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Doing Information Technology: a gender perspective on the New Economy

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Doing Information Technology: a gender perspective on the New Economy [1]

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In this paper[3], I will examine the 'doing' of information technology in a developing country such as the Philippines. I will show that while dependent assembly work persists, there has also been a broadening of spaces for active, creative work. This focus on active technological work examines not only the spaces within the global division of knowledge-based technological labor but also the spaces within the gender division of labor.

In 1997, the Philippine government came up with IT 21 or 'The National Information Technology Plan for the 21st Century'. This document presents the vision and the broad strategy to make the Philippines a 'knowledge center in Asia',

> "a leader in IT education, in IT-assisted training, and in the application of information and knowledge to business, professional services and the arts" (NITP 1997: 5).

Yet, the literature notes that among the three principal stages in the information technology production process, namely, design, fabrication, and assembly, the first two processes - which require scientific, technical and engineering labor - take place in the information technology company's home country. Fabricated products are then sent to installations in developing countries where they are assembled into final products (Webster 1996a: 86). Seen in this light, the goal of becoming a 'knowledge center in Asia' inevitably makes the question about how

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information technology is being done in a developing country a question about rethinking dependency.

Dependency reconsidered

Dependency as a basic concept in development theory refers to a limiting condition that is characterized by reliance on inputs from advanced industrial countries. One of its operationalizations is the international division of labor where particular countries specialize in certain products or in selected parts of the production process. Fröbel, Heinrich and Kreye (1980) describe the international division of labor that first appeared in the 1970s as 'new' to emphasize how the transfer of a significant portion of ecologically-damaging and low-skill industrial activities to selected developing countries fueled the industrialization of these countries. With the shift in the location of production means, these countries do not only produce raw materials but also manufacture key consumer goods such as textiles and electronic components (Pearson 1998: 171-172). These changes result in the creation of a new working class consisting mostly of women who worked for lower wages and in inferior conditions. The creation of this new working class happens through a process called 'feminization of labor'. In this process, certain attributes that were formerly reserved to female jobs (e.g., flexibility and deregulation), become associated with male jobs (Standing 1989: 1079, Haraway 1991: 166, Pearson 1998: 176). The transformation of traditionally male jobs is felt by women in the loss of the male wage, on the one hand, and in their intensified captivity to economically disadvantageous jobs, on the other. What these processes and changes point out is that the gender division of labor, which allocates tasks throughout society on the basis of gender, is an integral part of the international division of labor.

To take into account the centrality of knowledge and the conceptual limitations of the term 'international', I refer to the processes involved in the creation of information technology as the 'global division of knowledge-based technological labor'. This division of labor retains some of the features of the new international division of labor that emerged in the 1970s, but unlike its predecessor, it does not entirely marginalize women from the process of technological creation. This understanding is not recent: it is pointed out that while design and fabrication of information technology products take place in developed countries where they are done mostly by men, women in developing countries have been doing the final assembly of these products

(Webster 1996a: 85-86).[4] My aim in this paper is to widen both spatially and temporally the empirical inquiry of women's activities from companies located in Southeast Asian, Chinese, Indian and Latin American free-trade zones to the new forms and organization of information technology activities in an urban center of a developing country.

As an alternative to concepts of dependency, I use the notion of 'social interface' or the "point of intersection or linkage between different social systems, fields or levels of social order where structural discontinuities, based upon differences of normative value and social interests, are likely to be found" (Long 1989: 2). The concept allows me to examine the information technology industry in the Philippines as an arena where encounters among different actors and different social situations appear as negotiations, exchanges, and strategies (Arce and Long 1992: 214, Long 1992: 6, Lachenmann 1995: 24ff).

In these interfaces, actors create spaces that bear on "social forms and commitments that shape future possibilities for action" (Long 1992: 9). In other words, spaces are sites of changes and breaks in the existing global and gender division of labor. Thus, while there is empirical evidence that in offshore subsidiaries, women dominate the data entry and/or semi-skilled assembly workforce, software engineering has been carried out in India and other parts of Southeast Asia. In the Philippines, Japanese companies have been doing contracts for hardware design, including microprocessors.

