened up areas of experience and information not normally available locally.

> I often search the internet for definitions and medical terms of diseases for my nursing course. This is easier and more convenient to use than spending a whole day in the library where the information is often lacking.
>
> Jam, a friend and an avid user of friendster, now has two new textmates whom she met in the net. She spends her free time in the internet café.
>
> I often encounter female college students trying to meet foreigners using the web cam.

These latter examples are less ambivalent and see the internet as having instrumental use as well as enabling authentic relationships. However, some poor families have expressed concern about the growing expenditures (Pertierra 2006) for mobiles. Naturally both sets of informants share many common experiences of the new media such as an interest in pornographic and religious sites, games and keeping in touch with family and friends overseas. But another aspect of class or status is indicated by the reluctance of elite students to accept text messages from unknown senders. Elite students express a dislike for these messages and assume that they originate from lower class people. Provincial users generally accept these messages and use them to extend their networks, often establishing new relationships. The internet elicits fewer prejudices because national class markers are more difficult to identify. While the new media benefit members of all classes, they are more likely to have a transformative effect (but not necessarily economic improvement) on the poorer rather than the richer classes. For the former, the new media open a world hitherto closed while for the latter it provides them with more choices. For both, the new media encourages individual pursuits.

CONCLUSION

The answer to the question—are the youth any different?—is both complex and varied. In some respects the youth are different. They are much more optimistic than their teachers about the future of science. But this may be simply because of their lack of experience. The youth rarely participate in science clubs or organizations, are largely unaware of government scientific institutes or are able to describe their functions and cannot name many prominent scientists. However, apart from enjoying their studies of science, the youth are keen participants in new technologies such as the internet and mobile phones. Moreover, the youth are now part of a globalized world, where science and technology are aspects of everyday life.

These interests in communications technologies tend to orient the youth towards a more cosmopolitan and individualized perspective of the world. While still deeply influenced by the family, many young people are making decisions for themselves and see science as a domain for this independence. There is some evidence to show that the youth are likely to develop a less enchanted view of nature than their elders. This is as much a consequence of the growing specialization of contemporary popular culture.

Youth are generally more tolerant of difference and more comfortable in developing alternative identities and interests. However, they still regard a competence in science, like in the arts, as naturally arising from a Filipino identity. For these attitudes to change there will have to be a more radical transformation of Philippine society. A culture of competence and an emphasis on specialization will have to be more consciously pursued before such a transformation can take place. The needs of a globalized economy, polity and culture may provide the incentives and conditions for this change.

The full impact of the new communications media has not yet been assessed but already there are definite signs that they are changing fundamental attitudes among the youth. The success of cellphones is phenomenal; they are the first technology that has opened up channels of communication for all Filipinos, regardless of class and status. While the internet is not as accessible, internet cafés in most urban centers allow many of the youth regular access. They now enjoy a virtual cosmopolitanism previously available only to their affluent counterparts. The routine incorporation of the "stranger" into networks of communication can be expected to produce a more artifactual orientation to the world. While the millenarian claims for the new media have not materialized, we are indeed in the cusp of a new age. What this new age will bring depends on how today's youth appropriate the new technology.

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SOCIAL PRODUCTION OF GLOBAL SERVICES IN THE OFFSHORE CALL CENTER: A VIEW FROM THE PHILIPPINES

Alinaya Fabros

Abstract

The call center enterprise in the Philippines has attracted considerable attention and debate. Associated with staggering statistics regarding growth, revenues, employment and earnings, the call center enterprise promises to be the new sunshine industry of the Philippines, with projections of as many as two million jobs by the year 2010. Amidst these developments, this study probes this global service production complex, exploring how fragmented operations spanning a global distance impinge on work conditions and experiences of Filipino call center agents. The study situates and substantiates projections and figures associated with the global call center phenomenon by providing a snapshot of global outsourcing from below. It problematizes the notion of global service work in the third party, offshore call center, examining its imperatives and implications, as well as its various dimensions and conditions. Working for almost six months in a call center in Metro Manila, and supplementing my interviews with agents, managers, and trainers from various call centers, I looked into the social production taking place within these sites, highlighting processes and practices of social and symbolic work in the production and exchange of global services within what I call a "global economy of signs and selves." The study shows how the global restructuring of work and production to achieve increased levels of productivity, competitiveness, and profitability resulted in an intensified and dehumanized work regime. It demonstrates the expanding role of the agent in the offshore service platform, emphasizing the social dimensions and human costs of global outsourcing and the relentless pursuit of new efficiencies that underpins it. At the same time, the study illustrates how the Filipino call center agent locates herself within this global terrain, as well as identifies some ways by which agents negotiate and navigate through the structures and imperatives that constitute this global enterprise.

In this study, I look at the work regimes of Filipino call center agents, highlighting the social production involved in arms-length service provision carried out by offshore call centers.[1] Examining the experiences of Filipino agents who work under fragmented, global service operations, I conceive of social production as a concept that captures the peculiar conditions of production comprised of varied, under-emphasized, and undervalued forms of work that the Filipino agent performs in the call center. Here, the globalized call center and the social production taking place is situated within a larger, *global economy of signs and selves*.

The frame of a *global economy of signs and selves* wishes to underscore a form of production that encompasses a unique combination of physical work, mental work as well as added dimensions of temporal work performance, emotional work performance, and sociocultural work performance that global call center production entails. These various aspects of the agent's work regime, the breadth and depth, and the range of different types of work performances required underscore the exaggerated and extensive demands of this global production enterprise. Further, it shows that while call centers have resulted in decreased costs as well as increased productivity, profitability, and competitiveness for corporations involved, agents in contrast have had to assume and contend with additional social dimensions and human costs of global call center production.

In this respect, notions of production and of a global economy are not only confined to the production, consumption, and exchange of goods and services, but moreover, the production, consumption, and circulation of *signs*, symbols, meanings, dispositions, performances, attitudes, and a particular presentation of a *self* that embodies the values, images, and imperatives of production. Worker performances reflect the peculiar conditions, demands, imperatives, and exigencies of call center production. As such, the idea of social production makes explicit the varied, intense and even deeply personal, private, and individual aspects of the (call center) worker's production and performance that are often overlooked.

Such a notion of social production springs from the idea of a "non-economic" global economy, a "global economy of signs and selves," which weaves together three important bodies of ideas: First, Bourdieu's "economy of practice," in particular his view regarding the "dual reality" of practice, bringing to fore the social, symbolic, as well as the economic work that underpins human activity; Second, Lash and Urry's "economies of signs and space," which identifies a period of disorganized capitalism where the products are no longer material goods but are symbolic goods or "signs" given the faster and wider circulation of commodities in today's world economy; and Third, Goffman's dramaturgy and "presentation of the self in everyday life." By defining a global economy that does not simply consist of "economic goods," but of different forms of goods and capital, objects and subjects, circulating in various spaces and fields that constitute the social world and human practice, we present a framework that links everyday human practice (of workers and subjects) to corporate, organizational imperatives, and global processes and spaces. Such a global economy subscribes to the assertion that "it is in fact impossible to account for the structure and functioning of the social world unless one reintroduces capital in all its forms and not solely in the one form recognized by economic theory" (Bourdieu 1986, 242). This compells the sociologist to "make explicit" various forms of under-emphasized and under-valued goods, capital and work (cultural, social and symbolic) underlying human activity within any sphere, in our case, call center production.

The social production that characterizes agents' work practices in the call

centers are conceived then as performances, where the worker is at once producer and product of the day-to-day production she undertakes. This places special emphasis on:

1. The interactive, relational aspect of production, which takes place always with respect to and in behalf of an audience, whether the audience in question is the client, the management or the customer on the line;
2. The expanded conception of production, which resurfaces underemphasized aspects of social-symbolic work and sign producing functions of the worker, as such, highlighting the signs and symbols which are produced, consumed and circulated in the global economy as well as highlights the central role of the agent, the worker, the self engaged in, subjected to, reflecting on and circulating in such a "global economy of signs and selves;" and
3. The deeply personal and intimate character of production, in the sense that performances make use of resources and inputs that are identified with and integral to the worker, with production imperatives increasingly regulating various arenas of the agent's body and personal front, thereby constituting the worker as a social product, the primary commodity being offered by the call center enterprise.

In this respect, the use and elaboration of the theories of Lash and Urry, Bourdieu, and Goffman allow us to connect personal performances of everyday local production to larger global sign economies where the worker, the agent, plays the central, critical productive role. This global economy of signs and selves underscores the global conditions as well as the "non-economic," social and symbolic work that underpin personal, individual, local human activity. Here, I put forward the concept of a global economy that is not simply confined to or defined by economic production and exchanges, but more importantly by social relations, symbolic practice and human interaction. It argues that the production and exchanges taking place in call centers are made possible by the different forms of work performances carried out by the agent, forms of work performance that draw extensively and intensively on emotional, temporal, social, and cultural resources of the agent, who may have to subsume these deeply personal aspects of herself to production imperatives. The different work performances delivered by the agent illustrates the distinct production taking place, one which is inextricably intertwined with the worker, in the sense that work performances cannot be disembodied and divorced from the worker carrying them out. This deeply personal and private aspect of performances highlights how the day to day work of the agent in turn results in the "production of the agent," the worker, as well as the self that can plug into such a globally fragmented production enterprise.

Thus, we emphasize that the main product of the call center enterprise is not just services but selves, in particular "outsourced selves." The notion of "outsourced selves" refers to the manner that the production and presentation of the self is grounded on imperatives and conditions that are outside the immediate realm and control of the agent in question. At the same time, it pinpoints

and demonstrates the factors that go into the "outsourcing" of selves, that is, the process and conditions by which these agents are produced such that they can be readily launched and widely circulated within the global economy of signs and selves.

The distinct product of "outsourced selves" highlights the peculiar conditions that underlie the global call center. Here, the global call center is presented as a production enterprise that exemplifies the process by which corporations have restructured their operations in order to achieve new levels of productivity, competitiveness, and profitability. The development of call centers illustrates how corporations have fragmented their operations to focus on core functions for more efficient production, in the process slicing off and standardizing peripheral functions such as customer service. Such segmented functions are either delegated to in-house "back offices" or outsourced to other organizations resulting in significant decreases in operations and labor costs. Moreover, functions are not just outsourced to third party vendors, these are also increasingly being transferred to remote locations overseas, illustrating the twin drive to restructure and relocate operations that underpins global outsourcing of services. What was only previously observed in manufacturing production became possible for services, which traditionally required face-to-face transactions. The capacity to provide remote, real-time service became the cornerstone of this regime of new efficiencies under global restructuring and offshore production.

As such, we focus on how the global restructuring and relocation of call center operations has engendered a unique combination of conditions that characterize call center work regimes, facilitating the outsourcing of selves. Outsourced selves circulating in globally fragmented production systems are defined and regulated by conditions and imperatives outside their own context and control. Here, I consider how agents are driven by technology, systems and production structures that set the pace of work, the workload and the required level of productivity per worker. Also, I stress how agents take on and perhaps even internalize the demands and interests of others, external imperatives presented by the caller, the corporation and/or the call center, which regulate and shape individual practices and personal performance.