How are interfaces and spaces structured within the information technology arena? I shall suggest an answer to this question by presenting two concepts. One is Granovetter's 'social embeddedness of the economy'; the other is 'gendered embeddedness', an approach that is being elaborated at Bielefeld University (see, for example, Lachenmann 1999). The social embeddedness approach is a critique of the classical and neo-classical view in economics of rational behavior as behavior that is affected minimally by social relations. In relation to technology, this view of 'undersocialized' actors is expressed as 'technological determinism', whose central element is the view that "technology impinges on society from outside of society" (MacKenzie and Wajcman 1985: 4).

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[4] Webster mentions that information technology companies in Europe, which are concentrated in Scotland and Ireland, also let women carry out semi- and unskilled production operations. However, these companies carry out complex product manufacture on a batch production basis unlike the assembly and mass production being done in Southeast Asian off-shore companies (Webster 1996a: 87).

In opposition to an 'undersocialized' account of actors in economics and technology, there is a tendency, no less faulty, to subscribe to an 'oversocialized' account of an actor. In this view, the actor has fully internalized social norms and ongoing social relations have minimal effects on behavior. Granovetter, resolving the extremes of the two conceptions, points out that both share a common view of action and decision as being carried out by actors who are independent of social relations. Departing from this view, he argues that

> "[a]ctors do not behave or decide as atoms outside a social context, nor do they adhere slavishly to a script written for them by the particular intersection of social categories that they happen to occupy. Their attempts at purposive action are instead embedded in concrete ongoing systems of social relations" (Granovetter 1985: 487).

Granovetter (1985: 490) distinguishes between 'relational' embeddedness which refers to the dynamics and norms of one's personal relations with one another, and 'structural' embeddedness which corresponds to the broader networks of social relations which are affected by the ripple effect of an economic transaction. Barber (1995: 388), arguing that other embedding contexts have been analytically left out of Granovetter's concept of 'networks of interpersonal relations', writes about the importance of larger social systems such as kinship, stratification, knowledge, religion, and government institutions.

The second concept, 'gendered embeddedness of the economy', is an analysis of the 'social embeddedness of the economy' from the gender perspective. This approach looks at the contexts of women's activities and the gendered structure of economic fields, and offers a correction to the tendency and the deficiency of the use of 'gender' in development theory only in the sense of excluded, poverty-stricken and vulnerable groups (Lachenmann 1999: 1).[5] As a way of looking at multi-layered interactions of women's activities with reproductive, subsistence, informal and formal economies, Lachenmann (1998: 298) suggests the concept of 'women's economy' whose crucial characteristic is the interaction and complementarity of women's employment to their life-worlds. Viewed within women's economy, asymmetric gender structures (e.g., prevalence of

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[5] One source of this view is Ruth Pearson and Diane Elson's 1981 work. Pearson, responding to critiques that she and Elson ignored the benefits of industrial employment to Third World women and the 'agency' of these women, says that they did not intend to represent Third World women as unambiguously disadvantaged by industrial employment. While she concedes that their examination of the interaction between the experience of industrial employment and traditional gender identities was for heuristic purposes, she points out that such examination allowed them to show that the relationship between capital accumulation and traditional gender identities was determined by capital and patriarchy rather than open to negotiation and reconstitution by women workers (Pearson 1998: 180).

male spaces in certain information technology arenas) are not problematic. Rather, they are manifestations of how the social organization and networks within the Philippine information technology industry are structured, of which the construction of gender is an integral part.

A map of the Philippine information technology arena

The examination of the 'doing' of information technology[6] in the Philippines spans questions about types and arenas of knowledge and practices which in turn are related to the question of 'who is doing what and why'. Borrowing from Schutz and Luckmann (1973) who elaborated on the difference between the 'layman', the 'well-informed', and the 'specialist', I refer to the different activities and levels of complexities within the information technology arena as the 'social distribution of knowledge'. Inherent in the use of the concept are two assumptions: one, that the information technology arena is inhabited by a variety of knowledge forms and actors, and two, that knowledge is expressed in the realm of practices.

In a framework for exploring disjunctures of the global cultural economy, Appadurai (1996: 34) introduces the concept of 'technoscape' for the fluid, global configuration of high and low, mechanical and informational technologies, and the complex relationships among money flows, political possibilities, availability of both un- and highly skilled labor, and the distribution of technologies. In adopting Appadurai's 'technoscape', I draw a map of the social distribution of knowledge in the information technology arena which shows that in between unskilled and highly skilled labor there are varied intersections of knowledge systems and practices.

In this map, the supply chain of information technology workers as a division of labor between the Commission of Higher Education (CHED) which regulates programs for university and college levels, and the Technical Skills Development Authority (TESDA) which develops regulations for training programs for the so-called middle-level workforce (e.g., non-degree programs that develop data encoders, computer programmers, computer technicians and network

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[6] Information technology (IT) generally applies to the electronic exchange and management of data. In the 1960s, this arena was called 'computer technology' and mainly comprised data processing and office machines. With the merging of telecommunications and computers in the 1980s, it became 'information and communications technology' (ICT). This arena keeps on growing. For example, at CeBIT 2001, multi-media entertainment and security were identified, along with telecommunications and information technology, as key technologies of the new economy. In my work, I use IT and ICT interchangeably.

technicians). In this map, the occupations are structured into three groups: programming development, customer support, and data encoding. The hierarchy in these groups starts with the TESDA-supplied encoders, programmers, computer and network technicians at the bottom and is filled up by CHED-supplied programmers, systems analysts, project managers, systems and network engineers, database, systems and network administrators, and project managers.[7]

The arena can also be mapped out according to the industries where the creation of information technology products is pursued:

a) manufacturing (e.g., manufacture of machinery and equipment, electrical apparatus, radio, TV, and communication equipment and apparatus, medical, precision and optical instruments, watches and clocks),

b) wholesale and retail trade (e.g., wholesale of household goods, machinery, equipment, and supplies; retail trade of goods in specialized stores; repair of personal and household goods),

c) transport, storage and communications (e.g., telecommunications including transmission of sound, images or other information via cables, broadcasting, relay or satellite),

d) real estate renting and business accounting (e.g., renting of personal household goods, machinery and equipment, hardware and software consultancy; data processing and conversion services; maintenance and repair of office, accounting and computing machines, research and development),

e) education (private technical and vocational post secondary non-degree education; private higher education), and

f) other community, social and personal services (e.g., motion picture and video production and distribution).

Radio, TV and communication equipment and apparatus manufacturers are the biggest employers in the industry with a mean employment (total employment/number of

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[7] Another way of mapping the Philippine information technology arena is to divide the industry into information and communication technology, e-business, and call-center occupations. Information and communication technology occupations include systems development, design, implementation and maintenance (e.g., hardware and software programmers and designers). E-business occupations include those which use the Internet as the central element of work (e.g., web design), while call center operations rely on the telephone as the main instrument of work (e.g., client support services). These categories overlap as in the case of the technical support group of an internet service provider where engineers provide client visits as well as on-line and telephone assistance. But such a presentation only includes high-end information technology occupations.

establishments) of 448 persons. On the other hand, hardware/software development and consultancy, data processing, database management and R&D establishments--- areas where I did most of my biographic interviews and direct observations--- have an average employment size of 25 persons (1997 Annual Survey of Establishments, National Statistics Office).[8]

Electronics industry: second impressions

I asked the owner of an electronics manufacturing company which runs research and development (R&D) activities on leading edge technologies in electronics, communications, and the environment about how he chooses R&D areas to go into. His account displays one theme that will be repeated all throughout this paper: the activities in information technology industry do not mean a displacement but rather a diversification of existing forms of practices.

> "This was four years ago. Telecommunications was growing, we had a lot of workers, but we had to compete against China...We decided to get into fiber optics so I looked around. Companies were making cables with specific length, but if it is not a standard length, it will take two-three months to get an order. We went to a company that makes fiber optic cables, and told them we want to get into specialized cables. In fiber optic cables, there are two connectors, one at each end and that was to be done manually. So what are we looking at is that women will be working on it, it is hand-made, and there is a market..." (Julius, 01/09/2000)

Over time, the company's facilities and workers who produced parts for Japanese TV sets in the 1980s also produced connectors for fiber optic cables, and electronic ballasts for solarium lamps and microwave ovens in the 1990s. Julius's account points to a fact that is rarely considered in any discussion of technological change: that the conversion to another technology is accelerated by the availability of female workers (Cowan 1985: 53). This in turn leads to two conclusions:

First, both monotonous work in the 1970s and multi-skilled assembly work in the 1980s continue to exist in the information technology industry. Braverman (1974) introduces the