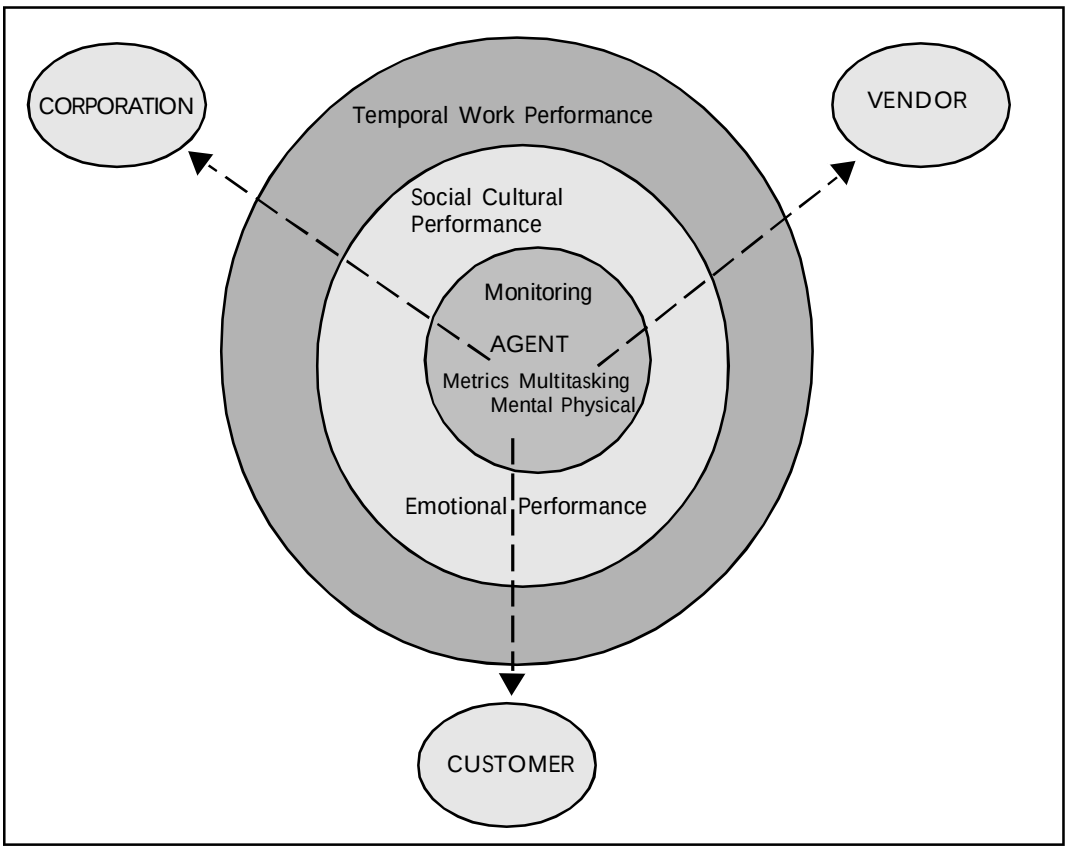
Here, the global and organizational distance between producers and consumers of service has placed the call center agent in a peculiar location, a distance which she experiences and responds to in various ways. First, given the organizational distance that defines production, the agent finds herself contextualized by and identified with various interests that she must cater to, interests and demands imposed by the corporation-client, the third party vendor, and the customer. This is a potentially challenging position given tensions and relations surrounding these interests, where the agent assumes the productive role of catering and attending to these varied and at times conflicting demands. This global outsourcing enterprise is underpinned by a greater imperative of keeping costs at a bare minimum, and extracting maximum output from each worker to ensure profit margins for these vendors. The offshoring of call center

production became more than just a platform to take advantage of cheaper labor overseas. It also heightened imperatives for exaggerated demands on labor time and productivity. In effect, the outsourced climate has resulted in intensely monitored, manic paced and tightly controlled work regimes.

The outsourcing of selves over such a global distance moreover implies cultural, social, and temporal differences between the agent and the customer, which contextualize the performance carried out by the agent. These differences require the agent to expend additional emotional, temporal, cultural, social, and symbolic work, to tap into such external "sources" of the self, and integrate these into each performance encounter with a customer. Here I argue that as call handling work is "deterritorialized" and performed in remote locations, the job description remains the same, but the demands change (Figure 1).

For instance, the agent carries out additional temporal work, as she is required to synchronize her performances and production with the rhythm, the beat and the cycles of call center production. Call center production imposes rotating, erratic, graveyard schedules, mandatory overtime, and rest

Figure 1. Multiple Dimensions of Global Service Work



day overtime on the agent who is expected to submit her sleep and eating patterns, the bodily and biological functions that define the order of her everyday routines, to the dictates and imperatives of production. This is reinforced by strict attendance and adherence policies as well as constant monitoring and surveillance in the call center. In this regard, it was demonstrated how agents had to perform work in adjusting individual cycles to coincide with external imperatives presented by production. Here, we emphasized that the apparent readiness of agents to comply with the pulse and urgency of production is made possible by considerable, hidden, under-valued work she performs to synchronize her routines with an alien distant sociotemporal dimension. Apart from offering her physical and mental labor therefore, an agent must also regulate her own cycles so that she will be readily available whenever production requires.

Moreover, the agent performs additional emotional, cultural, symbolic, and social work as she attends to an incessant barrage of calls that are routed to her without let up. In this respect, emotional performances require agents to manage disruptions that result from the abrupt, uninterrupted routing of calls as well as suppress spontaneous feelings arising from an interaction so that she is able to consistently present the affective line specified by production rules which projects the image of empathetic, efficient customer service. The adjustment and management of emotions and feelings becomes an integral component of the service being delivered. In this view, agent performances are structured by scripts and spiels, regulating the tone, pace, and content of exchanges. This is also implied in the social and cultural work performed as production imperatives impose particular accents and speech patterns that must be incorporated into agent performances. Agents are required to exhibit a particular identity and persona that coincide with the attributes and characteristics of the callers they relate with, as if these exchanges are taking place at home, rather than overseas. As such, agents take on more familiar names (Paul instead of Bong, Terry instead of Tere), use more “normal” sounding accents, and infuse their performances with everyday ”jargon” and “common” signs and symbols that spring from the alien social dimension they cater to, in order to facilitate these exchanges that are lifted out of their local moorings and transposed to a global sphere. These performances become necessary as agents relate with and attend to the issues and concerns of demanding American customers, who may be upset, distressed, agitated or hostile. This shows how agents must expend additional work on top of their physical and mental labor to bridge the global distance that separates them from their customers.

As such, the global and organizational distance implied by globally fragmented call center production has presented a host of different social, cultural, physical, emotional, and temporal demands that the agent has to contend with. This underscores the extensive range of exaggerated demands that call center production imposes upon agents. It is in this respect that I argue that the Philippine case stresses the manner that call center work conditions have become exa-

cerbated by globalized production, in the sense that global service outsourcing platforms have managed to perfectly integrate and execute the drive to keep costs at a bare minimum, optimize individual worker productivity, and maximize firm profitability by incorporating technology and management tools available into the labor process as well as the over all production system.

Apart from pre-determining the boundaries of the service interaction, the corporation (client) also imposes strict monitoring and metrics to keep the agent in line with imperatives set by the corporation, during a call and even beyond. Moreover, the agent is not only subject to control and surveillance measures set by the corporation-client but also by the call center vendor which imposes sanctions and corrective measures for agents who fail to comply with specified targets for performance and productivity. It should be noted here that for agents employed by third party vendors, there is that lingering threat of losing one's job due to corrective action and termination for "poor performance." Also, in the context of highly mobile accounts, agents may find themselves jobless once the contract with the client ends or when accounts are closed and transferred to yet another vendor. Performance and productivity targets have become tougher and sanctions more severe, since vendors need to remain competitive vis-a-vis other outsourcing firms and at the same time maintain a profit margin. Agents are usually measured according to how fast they handled a call, how well they resolved the issue, and how much they satisfied the customer. In this context, there is constant pressure driving the agent to do it faster, better, cheaper than everyone else.

This condition is illustrated in Figure 2. In the discussion that follows, the agent bears the brunt of agreements decided upon by the vendor and the client.[1] The vendor, in order to secure or maintain accounts, tends to bid lower or agree to certain penalty clauses to keep an account. In such a relationship, the agent becomes subject to conditions that she has little knowledge of or control over.

– The metrics laid down on the contract with the client have corresponding penalties. Like for example, these are the metrics that you need to meet. So for each metric that the vendor is not able to meet, at the end of the month, the amount that they should get for the service will get penalized and reduced by this much.[2]
– The vendor gets penalized for not meeting the metrics?
– Like for example, quality monitoring, this is your goal. If you don't meet it at the end of the month, five percent of the amount will get deducted. They have this in the agreement.
– So there's really pressure on the vendor to meet the metrics, but does that pressure translate to the agent?
– On the agent, of course. Yes. Because you'll really push them to meet these stats.
– Otherwise the vendor loses money.
– What they do is they cut your lunch hour, for example reduce it to thirty minutes if the targets are not met.
– Or they take away your second break
– If you don't meet the metrics...
– Because managers are measured by the gross profit of the account. If that

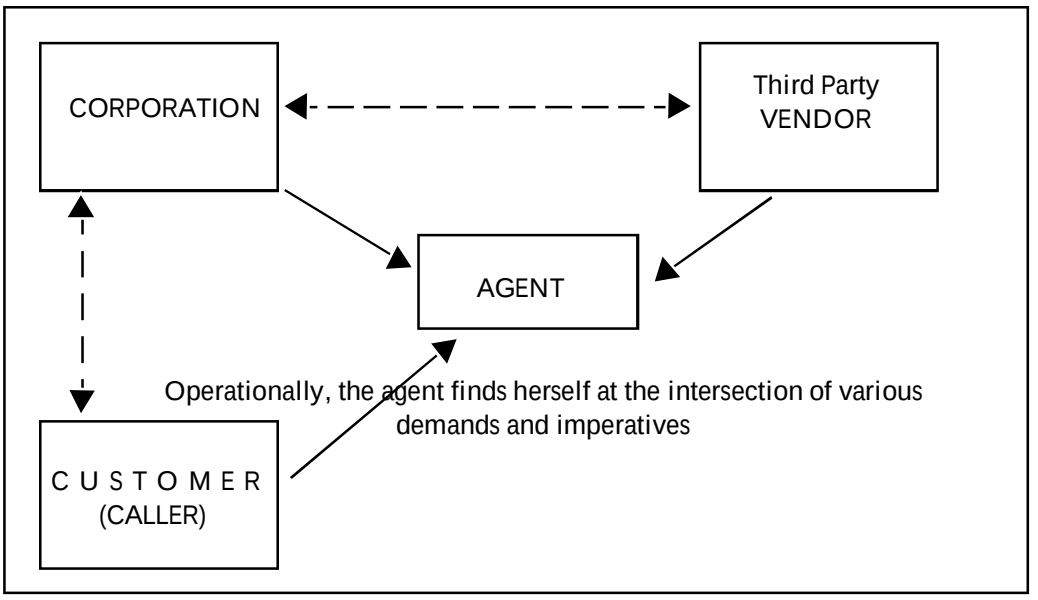
is not met, it means the metrics are not met. So they drive the team leads and the team leads drill the agents.

– So the client pressures the vendor and the vendor pressures the agents.
– It's the agent who's got it the worst in the end. Basically they agreed to that kind of set up. In the first place it's in the contract.
– Do agents know these things when they get in?
– No.

This resonates findings in previous research regarding management and employee systems in offshore call centers. A study by Batt et al. (2005) compares call center workers in India and the US and reports significantly more intense monitoring and lower worker autonomy resulting in higher stress levels among Indian workers than their American counterparts.

In the Philippines, agent work regimes reflect the worker's lack of autonomy and control over the pace, content, direction, and context of her own work, defined and structured by the various forms of intense demands and impositions on the worker's time, routines, emotions, attitudes, dispositions, and identity. Call centers have exercised pervasive and invasive forms of control, through the use of monitoring technology, performance measurement tools, workforce management systems, scripts, to the point of structuring and subsuming various other aspects of workers' day-to-day lives, assumed personal and private, according to the imperatives of call center production. In this regard, the "outsourced self" is primarily derived not from the individual, personal and private context of the worker, but from conditions and imperatives that are sourced out and external to the worker in question.

Figure 2. Web of Demands



Here I underscore the "total," "encompassing tendency" of the call center enterprise, which heavily regulates various aspects of the "self" and different spheres of the agent's life in order to achieve operational goals of producing "selves" that may be readily outsourced, launched and circulated in the global market. This bears significant resemblance with Goffman's notion of a total institution. For Goffman (1961,5-6),

> "a basic social arrangement in modern society is that the individual tends to sleep, play, and work in different places, with different co-participants, under different authorities, and without an over-all rational plan. The central feature of total institutions can be described as a breakdown of the barriers ordinarily separating these three spheres of life. First, all aspects of life are conducted in the same place and under the same single authority. Second, each phase of the member's daily activity is carried out in the immediate company of a large batch of others, all of whom are treated alike and required to do the same thing together. Third, all phases of the day's activities are tightly scheduled, with one activity leading at a prearranged time into the next, the whole sequence of activities being imposed from above by a system of explicit formal rulings and a body of officials. Finally, the various enforced activities are brought together into a single rational plan purportedly designed to fulfill the official aims of the institution."

As such, total institutions are contrasted with ordinary establishments where for instance "the authority of the workplace is kept within strict bounds," with clear demarcation lines drawn that distinguishes where the authority of the work place stops and where the worker's private affairs begin. Work organizations such as the call center exact total authority and control in the sense that their control extends beyond the realm of work, permeating arenas that are considered private and personal. In the call center, agents do not find themselves confined within one place/space, but it is evident how the enterprise defines and regulates their different practices, whether pertaining to "work, sleep, or play," as such, including activities that take place beyond the physical space that the call center occupies.

This condition can be observed in call center demands on agent time. As demonstrated in previous sections, agents submit themselves to tight, erratic, rotating graveyard schedules that are precisely matched and synchronized with production hours, referring to both the distinct timezones of their callers and the specific times that calls actually come in, with the call volume dictating their actual presence on the floor. Tight schedules require strict adherence on the part of the agent, who is expected to log in on the dot, take their breaks on designated times and only for the exact duration set, as well as adjust to periodic changes to schedules. Particular attention paid on "over break" for instance, where failure to return from breaks on time becomes grounds for corrective action and supervisor reprimand, reflects the kind of demanding schedule regime agents have to face. Conditions of mandatory overtime and even rest day over time present another illustration of how agent hours are contingent on call volumes and subject tight production control. In this sense, an agent is "on call," expected to be readily available whenever production requires. As

Goffman (1961, 10) observes, "in some institutions there is a kind of slavery, with the inmate's full time placed at the convenience of staff."

Under such settings, an agent's movements and actions are strictly regulated, in the sense that they are required to ask permission before proceeding from one activity to another, undergoing a tedious process before she can take "toilet breaks," authorized absences and leaves. The conditions on the production floor, including the design of the labor process and the design and structures of the work setting, prevent agents from simply getting up, moving about, commencing or ending an activity at their own pace and discretion. In *Asylums*, Goffman (1961, 41) explains that in the total institution,

> "one of the most telling ways in which one's economy of action can be disrupted is the obligation to request permission or supplies for minor activities that one can execute on one's own on the outside, such as smoking, shaving, going to the toilet.... This obligation not only puts the individual in a submissive or suppliant role "unnatural" for an adult but also opens up his line of action to interceptions by staff."

In yet another way, exaggerated impositions on agent time can be gleaned from the manner by which agents synchronize their day-to-day routines with the schedules of call center production, in the process dramatically altering and reversing the order of their everyday life. As they take on the timezone of their customers and clients, the day-to-day lives of agents begin to revolve around call center production, strictly limiting outside, private activity and interaction with significant others. This represents a parallel "curtailment of self," where barriers are effectively put in place between the agent and the "wider world." For Goffman (1961, 14),

> "[t]he barrier that total institutions place between the inmate and the wider world marks the first curtailment of self. In civil life, the sequential scheduling of the individual's roles, both in the life cycle and in the repeated daily round, ensures that no one role he plays will block his performance and ties in another. In total institutions, in contrast membership automatically disrupts role scheduling, since the inmate's separation from the wider world lasts around the clock and may continue for years. Role dispossession therefore occurs."

As agents take on their productive role within the call center, their ability to carry out their roles in other arenas become constrained and reconfigured by the demands of production. Call center production in this sense considerably shapes their capacity to play out their roles as husbands or wives, fathers or mothers, sons or daughters, and so forth. Instead of actual physical barriers that lock them up, agents confront temporal barriers that isolate them from their parents, their children, their partner, and friends. Consider for instance the case of Anelle and her instant, fleeting encounters with her husband. Her husband is at home when she's at work. She's at home when he's at work. She works on weekends and takes time off on weekdays. In their day-to-day lives, they cross each other's paths without ever really meeting. She talks about not "seeing" each other much. "The only time we really get to spend with each other is that ten minutes when we have coffee

near the train station. We just share that cup and kiss goodbye. Then he's off to work and I'm on my way home. That's the way it works everyday," she shares.

Instead, the more significant relationships that agents are able to maintain are with co-workers and friends from call centers who share the same sociotemporal space they inhabit. Agent leisure time for instance becomes a function of production, in the sense that they are still pivoted around the hours and structures of the call center system. Agents in this respect unwind during "8 am happy" hour, with co-workers, exchanging stories about work, their supervisors and their calls.

Even resting hours are drastically altered, with sleep patterns considerably disrupted by rotating shifts and graveyard schedules. Apart from having to sleep during the day and work at night, agents have to undergo considerable adjustment to regularize sleeping habits and achieve enough rest for another work shift, given weekly changes in their schedules. In this respect, agents spend a considerable amount of time outside work to recoup sleep lost, so that they may be re-energized to take on their productive role when they return to the production floor. Agents lament that they do nothing but "sleep and work," as they devote much of their non-work hours and rest days, catching up on sleep. In this respect, agents also share their difficulty in adjusting to work hours, and to achieve restful, uninterrupted sleep, during the day, under broad daylight, when it's hot, humid and noisy. This is primarily attributed to "the biological make up" of bodies, which have been designed and socialized to carry a particular activity, "work, sleep, play," at specified hours. In this respect, the demands of call centers are total in the sense that the production system ignores and violates the body and the biological, which they similarly attempt to regulate to adhere to production imperatives. It is also interesting that such adjustments, no matter how considerable and stark, remain under-valued, taken-for-granted aspects of the agent's work regime.

This further relates to another characteristic of the total institution, which is likened to "a finishing school, but one that has many refinements and is little refined." This pertains to the changes that agents have to undergo, as they are prepped up, "reassembled" and "finished" to become "outsourced selves." Such changes are not limited to the temporal work adjustments of agents, but also include emotional, cultural, and social adjustments so that they may embody the attributes and identities expected of "outsourced selves."

These identities are presented and performed on the floor, rehearsed and mastered during training, where agents are "processed" for outsourcing. Agent training can be considered what Goffman calls "admission procedure" that "trim" and "program" the worker or "inmate." "Admission procedures might better be called "trimming" or "programming," says Goffman, "because in thus being squared away the new arrival allows himself to be shaped and coded into an object that can be fed into the administrative machinery of the establishment, to be worked on smoothly by routine operations" (Goffman 1961, 16).

These admission procedures entail a process of "leaving off and taking on"

imposed attributes, values, and imperatives. For Goffman, "leaving off entails a dispossession of property, important because persons invest self feelings in their possessions" (Goffman 1961, 18).

Instead, substitute possessions in the form of specified attributes, characteristics, values, and imperatives are then imposed on agents.

> "Once the inmate is stripped of his possessions, at least some replacements must be made by the establishment, but these take the form of standard issue, uniform in character and uniformly distributed," explains Goffman.
>
> "One set of the individual's possessions has a special relation to self. The individual ordinarily expects to exert some control over the guise in which he appears before others.... in short an individual will need an identity kit for the management of his personal front.... On admission to a total institution, however, the individual is likely to be stripped of his usual appearance and the equipment and services by which he maintains it, thus suffering a personal defacement (Goffman 1961, 19-20).

The call center in this respect strips agents of their speech practices and language as well as their identities and names, which are subsequently replaced with more "uniform," homogenized, familiar, and "normal" sounding ones, as in the case of Bong and Tere, a situation that for Goffman constitutes a great curtailment of the self.

> "Perhaps the most significant of these possessions is not physical at all, one's full name; whatever one is thereafter called, loss of one's name can be a great curtailment of self" (Goffman 1961, 18).

Similarly, "[j]ust as the individual can be required to hold his body in a humiliating pose, so he may have to provide humiliating verbal responses. An important instance of this is the forced deference pattern of total institutions" (Goffman 1961, 22). Agent speech and spontaneous responses are tightly regulated. For instance, a general deference to over-all production rules and protocol is expressed by agents, as they subscribe to enforced patterns of speech on the floor, where agents contend with a similar "removal of behavior opportunities," as when they are required to refrain from talking in Filipino, to adhere to the English only policy, speak the specified language, using the preferred, "normal sounding" accent (Goffman 1961, 13).

Moreover, such a level of deference can be seen during calls, where agents perform emotional labor as they take on a particular verbal pose, structured by tight scripts and spiels, peppered with words that reflect the company affective line, such as please, thank you, sorry, may I. This deference pattern in speech can be observed in the repeated use of the phrase "Thank you" from start to end of a call, no matter what transpires during the exchange. This can also be seen in the emotional performances of agents who are "sorry to hear that you're upset..." and "more than happy to help you with your concern."

Such verbal deference is imposed even when agents confront disrespectful treatment of hostile callers as they perform on the floor. This is another feature related to total institutions where inmates suffer

various forms of indignities while confined to strict behavior protocol and scripted responses. Within the total institution of the call center, agents are forced to bear the "indignities of treatment others accord him," in the form of verbal or gestural profanations, such as when an agent is called obscene names, cursed and verbally abused (Goffman 1961, 23). Further,

> "whatever the form or the source of these various indignities, the individual has to engage in activity whose symbolic implications are incompatible with his conception of self. A more diffuse example of this kind of mortification occurs when the individual is required to undertake a daily round of life that he considers alien to him – to take on a disidentifying role. On the outside, the individual can hold objects of self-feeling—such as his body, his immediate actions, his thoughts, and some of his possessions—clear of contact with alien and contaminating things. But in total institutions these territories of the self are violated; the boundary that the individual places between his being and the environment is invaded and the embodiments of self profaned" (Goffman 1961, 23).

For agents, the totalizing structures of the call center enterprise control them from responding spontaneously from verbal attacks and demeaning and dehumanizing encounters, as they are kept from displaying their real feelings, required to suppress negative feelings and over-express specified emotions and attributes, in order to portray the customer service image and persona that the corporation wishes to project. In this sense, agents find themselves in frustrating encounters with callers, who berate and disrespect them for what they do, for who they are, for what they stand for, with hardly any means to counter or challenge such treatment and behavior given the tight structures that she is faced with. This level of adherence and control is made possible by normative and management structures that are embedded in the production system.

In this sense, call centers exhibit similar structures and conditions parallel to total institutions, as seen from the climate of intense monitoring and surveillance, punishment and corrective action on the floor. Such structures reinforce the specified productive role of the agent. As she attends to her call handling work and caters to the demands of various audiences, clients, management and customers, the agent is likewise "never fully alone; he is always within sight and often earshot of someone" (Goffman 1961, 25).

Agent performance in this respect becomes the arena of the audience, whose expectations and demands are incorporated into each routine, each delivery. The agent's responses, performances, and practices are then carried out with the audience in mind, constantly reminding the agent that her actions do not belong to her, but ultimately belong to the audience she serves. Like in total institutions, agents "can be supervised by personnel whose chief activity is not guidance or periodic inspection (as in many employer-employee relations) but rather surveillance – a seeing to it that everyone does what he has been clearly told is required of him, under conditions where one person's infraction is likely to stand out in relief against the visible, constantly

examined compliance of others" (Goffman 1961, 7).

On top of routine and constant monitoring therefore, agents have to face a harsh system of punishment and corrective action geared at making sure that the agent is consistently in line with production policies and imperatives. Agents who fail to perform according to production targets, receive corrective action memos and run the risk of being suspended or terminated. Under such conditions, agents find themselves gradually regulating their own performance according to the specified pace, direction, content, cycles, and exigencies of production, with their conscious knowledge that "they are being watched," and the constant, consistent drumming on the floor that instills in the agent the values, beat, urgency, and imperatives of production.

What is interesting about this total institution is that agent entrance into the enterprise is voluntary and not forced, with agents having a level of understanding of what she is getting into as she takes on the job. "When entrance is voluntary, the recruit has already partially withdrawn from his home world; what is cleanly severed by the institution is something that has already started to decay," says Goffman (1961, 15).

In this respect, agents resign themselves to the total institution of the call center, carrying out their regulated practices as "part of their job" and "duty." At the same time, it can be said that parts of their productive role may resonate images and symbols that agents relate with themselves, having been socialized in a particular manner that has an affinity with the sociocultural spheres they service, whereby portraying a particular act may be viewed as a form of validation of particular aspects of the agents sense of self, facilitating their submission to production goals and imperatives.

The encompassing character of the production system, as well as the level of submission of agents, can similarly be observed in practices that subtly attempt to interrogate the institution of the call center, as agents respond to the structures of the call center and try to direct their own actions within. As they navigate the call center enterprise, agents find themselves resorting to what may be considered "secondary adjustments," which for Goffman consist of "practices that do not directly challenge staff but allow inmates to obtain forbidden satisfactions or to obtain permitted ones by forbidden means." These practices are variously referred to as "the angles," "knowing the ropes," "conniving," "gimmicks," "deals," or "ins." Secondary adjustments provide the inmate with important evidence that he is still his own man, with some control of his environment (Goffman 1961, 54).

The study similarly demonstrated some means by which Filipino agents attempt to structure their own performances, in the process negotiate the conditions of production. This emphasizes the dialectical character of the performance of "outsourced selves," which are simultaneously subsumed by external, organizational, and global imperatives as well as directed and played out by the agent. In this sense, we note how agents find opportunities to subtly defy call center structures, in such strategies like transfer camping, release, and muted backtalk. Transfer camping

strategies for instance, where agents linger in the transfer call instead of taking on a new one, demonstrate how the agent has become so attuned to production, developing a keen, internalized sense of how production works, which permits her to identify and maximize opportunities that come at a particular moment so that she is able to slow down the pace of her work, negotiate her intense work load according to her own design without being detected. These opportunities are presented by procedural and technical aspects that constitute the labor process, such as the transfer call or the mute button.

In this sense, these strategies are carried out in spaces within the production system, identified by the agent who is able to maintain and assert resources of power within the very processes of her own subjugation. This has also been observed in the way agents construct their own role and position in the production process, as she defines her stance in relation to management, clients, and customers. This can similarly be seen from absenteeism and exit strategies that workers carry out. These become a platform for agents to act upon their dissatisfaction and resist their construction as mere cogs or robots plugged into the global call center complex, as they insist to leave their own imprint and "re-humanize" the intense and dehumanizing production they perform. However, it must be stressed that these forms of resistance have been practiced within spaces available, without considerably altering relations and conditions in this global enterprise. Forms of resistance have yet to take on a more organized and collective character to substantially transform bargaining power of workers in order to establish a level of control over the pace, content, direction, context and over-all conditions of their day-to-day work. This in turn further demonstrates the invasive, pervasive, and almost total control exercised by the production system over the agent, whose resistance and negotiation are still structured along the axis of the system she contests, reflecting how deeply embedded these structures, imperatives, and values have become.

In this regard, globally fragmented service production exemplified by global outsourcing of call centers is made possible by the construction of the total institution of the call center, which encompasses various aspects of the self and different arenas of workers' lives. Such an encompassing total production system is geared toward the process of "outsourcing selves," such that agents are transformed into consumed and circulated commodities in the global economy. These outsourced selves embody the values, cycles, imperatives, urgency, and images of call center production, with such embodiment facilitating their outsourcing and circulation in the global economy. As such, outsourced agents are consumed by customers who call in for a specific, mediated, carefully designed brand of service and corporations that utilize these flexible, highly productive workers as company front liners. The processing and production of outsourced selves can certainly be related to the idea of flexible labor, as in the contractualization of labor that became pervasive under global manufacturing platforms. In the era of global service outsourcing however, the

demand on workers is not confined to the need to submit to contractual, flexible work regimes. Labor flexibility as a leverage and currency in global service outsourcing pertains to a level of flexibility, of malleability required of workers who have to adjust and regulate their own performances in accordance with the multiple, exaggerated, encompassing demands of globalized production.

NOTES

1 This article is based on the author's master's thesis that was presented to the Department of Sociology, UP Diliman in February 2007. Dr. Walden Bello served as thesis adviser. An earlier version of the work won a citation in the Fourth International Sociological Association (ISA) Worldwide Competition for Junior Sociologists.

2 Group discussion, 8 July 2006.

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ONLINE TECHNOLOGIES AND KNOWLEDGE PRODUCTION IN THE NATURAL SCIENCES

Marcia Czarina Corazon Medina

Abstract

Epistemic communities consist of structures and selectivities in citation and referencing that scientists as "practical and economic reasoners" use in order to establish scientific credit and capital in their specialized field. Knowledge then becomes a product of social and economic shaping based on "selectivities," or decision-making processes in the epistemic community. This paper looks at the use of online resources (i.e., journal databases) in the natural sciences programs (i.e., physics, chemistry, and biology) of two Philippine universities, through key informant interviews with graduating students, thesis advisers, and library personnel. In this context, scientific credit and capital are gained by researchers from the credibility of the resources that they use (i.e., authors and research institutions cited in their thesis), although this is limited by the availability of resources in the universities. The availability of online materials is associated with functional meanings such as convenience. Meanwhile, the substantive meanings of the availability of online resources show the dilemma of universities in balancing costs and research independence, since findings show that the online usage in both universities is insufficient to maximize the costs spent in purchasing the online resources. The first university values knowledge production more than cost-efficiency in the acquisition of references, thus, the structure of knowledge production is more accommodating to the selectivities of its researchers. In contrast, it is seen that the structure of knowledge production in the second university regard costs as more important. This causes its researchers to use non-online materials.

INTRODUCTION

The incorporation of the internet in epistemic communities has shaped the trends in research and knowledge production, especially since the internet was launched in 1991. In the academe, online databases of research journals have been introduced to libraries for students and teachers alike, through an updated roster of journals published worldwide. Currently, few universities offer online databases in their libraries: Ateneo de Manila University, University of the Philippines, De La Salle University, and University of Santo Tomas.

This study contributes to the sociology of science and technology which is an emerging area of discourse, especially in the Philippines. Since the trend of making online technologies available in university libraries has been relatively new, analysis of its utilization and contribution to the knowledge community should be undertaken. For the universities that were studied, the findings

and analysis would be helpful in their respective evaluations on making and maintaining the online resources available in their libraries. For the research community in the Philippines, this study offers an insight into the dimensions of existing resource-sharing mechanisms.

In comparing the emerging knowledge production cultures brought about by the online technologies in the two universities, this study utilizes microsociological and social constructivist approaches (Knorr Cetina 1981). In these approaches, the researchers are "practical reasoners" who continuously attempt to situate themselves in an established epistemic community, through citations and incorporation of existing academic works into the formation of new knowledge in the field. This is most evident in universities when students work on their theses, with their thesis advisers and the university leading them to possible sources. In these cases, research is intensively taking referencing into account.

The universities chosen for this study have similar program offerings for the natural sciences and online databases available in their libraries (i.e., EBSCO). The study examines and compares the resulting research practice in two of the universities aforementioned with the availability of online resources as an intervening factor. It is guided by these research questions:

a. Comparing the two universities, how do students utilize technology through online databases in making their theses as contributions to the body of knowledge?
b. How do thesis advisers in both universities influence the levels of selectivity in both making online journals available, and having the resources accessed by their students?
c. How do structures of knowledge production in universities affect referencing in thesis-making?

Research Framework and Design

This study uses the micro-sociological approach (Knorr Cetina 1981) which focuses on "contextual contingencies," or "contextualities." Knorr Cetina argues that the construction of science (knowledge) is determined by the background, history, interests, and motivations of the institutions and agencies involved, as determined by their respective epistemic communities. These contextualities could be observed through the levels of decision-making, which Knorr Cetina calls "selectivities." These selectivities are always changing according to social, economic, and political factors, and that prior decisions affect the succeeding ones, such that selectivities, accordingly, is in progressive process of complexification.

Knorr Cetina (1981) characterizes an "epistemic community" as a specialized group which shares a common stock of knowledge and procedures, and presumably common standards of evaluation, professional preferences, and ways of making a judgment. These groups, accordingly, are scientific communities that are relevant social and cognitive organization in science. The key concern of studying epistemic communities is the identification of integrating mechanisms as practiced through citation and patterns of selective

referencing. References are taken to represent relations of intellectual indebtedness within the network of the knowledge-producing scientists. Therefore, it is seen that epistemic communities—their structures and prioritized values—determine the dimensions of its own knowledge production.

One way of understanding knowledge production is through what Saloma-Akpedonu (2006) describes as the process of "doing technology," technology in this sense encompassing the concept of knowledge. She says that "doing technology" should expand its notion into including not just the consumption of these technologies, but also the processes and activities that produce them. Accordingly, this implies production and the awareness of one's own self and the creative ability to negotiate meanings, shape identities, and to act upon these. Thus, it is seen how both the structure (i.e., the processes and regulations on producing and acquiring research references), and scientist (i.e., the social position of researcher) both influence the production of knowledge.

In this study, the concept of epistemic communities could be seen in two levels: (a) epistemic community within a university, and (b) the overall epistemic community in the Philippines (i.e., among universities). This study would also extend the meaning of epistemic community, such that it does not only involve the citation in written works. This study would also refer to oral or face-to-face referencing (i.e., recommendations of thesis advisers to their students, recommendations of thesis advisers to their colleagues, shared resources between and among teachers), in order to describe the structures of knowledge production in epistemic communities within universities.

Moreover, this study is focused on the production stage of knowledge, such that it is assumed that when researchers have better access to resources—in terms of quality and quantity of available sources—they would be able to produce better researches. The basis of the findings in this study is not the number of researches, because it is given that in a university setting, both teachers and students are required to produce researches. Instead, this study looks at the beginnings of the research process, and how the factors affecting both the structures in universities and the researchers translate to knowledge production.

In research, knowledge is considered as a reconstruction of existing knowledge, accruing as more and more researchers contribute to the existing knowledge. Knorr Cetina (1981) points out two sources of such reconstruction. The internal source refers to scientists as "practical reasoners" who consider acquiring scientific credit in their process of citation and referencing for their researches. As a form of symbolic capital, scientific credit is described as the recognition and acceptance of a researcher (or the new knowledge produced) in an established scientific community. As a form of symbolic capital, scientific credit is acquired by scientific agents through the imposition of technical definitions and legitimate representations of scientific objects in the field. Therefore, acquiring scientific credit could be considered as capital through being cited,

or choosing credible sources for citation and referencing. The standards of credibility differ according to specific epistemic communities.

The epistemic community of science engages in discourse through written communication. In each decision in the selectivity, economic factors and discourse are deemed important. Such economic and historical contexts are the external sources of reconstruction, therefore making scientists "economic reasoners." Both internal and external sources work in a dialectical manner to shape science and technology.

The economic aspect of knowledge production in epistemic communities could be better explained through MacKenzie and Wajcman's (1999) "social shaping of science and technology." This means that both costs and benefits are determining factors in the process of constructing knowledge, such that institutions are affected by their monetary capacity, as well as the existence of support systems that would forward the scientific endeavor. This study adopts these concepts by looking into the practical and economic reasoning of the actors in the epistemic communities.

In describing the effects of science and technology in knowledge production, this study utilizes the concepts of "functional" and "substantive" rationality (Pertierra et al. 2002). The functional rationality of everyday life may manifest in terms of convenience, confidentiality, and instant access (Saloma 2002). However, it is not automatic that substantive rationality changes with functional rationality. The meaning of science and technology is therefore determined with how the technology is consumed to develop the public sphere, that is, a realm of the social life in which something approaching public opinion can be formed (Pusey 1993).

Pertierra (2003) also observes that although science and technology are expressions of structural and cultural orientations, the rationalization of socio-cultural structures has not sufficiently forwarded autonomous discourses to operate within their respective areas. Science and technology in the Philippines benefit those who have appropriate competencies or capital resources, reflecting constructionism based on the sociopolitical context that generated them. Despite this, he points out to the optimism of Filipinos about the future of science, such that the insufficiencies in the state of science and technology in the present opens much room for improvement for people involved in them (i.e., unexplored opportunities, "potentially good students," lack of financial support from the government).

This study focuses on the natural sciences departments of two of the three universities in the Philippines that provide online databases in their respective libraries. Key informants, chosen using the snowball technique in data gathering, are comprised of undergraduate students completing their thesis requirement during the time of data collection, their respective thesis advisers, and library personnel who are in charge of the maintenance and documentation of either the online databases or the printed journal collection.

It particularly looks at thesis production in the natural science programs (i.e., physics, chemistry, and

biology), since these areas have specific online databases and printed journals available in the libraries.[1] Due to the specificity of the subject areas, these databases are accessed by groups specializing in the respective courses.

> **University A.**[2] This university provides the largest collection of online databases in the Philippines today. It has specific online databases for the natural sciences such as *American Chemistry Society (*ACS*) Legacy Archives* for Chemistry; *American Institute of Physics* (AIP) for Physics; and *Current Contents ISI®: Agriculture, Biology, & Environmental Sciences* for Biology.
>
> However, even if University A is slowly shifting to online databases for its library, it still purchases and makes available the printed versions of journals in its library – whether or not the journals are included in the online databases.
>
> **University B.** University B offers only two databases: EBSCO and CIPPA.[3] The two databases are backed up by its *Millennium*[4] and *B-Project,*[5] software databases that catalogue all printed journals, including graduate theses, in its library. The programs operate like online databases (i.e., search options include encoding a word, with all possible results appearing automatically).

DIMENSIONS OF KNOWLEDGE PRODUCTION

This section discusses the functional and substantive dimensions of knowledge production. The functional dimension is represented by research efficiency as a result of the availability of online references. Meanwhile, the substantive dimension corresponds to economic shaping (i.e., cost-efficiency in acquiring references), and social shaping (i.e., the factors on the non-utilization of the online databases in the universities) of knowledge.

Functional Meaning: Efficiency in Time and Effort

Looking for references in the online databases makes the theoretical framing stages of research more convenient, compared to when references are searched manually in the printed collections of journals. Updated online databases widen the scope of research. One student said:

> "You search for one keyword and almost all the information you need [would] be served to you. I do not think it makes us lazy with our research. You could always make use of online references to forward a good research."

University A students said that they "almost always" find the resources that they need in their library because of the wide range of selections – both printed and online. They said that the printed materials their thesis advisers recommend are in the library, and in the case they would need extra sources, they would look for the supplementary information in the journals in the online databases.

The preference of using online materials was also observed in University B. The University invested in online databases to follow the trend of digitization in Philippine universities. The students in University B also "demand" for a faster search and retrieval mechanism in the library, to which the online databases are a response. This is a

function of the role of the university in forwarding a more research-conducive environment for its students through the convenience of the online technologies, in order to situate themselves more into the larger epistemic community.

The efficiency in time and effort brought about by availability of online resources is functional in nature. But more than the functional meanings, the substantive meanings that arise are more determining of the dimensions of knowledge production in the epistemic communities in the universities. These substantive meanings are seen in the economic and social contingencies that affect the selectivities in both universities.

Economic Shaping: Maximizing Costs

Table 1 describes the costs of online database acquisition, while Table 2 summarizes the costs of reference acquisition for the library of University A.[6]

Some of the online journals indicated in Table 1 are also available in the University B library. Based on the serial and online collections of both universities, it could also be assumed that the cost for reference acquisition of University A is more or less the same for University B (Table 2). Therefore, both universities spend a large amount of money every year to sustain subscription of the references, both online and printed. Given the costs, library personnel say that both universities are working on a limited budget to secure all the references recommended by their respective academic departments. In both instances, there are two factors being dealt with by the universities: first, the costs of the acquisitions, and second, the relevance of the materials to be purchased in developing their respective epistemic communities.

Both universities maintain a certain number of serial subscriptions in their respective libraries. For academic year 2006-2007, the total number of serial titles in University A is 736, while University B has 273. Given this, both Universities want to avoid duplication of available journals. In University A, there is a movement towards prioritizing the acquisition of online references over printed materials, however, even if there are journals already covered by the online databases, University A would still purchase the printed versions. This is because the online versions of the journals are not always complete (i.e., some come in full-text version, others in abstracts only). A key informant from the library in University A said that if a researcher finds the full text of the journal unavailable in the online database, then the library personnel would check if it is available in the printed collections; in this case easily providing the researcher with his/her reference. In this case, the printed versions of the journals function as supplementary resources to the online databases. University A library considers this "necessary" in order to "induce comprehensive research" and "convenient resource gathering" in the University, despite the costs that duplication of resources entail. Although, contacting the authors of the journal entries through the e-mail addresses provided in the online database is an open option for researchers.[7] Therefore, University A ranks the creation of

Table 1. Costing of Online Resources of University A

TITLE	MODE OF ACCESS	PRICE (US DOLLARS)
American Chemical Society Online Journal Package	ONLINE SITE LICENSE	3,025.00
American Chemical Society Online Journal Package ***(Archive)***	ONLINE SITE LICENSE	457.00
ACM Digital Library Core Package	ONLINE SITE LICENSE	8,108.63
IEEE /IEE Electronic Library	ONLINE SITE LICENSE	26,500.00
Proquest Philosophers Index	CD-ROM	1,541.00
American Institute of Physics/American Physical Society Online Journal Package	ONLINE SITE LICENSE	4,400.00
American Institute of Physics/American Physical Society Online Journal Package ***(Archive)***	ONLINE SITE LICENSE	512.00
Institute of Physics Historic Archives	ONLINE SITE LICENSE	1,233.96
PROLA (Physical Reviews Online)	ONLINE SITE LICENSE	350.00
PsycArticles ***(Ebscohost)***	ONLINE SITE LICENSE	6,500.00
PsycInfo ***(Ebscohost)***	ONLINE SITE LICENSE	7,150.00
Academic Periodicals Collection ***(Included in Academic Search Full Text Premier subscription)***	DVD-ROM	Gratis
Academic Search Full Text Premier ***(Ebscohost)***	ONLINE SITE LICENSE	16,800.00
Biomedical Reference Collection: Basic ***(Ebscohost)***	ONLINE SITE LICENSE	Gratis
Business Source Premier ***(Ebscohost)***	ONLINE SITE LICENSE	6,000.00
Computer Source ***(Ebscohost)***	ONLINE SITE LICENSE	Gratis
Current Contents Connect ***(Life Sciences, Agriculture, Biology & Environmental Sciences, Physical, Chemical, & Earth Sciences***	ONLINE ***(4 USER LICENSE)***	8,704.00
Encyclopedia Britannica Online	ONLINE SITE LICENSE	1,650.00
ERIC ***(Ebscohost)***	ONLINE SITE LICENSE	Gratis
JSTOR	ONLINE SITE LICENSE	2,750.00
MAS Ultra School Edition ***(Ebscohost)***	ONLINE SITE LICENSE	Gratis
Proquest Digital Dissertations	ONLINE SITE LICENSE	5,980.00
Regional Business News ***(Ebscohost)***	ONLINE SITE LICENSE	Gratis
SwetsWise	ONLINE SITE LICENSE	700.00
ITS for Windows		1,710.00

Source: University A Library Acquisition Section

Table 2. Costs for Reference Acquisition for University A

Printed Journals/Serials	
AY 2004-05	Php 9,200,088.51
AY 2005-06	Php 14,388,381.76
Online Databases	
AY 2005-06	US$ 104,071.59 (Php 5,307,651.09*)

scientific capital higher than economic costs, which contribute to its scientific capital in the local and larger epistemic communities.

University A,on one hand, acquires all possible research references for its faculty and students, reaching an extent of academic independence. In this sense, the university does not depend on other universities or other institutions to supplement the resources that its researchers would need, since all the materials are already present in the university library. The university maintains this independence even if there are cases of duplication and increasing costs. It is because the availability of resources is very important especially to the natural sciences where research topics are very diverse and particular. The journals on particular topics will therefore be used only when a researcher has a study with a related topic.

University B, on the other hand, ranks economic factors more in its selectivity on reference acquisition. But it provided the *Millennium* and *B-Project* that catalogues all the printed journals and graduate theses and dissertations available in its library for more convenient access to resources. Moreover, as University B recognizes this "limitedness," thesis advisers refer their students to University of the Philippines-Los Baños (UPLB) or University of the Philippines-Diliman (UPD) in cases when the journals needed are listed in University B's EBSCO list but are not available in their printed collection. In these two University of the Philippines campuses, while there are no online databases available, their libraries provide a comprehensive collection of printed journals. According to a library staff and a thesis adviser, the Department of Science and Technology (DOST) organized a consortium of universities of which University B is a member. Each university is assigned to maintain particular collection. University B is assigned to maintain the collection of chemical abstracts and journals, therefore it would have to refer to other universities for other subject areas. University A, on the other hand, is a non-participant in this scheme organized by the DOST. As aforementioned, it purchases the references—both online and printed—for its research independence.

The economic shaping in the context of this study points out that the maximization of costs for both universities is relative to what is the higher factor of selectivity they adhere to. For University A, it is vastness of references for more convenient referencing and research

despite the costs. What University A considers as maximization of costs is acquiring as much references that would assist the knowledge production of its students and teachers. In contrast, for University B, maximization of costs means the allocation of limited monetary resources which is premised on its attempt to expand their reference selection through a consortium with other universities.

Social Shaping: Inefficiency and Non-utilization

For both universities, the online resources are not sufficiently utilized by the students. The following tables present a summary of the relationships between and among the projected user population of the universities, the number of accesses in the online database which both Universities have, and the number of accesses to the serials (i.e., printed journals). The tables also compare the average use per student of both online and printed serials.

In both universities, online usage is greater than the use of printed materials.[8] However, juxtaposing the number of expected student users with the total accesses, both online and serial references are not sufficiently utilized, according to the average use per student of both materials (Table 3). This evident in University B (Table 3 and 4), where the population is higher (compared to University A), but the access rate of online and serial materials is much lower. Despite relatively higher counts of accesses and downloads from online resources, the library in University A is still concerned about improving the utilization of the resources, because "more accesses means that the cost per access will decrease."[2]

Lack of information. A University A student used *scholar.google.com*[3] for choosing the topic and theoretical framework of his research because it was the reference introduced during a university plenary for natural sciences students. The staff introduced EBSCO instead of online databases for the natural sciences such as *Current Contents*. "I could have used them if I only knew they existed," he said. Another student said that he is aware of the online databases in the library, although what he understood was that the databases were useful "only to students of the Social Sciences." Therefore, the lack of awareness of University A students could be traced to (1) unclear information on available databases from the library, and/or (2) thesis advisers, because they do not recommend the databases in the library.

The library personnel in University A say that students should be aware of the online databases because library tours are being conducted for every freshman batch. However, students say that the tours are not very helpful, such that, "it only informs (the students) that there are online databases, but what they are for, what we could find in them, and what subject areas we could use them for are unclear." For the library personnel, such is not an excuse, saying that students should have the initiative to go the library and use the materials they that "they pay for."

In such a context, there is a gap as to how to disseminate the information on the particulars of University A's databases. But both set of actors—library personnel and students—point out to the function

Table 3. Expected User Population vs. Usage of Online and Serial Resources, (April 2005-March 2006)

	Expected User Population*			Online Usage**		Serial Usage	
	Undergrad	*Grad*	*Total*	*Actual* counts	Average use per student	Actual Counts	Average us *per student*
University A	18,040	3648	21,688	239,324	11.03	122,555	5.65
University B	53,007	7544***	60,551	96,453	1.59	25,108	0.41

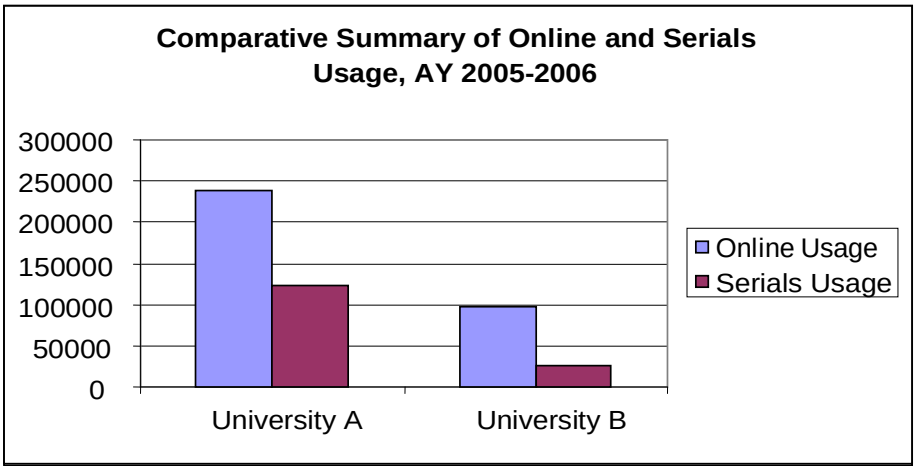
Source: University A Library, Office of the Registrar; University B Library, Office of the Registrar

* University A population includes the summer, first and second semesters of the academic year indicated. University B population includes only the first and second semesters.

** The counts of Online Usage are based on the accesses of *Academic Research Premier* that is included in the EBSCO host subscription.

*** Graduate students have their own separate library in their own division, therefore are not so much accessing the materials available in the library used by the undergraduates.

Table 4. Comparative Summary of Online Usage and Serial Usage, University A



of the teacher in order to bridge such information dissemination gap. University A thesis advisers recommend the online references, but the specific sources of these online materials varies. Some teachers recommend websites and search engines in the Internet, while others would direct their students to the online resources in the library.

Meanwhile University B thesis advisers seldom recommend online databases in the library because these are very limited and "almost useless" for the natural sciences. There are two scenarios emerging from the lack of journal resources in University B library. First, teachers do not at all know about the existence of EBSCO, *Millennium,* and *B-Project* in the library. Therefore, students of these thesis advisers would not be recommended to use the online databases in the library. But the library and the other thesis advisers (who know of the availability of the online databases) said the library has conducted several talks and seminars for the teachers to orient them of the online resources in the library.

In the second scenario, teachers know of the databases in the library, but they have not used it themselves, or have used it but rendered it not helpful for research. Teachers then recommend websites in the internet. The researchers send emails to the author of the journal, and hope that the author would send them a copy of the research. If this still does not work, then the thesis advisers would lead their students to other research institutes (i.e., National Library, International Rice Research Institute Library, Bureau of Fisheries, libraries of other universities).

Moreover, there is resource-sharing involved among the teachers. A University B thesis adviser who is unaware of the availability of databases said that none of her colleagues in the department has mentioned such library service, and that they are all relying on the same websites for researches. In other departments, on the other hand, where teachers are aware of online databases in the library, they recommend the use to one another, especially if they have used it before. Therefore, there is a social shaping involved: what their colleagues use, they also use.[11]

Therefore for both universities, the teachers' lack of information on (a) what are the available materials in the library, (b) how to access and utilize the references in the library, and (c) what is the extent of relevance of the online materials in the library with regard to specific fields in the natural sciences, are all contributory to the social shaping of the utilization of the technology, which in effect, shapes and is shaped by their immediate epistemic community. What is lacking in the scenario is a mechanism of information dissemination from the library, among the teachers, going to the students. Such structure of information could change how the actors involved perceive the online materials, since such structure is a factor in the social shaping of the utilization of technology.

User Reluctance. Even in systems of knowledge production wherein the universities recommend the use of online journals (even if the journals did not come from the library), there are researchers who remain attached to conventional research methods (i.e., using printed materials). These

researchers find it difficult to adjust to the changes—both functional and substantive—that online technologies bring.

An illustration of this is seen in Table 5.

First, the teacher's comment reveals that her only known way of accessing the internet is through going to the university library. Thus, it is not the cost that deters her from utilizing online materials for research, but the accessibility to the Internet. Second, her comment reveals her preference of printed journals and serials over online databases such as EBSCO, and that lack of awareness that one could easily print whatever journal has been researched in EBSCO.

Here it is seen how the teacher's research methods deviate from what is assumed in Knorr Cetina's (1981) concept of the scientist as a "practical reasoner" who would try to access as much new trends in acquiring scientific credit and capital. This key informant has a different definition of where the scientific capital could be found, such that her research is still based on more "traditional" methods (i.e., depending more on printed journals). This dependence on traditional methods is a result of the teacher's reliance of what she was accustomed to as a researcher (i.e., she has been using the printed journals throughout her years of studying, teaching, and researching), and adapting to the emerging research culture brought about by the availability of online technologies is something she does not find convenient.[12] However, it must be acknowledged that this reluctance to adapt to the changes in science and technologies limits the structures in epistemic community and in the production of knowledge as well. In this example, since the key informant is part of the Acquisitions Committee for the library, her preferences would push for the approval of printed journals over the requests for online materials. Hence, the degree of acceptance of the changes in science and technology is affected by the general attitude and priorities of the immediate epistemic community wherein one belongs. Such context is an example of what Pertierra (2003) says about how the rationalization of sociocultural structures has not forwarded the discourse that would incorporate the social changes brought about by the changes in science and technology.

The social shaping of technology involves structures that would make the utilization and formation of new technologies more conducive for the

Table 5. The Case of the Reluctant Teacher

A key informant in University B, a Ph.D. graduate from a prestigious European university, has been a teacher for "a very long while", and is highly regarded in the university in her area of study. She is also a member of the Library Acquisitions Committee which recommends the materials from the library's list of books and subscriptions that would be added (or deducted) to online and serial references. She recommends that her students refer to journals in their thesis research, although what she recommends is that they find the journal entry in printed form.
She said, "I do not always have the time to go to the library and go online, but when I have the study in paper, I have the convenience of having it just there in my files."

actors. However, in this study, the lack of information dissemination structures, and the interference of former structures (i.e., of time and age) hinder the growth of the knowledge production and epistemic communities.

EPISTEMIC COMMUNITIES: CREDIT AND CAPITAL

Through citation, referencing, and recommendations of relevant actors, students and thesis advisers locate themselves in the larger context of epistemic communities, and form their own structures and mechanisms of knowledge production. According to the students and teachers interviewed, they use published journals to adopt the research methodologies and "patterns of reasoning" in their respective studies. In this research, epistemic communities are analyzed through three parts – mechanisms of expanding and developing epistemic communities through the structures within the universities, inter-university epistemic community, and the acquisition of scientific capital in the larger epistemic community through referencing.

University Mechanisms for Expanding and Developing Epistemic Communities

Tables 6 and 7 summarize the structure by which universities expand their collection of references in order to provide for the demands of research materials in their libraries.

The structure in University A gives opportunities to address the reference needs of not only teachers, but also students. The structure rewards those who accumulate more references, such that the library is willing to augment the budget of the department who has exceeded their original budget to acquire materials. The annual evaluation of funds also point out that the university puts primacy in research, such that the more references the departments buy and make their students use, the greater amount the university allots for their budget for acquisition for the following year. The university gives an extent of autonomy to its researchers to pursue knowledge production. Thus, the structure and mechanisms entail for the expansion of the epistemic community within the university to locate itself in the larger epistemic community.

In the case of University B, there is an inherent limitation in the structure, because the teachers in the departments and the library are mediated by the members of the Acquisitions Committee who are appointed by the Dean. The members of the Acquisitions Committee would inevitably have their own selectivity factors to prioritize, especially for requests for their department because new materials would widen the range of references for their area of research.

Moreover, since University B spends more on printed journals over subscriptions of online references, the range and extent of the materials for the natural sciences are limited according to very particular topics. Therefore, the topics that are covered by the printed materials are only those that are made available, compared to a possible vastness of journals that subscriptions to online materials could give. One teacher said that the university could at least get an account in some of the most frequently

Table 6 Summary of Reference Recommendation Procedure for University A*

Each academic department in University A has a certain budget for their acquisitions. Throughout the academic year, faculty members could forward their recommendations for books and journals (among other materials) that they need according to the subject and course curriculum. The allotted budget for each department is used to acquire the materials. Moreover, students could also forward their own requests to the library, especially in terms of journals. The library would look for the references to provide for the student researchers for the meantime, and if they receive sufficient request for the same material, they would consider purchasing the reference to be included in the library. There is a system of rewards given to the academic departments based on their acquisition. If a department has used more funds for their references, then the University allots a larger sum for them the following academic year. However, if the department is found to have not been effectively using the acquisition funds allotted to it, then its budget would be re-evaluated. At points during the semester that the acquisition budget of the departments cannot pay for the reference requests, University A's library uses its own acquisition budget to purchase the reference materials recommended. The library's acquisition budget comes from various sources (i.e., as allocated from the over-all University budget, from the amount charged per student, and from donors if ever such amounts are given).

*As explained by University A library personnel

Table 7 Summary of Reference Recommendation Procedure for University B*

University B is divided into Schools, each home to different academic departments. The University has an Acquisitions Committee, to which each School is represented by one faculty member chosen by the Dean. The representative would gather recommendations from faculty members which he/she will forward to the Acquisitions Committee when it convenes. The Committee and the library decide which reference recommendations would be approved, according to standards of affordability and being in line with the curriculum. This means that if the reference is necessary for the course and the subject area, then the library approves of it. There are more printed references than online materials, such that the library selects to acquire printed ones rather than pay for subscriptions for the online websites and databases. The library maintains a number of serials and printed journals in its selection, and cancellation of the subscription is placed under scrutiny. The Departments and the Schools must be "sure" that they want to cancel a subscription, because if the subscription is stopped and then later on resumed, then the result would be an incomplete collection.

*As explained by University B library personnel, and a thesis adviser who is a representative to the Acquisitions Committee

used website of journal databases that the teachers use, and the account could be shared by the departments and/or the university itself. However, the structure of prioritization of printed journals does not allow for the suggestion to happen, or at least not as of this time. Hence, the expansion of the epistemic community by means of a wider range of journals and researches to cite is not so much evident in University B, compared to University A.

Inter-University Epistemic Community

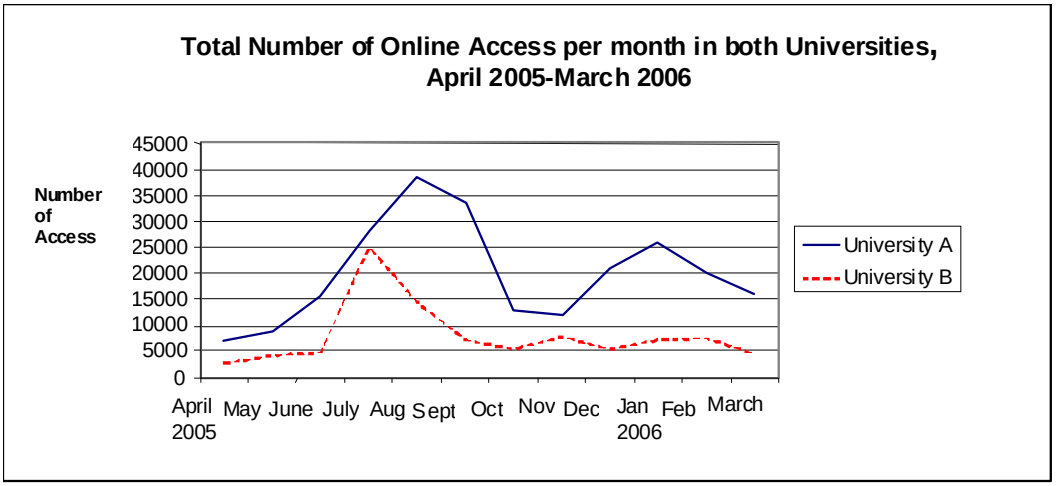
Table 8 summarizes the trend of accessing online resources, based on the tallies of searches of each university subscription from the EBSCO server. Based on table, the trend of accessing is almost the same for both universities. It peaks during the latter part of the first semester, and rises again at the latter part of the second semester in preparation for final requirements for different course loads. This shows the basic trend of research for the Philippine educational system, that at least once every semester, the students are required to conduct researches to contribute to the knowledge production.

As earlier discussed, University B has limited serial and online resources. This limitedness is shown by the low counts of online access throughout the year (Table 8), because students and thesis advisers say that once the database shows that there are very few available sources for a particular topic, they would immediately go to other universities to find references. Thus, because some universities have more references than the others, resource sharing is done among Philippine universities.[13] They allow access to each others' collections, given proper recommendations are made. In cases that thesis advisers have to recommend a library to go to, where do they usually send their students?

University B thesis advisers, refer their students to University of the Philippines Los Baños campus or Diliman campus because the libraries of these campuses have a wider range of collections than the University B library. Here it is seen that the selectivity focuses more on the printed materials than the online materials. When asked why they do not send their students to University A, thesis advisers said that they are unaware that the University A library allows for visitor researchers. Whereas, University A library personnel said that it allows non-members of University A to use the references in the library for a minimal fee. Here is it seen that the relationship between the epistemic communities of University A and University B is not so much established, compared to the relationship and link of University B to University of the Philippines.

This means that the Philippine epistemic community is still putting a premium in utilizing printed journal collections in research, rather than referring to subscribing to websites that offer vast collections of references. Knowledge production has not adjusted to the changes brought about by technological advancements. Moreover, the Philippine epistemic community is nuanced to the societal conditions, as Pertierra (2003) says, that only some universities could afford such advancements in technology. Science and technology in the Philippines benefits those who have the capital (both financial

Table 8. Total Number of Online Access per month in both Universities, April 2005-March 2006



and scientific), which in turn produces more capital for them. In this case, the epistemic community in University A acquires the scientific capital through referencing to the most recent researches abroad, through its vast collection of updated databases.

SELECTIVE REFERENCING AND SCIENTIFIC CAPITAL

Knorr Cetina's concept of epistemic communities point out to the practice of citation and selective referencing as integrative mechanisms, which allows the scientist as a "practical reasoner" to situate himself in a larger epistemic communities. This assumes that the choice of referencing is placed under the selectivity of the researcher who wants to establish his place in the scientific community.[14] However, the findings of this study regarding referencing of natural science researches in the Philippines would say that researchers do not have the discretion in "selective referencing." Instead, Natural Science researchers in the epistemic communities of Philippine universities rely on whatever reference is available for their particular area of study. Therefore, the student and teacher researchers are limited according to what studies they could find that would be relevant to their research.

This is attributed to the lack of resources for the natural sciences here in the Philippines. Universities strive to acquire as much resources as possible, so that they would be able to provide for references to further the local epistemic communities. But this is nuanced to the economic factors that the Philippine universities have to deal with, such that very few institutions could afford resources such as University A, or a particular number of resources only such as University B.

However, even if referencing is limited, thesis advisers and students still use a number of criteria to select which

references they would be using for their research. This is the appropriation of the concept of "selective referencing" here in the Philippines. The following are the criteria that researchers in the natural sciences are using when utilizing printed journals:

- *Area of study for relevance*. This is the primary criterion given. Since researches in the natural sciences are very particular and focused, whatever resource for the topic would be deemed relevant.
- *Year of publication for significance*. The earlier the publication of the journal, the better. Some thesis advisers require journals published only as far as ten years prior to the present study (i.e., up to 1996 only if the thesis is done in 2006), while others require only from year 2000 onwards. This is to locating the studies in the most recent and developing epistemic communities.
- *Peer evaluation for credibility*. Researchers look at the website and see if the journals have been peer evaluated, meaning have been read and reviewed by other scientists as well.[15] Peer evaluation could also mean that the journals (or websites) are recommended by their colleagues or their mentors.
- *Place of experimentation for research capacity***.** Teachers and students say that they would find the sources credible if the researches had been conducted in Europe, America, and Japan, although they are not very much particular on the research institute or the authors. Therefore, much of the natural science researches here in the Philippines are referenced to the said larger epistemic communities abroad.

Hence, the concept of selective citation in Philippine natural science research deviates from the definition of selective citation by Knorr Cetina. Although, the assumptions remain that there are sources that are established in the epistemic communities abroad, which in turn would be used to build up scientific capital for the researches here in the Philippines.

If such criteria (i.e., significance) are used to determine which journals would be acceptable for study, then the continuous acquisition of printed materials would be put under question. For example, what happens to the printed journals when they are already considered outdated? They cannot be disposed, both Universities agree, but must be stored in case the journals would be needed in the future. For University A, such problem is answered by the movement towards acquiring and maintaining online databases. In the case of the printed collections, University A is "microfilming" the journals and store them in CDs, so that the studies would still be kept. On the other hand, University B is not concerned of such as of now, and has not finalized if its library would expand its collection of online databases because of the costs entailed. All of these concerns would have to be addressed in the near future not just by the two universities under study, but all the universities in the Philippines that acquire reference materials.

Epistemic communities here in the Philippines are nuanced to the structures within Universities, the referencing practiced by teachers, and the limitations set by the capacity of Universities to acquire and share resources. Thus, Knorr

Cetina's (1981) selective referencing does not readily apply, at least to the natural sciences, since researchers in the Philippines are bound to the socio-cultural and economic considerations in the acquisition of online materials.

CONCLUSION AND IMPLICATIONS

Epistemic communities in the undergraduate natural sciences programs in the Philippines are challenged by the constant innovations in science and technology. These innovations have implications to access to journals and researches that situate the country's researchers in the more established research communities abroad. In such case, the scientist as a "practical and economic reasoner" plays a very important role in making the epistemic communities in the Philippines more established, and in creating a balance between scientific credit and capital with the economic limitations. The values that inform the decisions of these "scientists" in knowledge production must be clear: should research communities in the Philippines value research capacity and independence, or should they primarily consider costs and expenses acquired in the process of purchasing references? Such contingency is not in a binary opposition, since it is already established that resource-sharing is possible. However, even this resource-sharing is still adapting to the emerging online technologies, and would require more time for the epistemic community encompassing all the knowledge producers in the Philippines to be able to maximize the benefits of the online databases to researching.

Moreover, this study shows that the knowledge producers in the natural sciences in the Philippines possess less capacity to determine the course of their research, at the very start in the theoretical framing stage because of the limitedness of the references in the country. This is because selective referencing in the Philippines is limited to the availability of references, nuanced to the economic capacity, and factors of selectivity considered by agencies of knowledge production. This is slightly different from Knorr Cetina's (1981) assumption that the scientist has the prerogative to choose references in established epistemic communities.

This research is the first study ever conducted that evaluates knowledge production in Philippine universities with regard to online technologies. This could be furthered in a few years' time to reassess how technologies are utilized to further research – whether or not online databases in universities are more utilized, whether or not the problem of physical space has been addressed, whether or not teachers and students are more comfortable in using online technologies, whether or not resource sharing among Philippine universities have significantly changed. This study could also be forwarded if expanded to examine the use of technologies in social science researches.

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NOTES

1 This focus takes into account that researches for the social sciences have a much wider scope of available references. Online journals such as EBSCO and JSTOR contain researches from almost all areas of research, not only in the social sciences. Moreover, other fields of study in the social sciences also tap into current events and updated statistics, and such data do not come from the journals made available by the online databases.

2 The names of the universities are kept confidential, since there are data and information in this study that have been granted permission only for research purposes.

3 CIPPA, a program shared by some Philippine universities, compiles and microfilms local publications for archiving and retrieval. It is a project started by and purchased from Ateneo de Manila University.

4 *Millennium* is the real name of the university software.

5 *B-Project* is a pseudonym for the actual project that has been launched by University B.

6 According to library personnel, the costing as given by the host server (i.e., EBSCO) differs according to the number of projected users in the university subscribing to it, among many other considerations. This means that the costs could lower as the number of potential users increase.

7 If a needed journal is not available in University A library, University A would contact the other universities in the Philippines that provide online databases to check for the availability of the needed study. The researcher would then have to pay for fax services. However, since University A provides the largest collection of online databases in the country, this scenario does not always happen.

8 This supports the interview findings that students and teachers prefer doing research in the library, at least initially, and would continue to access online journals for as long as they could find the resources that are applicable to their area and topic of research.

9 This observation is based on computing the total amount spent on acquiring online materials divided by the total number of accesses. Therefore, more number of accesses, the lesser amount is spent per access.

10 *Scholar.google.com* is a search engine powered by Google.com that looks for journals, theses, and dissertations that are available in the internet. It might be considered a competition for the online databases that have to be purchased by universities, but University A library personnel say that the collections in *scholar.google.com* are "less vast and less credible" than those in the purchased online databases. A key informant who works in the library said that EBSCO reviews which journals it would include in its roster of titles and would offer the most useful ones. However, students who have been using *scholar.google.com* disagree, saying that those in the library "*could be*" more limited than the internet.

11 The consensus of what the teachers use determines their epistemic community and locates their epistemic community to a larger one – that wherein the studies they download are part of.

12 Before, internet resources were not yet available, and she takes this scenario as the "convenient" one. Selectivity could be at work when she reasons that since it worked during her time, then it should work in this time, ignoring the influence of the development of online technologies and its effects in research.

13 It has been explained at the earlier section of the findings that University B is maintaining the chemical abstracts based on its agreement with the Department of Science and Technology, while University A gathers as much resources as they could which gives it an extent of research independence.

14 For example, researchers would have a particular author or school of thought in mind, and that they would connect themselves to this author through citations so that they could be integrated in the author's epistemic community.

15 This is not particularly a concern because journals would have to be peer-evaluated before they could be published. This criterion applies more on the researches that are searched and retrieved through the internet.

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REVIEW ARTICLE

Saloma-Akpedonu, Czarina. 2006. Possible Worlds in Impossible Spaces: Knowledge, Globality, Gender and Information Technology in the Philippines. Quezon City: Ateneo de Manila University Press. 247 pp.

Raul Lejano

The theme of Saloma-Akpedonu's book is the discovery of new heteropias within the Philippine IT (information technology) industry. Unlike More's utopia or Castell's hypertext, a heterotopia is a real place (Foucault 1986). Indeed, even that most ethereal of worlds, the internet, exists in real places, as zeroes and ones pulsing on and off in some server, over which hovers an IT specialist slurping a real cup of coffee (or tea) or inhaling a slice of pizza (or Tandoori chicken). Unlike Baudrillard's simulacrum, the heterotopia does not exist so much as a hyperreal copy of real places, but instead as a counterpoint that relates to every other place as a site of deviance, irony, and a radical reordering of space and time.

In the beginning of the book, the author proposes two things. First, that the Philippine IT industry allows for the creation of a local community (which, in its dialectic with the global, moves us to make up awkward words like glocal) that is embedded in and embeds in itself the global and that, furthermore, this community allows for feminine spaces in an otherwise masculine field. The second proposition is that this should not happen, if IT is to go the way of other technological advances (e.g., industrialization, computerization) where the global completely colonizes and dominates the local, and where feminine spaces are relegated to the lower-end, routinized, phase of production.

The author proceeds to study the Philippine IT industry not as an industry or state of the world per se but as a practice – in the doing of IT. In this manner, she employs a mode of research popularized by Latour in his study of science in action – simply observe IT professionals actually producing IT in its everyday sense and see what its culture and supporting networks are (Latour 1987). Working as journalist and ethnographer, she proceeds to study two such "laboratories": the nondescript office of the Pinoymail headquarters, and the more formal Makati office of a GPS (global positioning system) hardware/software developer. The contrasting ecologies of the two sites lend us much insight into the range of contexts that might be found within the IT world – giving credence to her thesis that within

this space might be found unexpected worlds. Indeed, it makes the reader desire to see into other such laboratories.

In chapter six, the author builds the intriguing argument that the Philippine IT industry is an active site of glocalization. She illustrates how the local manifests itself in the globalized theater of internet mail. The most interesting example of this is Pinoymail – which like Hotmail (which is globalized) and yet Filipino. The phenomenon goes the other way, too, as the local Pinoymail expands discursively, as users bring to it ideas that exceed any local meanings. In chapter five, she looks at the emergence of feminine spaces within IT. The explanation she gives for these spaces, while preliminary, are quite plausible, having to do with the nature of this particular technology (e.g., combining both digital and business know-how) and the agency of the intermediate technology professional herself.

Mind you, I felt the treatment of the Philippine IT phenomenon tended to tail off when it started to get most interesting. Primarily, it might have attempted a thicker description of everyday practice, on the one hand, and a more ecological treatment of its sociological dimensions, on the other. In terms of the everyday, one wonders what practices constitute the identities of the technicians within it. What is the social habitus within which Pinoymail establishes and sustains itself? Cyberspace is irreducibly contextual, as Woolgar (2002) has pointed out and, so, one needs to have a richer treatment of context. How do these places interact with their virtual spaces (e.g., Horan 2001; Blanchard 2004)? Having broached the sphere of the personal, one might as well enter all the way into an ethnographic description of this professional and social milieu. How do IT professionals construct their own identities, and how does society reinforce this, as Giddens (1987) might wonder? How are these heterotopias constructed, both discursively and materially? Regarding the sociological, I had hoped for a more thorough working out of the process of realigning the global labor force and, particularly, the Philippine labor scene.

I believe that the book manages to carve out an important area of thought and sociological research. Engaging questions surface, such as:

- What exactly are the implicit and tacit knowledges embedded in IT?
- Is glocal, in IT, merely the merging of global or local, or is it a new topology?
- What are the ecologies and practices like in other IT "laboratories" in the Philippines?
- How is "Filipino" constructed in the internet? How is "Filipina?"
- What is the phenomenology of place in this new medium? How does place matter?
- Is the net really a public domain or, if not, who are the hegemons?
- Is the net a tool for neoliberal discourse, or is it what I have heard some long-winded theorists call a directly deliberative polyarchy?
- Who is reading my email?
- When I get email from a former ambassador in Sierra Leone who needs help recovering $50M from is late father's, the shipping magnate's, trust, what do I email him back?

but answering these is not what the book is ultimately about. It is more about uncovering a new heterotopia, suggesting where to find it, and what it might look like. I do see how the world of Philippine IT might be heterotopian, simply because its places are sites of irony, allowing feminine spaces and glocal communities that one might not have expected (hence the title). In it, space and time are reordered, and relations between social spaces are reconfigured. Lately, I am feeling otherwise—it is not so much a heterotopia but, in fact, a new type of private-and-public (prublic? publivate? neo-hemiprivipublicate?) space, sometimes supplementing, other times displacing, ordinary spaces. Perhaps we should map these like we do real spaces (e.g., Stokols and Montero 2002) — now that is an area that is just ripe for research.

The book introduces inquiries that are not just novel but maybe crucial. It gestures toward a horizon to which Philippine society and economy may be heading—where everything is increasingly disemplaced and migratory, interstitial, ethereal, and fragmenting. I wish Philippine academics did more research, like this and more. We owe it to society to begin unearthing the nature of these new spaces of industry and identity at the same time as the latter unearth us.

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BOOK REVIEW

Pertierra, Raul. 2006. Transforming Technologies: Altered Selves, Mobile Phone and Internet Use in the Philippines. Manila: De La Salle University Press. 158 pp.

Sakari Taipale

Expectations for information and communication technologies (ICTs) were high at the turn of century in Asia. It was hoped that the mobile and the internet would improve the economies of the region, reshape social networks and strengthen cultural identity. Raul Pertierra's book, *Transforming Technologies: Altered Selves, Mobile Phone and Internet Use in the Philippines*, analyses the social and cultural consequences of ICTs for the Philippines. Filipinos quickly embraced the mobile, reaching the top of international ranking lists for the number of sent text-messages, even though economic development did not follow. To examine why the Philippines did not benefit from the first wave of new technologies, the book deals with two major concepts: discursive intimacy and notions of the stranger, and describes how Filipinos are re-evaluating their bodies and even their souls through the new technologies. This latest book is an extension of an earlier research project which resulted in the book, *Txt-ing Selves: Cellphones and Philippine Modernity* (2002).[1]

ECHOES FROM THE PAST

The book begins with a sharp and critical review of the ineffectiveness of technology and science policy in the Philippines. According to the author, there is a major culture-historical process behind the current state of affairs. Philippine science policy was politicized when the local administrative power was transferred from the Americans to Filipinos during the 1930s. Thereafter Filipinos aimed to strengthen their national identity by redefining the focus of national science policy. By implication, Pertierra leads us to understand that the seeds for an information society that were sown under the American regime were mostly uprooted. In addition, Pertierra considers that the culturally-embedded idea of inborn skills has decelerated the scientific and technological development in the Philippines. Because Filipinos consider many of the characteristics of their national culture as modern and global, investments in the cultivation of skills and knowledge have been insufficient. According to Pertierra, especially such

features as sociality and musicality are often perceived as blessings, not as improvable skills. He suggests that sociality as an inherent feature would explain, at least partially, Filipino enthusiasm for text messaging. Deficiencies in the cultivation of skills, for one, may help us to understand the invisibility of science and technology in the country.

Although the culture-historical basis of the book can be justified, the book does not bring out many causes for optimism. Are there any positive signs in view in the Philippines regarding the future of science and technology? From the European point of view, it could be assumed that the new cellphone generation and the great mobility of Filipinos could gradually lead to the creation of a science and technology culture. Service-sector occupations abroad have employed less-educated Filipinos already for long. Asian, European and American universities, on the other hand, have fascinated education seekers and contributed to international mobility amongst the well-off. When one also considers that around 10 percent of Filipinos is estimated to reside overseas, it could be assumed that mobility as presented above indicates the growing thirst for knowledge and self-development fuelled by societal circumstances. Despite all this and the fact that overseas workers actively utilize new ICTs, Pertierra does not seem to believe in new generations and mobility as transforming forces. Quite the contrary, he proposes that many Filipinos are bounded by family-centeredness and that well-educated returnees optimize poorly their skills for the common good of the country.

THE NETWORKS OF INTIMACY

The analysis on the networks of intimacy is by far the most interesting part of the book. Considering a lack of domestic space in densely built-up areas like Metro Manila, cellphones and the internet may provide ordinary people with many possibilities for extending their private space. Pertierra vividly illustrates how the networks of intimacy, the members of which are significant only to a given individual, are created with help of new ICTs. The conceptions of body and soul are more often re-evaluated in virtual networks, and in a constant dialogue with online others. This kind of intimacy gains it meaning from the total independence on the present others. Therefore, virtual space may become an irreplaceable arena of privacy-making in densely occupied societies. Pertierra presents a set of case examples which illustrate how Filipinos get to know strangers via mobiles, how the internet enables exploratory online journeys and cybersex. It is surprising to notice how intimate virtual spaces appear very much as private but not secluded at all. The beauty of Pertierra's insightful analysis is right here. It brings out a reversed version of privacy-paradox originally presented by Durkheim in his well-known study on suicides. Whereas the initial purpose of the cellphones has been social (i.e., to connect people), the cellphones are increasingly utilized for private and intimate purposes.

A close relationship of religion and the cellphone is another distinctly Philippine phenomenon presented in the book. In a Roman Catholic country, spiritual content services which link a human being to the sphere of spiritual life have gained much popularity among a

wide range of social classes. Although Pertierra courteously argues that the conservative and religious culture has been hindering technological and scientific development in the Philippines, he depicts the relationship of religion to ICTs otherwise as rather uncomplicated and tolerant. Pertierra suggests that the popularity of spiritual services may well indicate the capacity of new technologies to bring out the innermost feelings and beliefs of human beings.

WHOSE TECHNOLOGIES, BODIES, AND SOULS?

The book hints that new ICTs could have opened the floodgates to globalization in the Philippines. My reading herein is that cellular phones have manifested themselves rather as commodities brought by globalization, not as the enablers of globalization. The study describes how cellphones have been utilized in order to overcome the norms of intimacy, as well as the limits of time and space, in various ways, but the analysis in this respect is placed mainly within the borders of the Philippines. Regarding the internet, the picture is quite different. The information highway has really broken down boundaries and it really seems to link Filipinos with the rest of the world. This is the case even if the number of internet users is still limited.

The generalizability of the study is fairly difficult to assess, alongside the composition of internet users. However, some deductions can be made since the study includes a small survey and some background information on interviewees. The study deals mainly with young adults. Regarding the internet, the focus is on the comfortably well-off people. Considering the cellphones, for one, the socio-economic coverage of the study seems to be wider. Even if the elderly and the elite are to a certain extent underrepresented, the study presents fairly good snapshot of the accessibility and diffusion of new technologies in the Philippines. Only the well-off can afford the internet without major efforts but the cellphone is within the reach of the many.

Finally, Pertierra's study on the internet and cellphone culture in the Philippines opens up new horizons for research on technology-meditated social networks. Whereas sociological studies on ICTs have paid much attention to teenagers and entertainment usage, Pertierra's in-depth analysis reveals that cellphones have the capacity to accumulate social capital and extend social networks. Interestingly, this capacity may be active even when the primary purpose of mobile use is to strengthen the sphere of privacy. This is illustrated very well in the examples dealing with texting with strangers. In addition, the book provides fascinating examples of the blending of social, cultural and technological in the context of the Philippines. The book provides food for thought for social scientists and experts of development studies.

NOTE

1 Pertierra, Raul, et al., 2002. Txt-ing Selves: Cellphones and Philippine Modernity. Manila: De La Salle University Press. 197 pp. This book won the National Academy of Science and Technology (NAST) Outstanding Book Award, Social Sciences Division in 2004.

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1. Standard length of papers is 6000 words (approximately 20 pages typed double spaced with generous margins at the top, bottom, and sides of the page), but shorter contributions are also welcomed.
2. Include a brief abstract of 100-200 words summarizing the findings and at most five key words on a separate sheet of paper (without author information).
3. Title, author's name, affiliation(s), full address (including telephone and email address) and a brief biographical note should be typed on a separate sheet.
4. *Notes* should contain more than a mere reference, although it is recommended to use notes only for substantive observation and to limit the length. They must be numbered serially and presented at the end of the article in a separate endnotes section that appears before the References.
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6. Please use The Chicago Manual of Style, 14th ed.

   a) The following examples illustrate the format for referencing in the text:

   (Banzon-Bautista 1998: 21)
   (Lynch & Makil 1968)
   Zialcita (2005)

   For Filipinos, the "outside" world is "a place of power, wealth, cleanliness, beauty, glamour and enjoyment" (Cannell 1995: 223).
   Source: Saloma 2001

   "After all," he said, "*pinoy* can be seen along national lines."
   Source: Saloma 2001

   b) List two or more works by different authors who are cited within the same parentheses in alphabetical order by the first author's surname. Separate the citations with semicolons.
   For example:
   Scholars (Karaos 1997, Porio 1997, Tapales 1996)

c). All references cited in the text must be listed in the *References* section. The details should be listed in full, alphabetically by author. The following examples illustrate the format for references.

Journal or Magazine Article

Marcuse, P. 1989. "Dual City: A Muddy Metaphor for a Quartered City." *International Journal of Urban and Regional Research* 13, 697-720.

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Estopace, D. 2005. "The business of poverty." *Today*. 25 January, p. B3

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