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[8] The information technology industry has existed for more than three decades in the Philippines, but the move to classify it as a separate industry in the Philippine Standard Industrial Classification (PSIC) System started only in 2000. The above figures come from existing establishments where IT and IT-related activities are likely to be found. The second biggest IT sector is the manufacture of medical precision and optical instruments, watches and clocks whose establishments employ, on the average, 379 persons. The next highest mean employment figures are found in private higher education establishments

concept of 'de-skilling' to describe the fragmentation of work in the 1970s into smaller, simpler and unskilled tasks and the consequent displacement of skilled labor by unskilled labor, chiefly women and untrained young people. Subsequent studies challenge the de-skilling thesis. They point out that while some women may have lost jobs as certain skilled occupations disappeared in the 1980s, others experience skills upgrading. In some instances, women who have been de-skilled of their former skills of nimbleness and dexterity have acquired new skills such as abstract reasoning, problem-solving, simple machinery repair, and statistical process control.

Second, the assembly of fiber optic cables suggests that women continue to perform the 'invisible' activities that service the strategic sectors of a society, from electronic media to telecommunications. The 'invisibility of women' in the production process is not only due to the fact that the components (e.g., integrated circuits) assembled by women are usually not visible as end-products. It is also a result of studies that focus on areas such as development and design where women are scarcely present. These studies examine the shaping of technology in the hands of its creators and present an alternative view to technological determinism. But since most of the creators of technology are men, these studies failed to see women.

Studies of technology in developing countries have addressed the conumdrum of the 'invisible woman' by focusing either on female-dominated assembly work or on women as users. The latter renders women visible in technology by examining how users or consumers (who are mostly women) are shaping technology not only through their feedbacks but also through their use of technologies in ways that are sometimes unintended by their creators (Berg 1994: 98). Nonetheless, this paper departs from an examination of assembly work and technology use per se and looks at the social shaping of technology one more time. My goal is to render the women in other arenas of information technology visible.

The 'Middle Group'

After taking note of the continuities in the assembly sector of the Philippine information technology arena, I now ask attention to the group of Filipino information technology workers who consume, produce, and re-purpose the elite technological stuff for the consuming majority. In the creation of information technology products in the Philippines, there are three distinct

108 persons), telecommunications establishments (60 persons), and research and development (52

groups involved: an elite group, usually based in developed countries, that produces seminal information, knowledge or technology; a group that consumes; and a group which processes high-end technologies for consumption both in the Philippines and outside of the country. In this paper, I locate the latter in a web solutions provider, internet service provider, software and hardware design house, and content processing company. Given its position in the creation and consumption chain, I refer to this group as the 'middle group'. Underlying the emergence of this group are 'user-friendly technologies', horizontal learning structures, and the hybridity or mixed nature of some arenas of information technology.

User-friendly Technologies

Connie, who was among the first group of computer professionals recruited by NCR Corporation in the Philippines in 1966, narrates the changes in the complexity of activities that accompany the shift from mainframe computers to mini computers, then to micro computers:

> "In terms of the mainframe, in terms of education and training, the people who were involved in these really got to have intensive training. And then, unlike now where the computers are very user-friendly, there were no user-friendly computers before. You had to understand the intricacies of the computer inside and out...You had to be able to visualize how the computer is working inside because programming was dependent on that. Unlike now, when you say user-friendly, you are just taught to press a few buttons. There are software programs and you can go...In the 60s, no software was ready-made. We had to develop everything. That meant people were more careful with details, with logic...Like you got a flair for it, some skills, like an eye for details, like if you put a comma instead of a period, everything goes berserk (laughs). Unlike now, they give so much room for error." (Connie, 22/06/2000)

Innovations such as personal computers, interactive computing and off-the-shelf software programs accompany the diversification of the activities of the 'middle group' which now include activities related to the Internet. This diversification suggests that activities related to information technology do not have to be as complex as those attendant to the mainframes and mini-computers or to hardware and software design activities. In the 1960s and 1970s computer professionals in the Philippines who were connected with companies other than NCR Corporation and IBM bought expensive computer time from the latter. The move from monolithic mainframe to smaller computers implies the breaking of strangleholds of selected individuals over computing facilities, and an increasing ability by end-users without any

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persons).

technological background to use their own systems in their own ways. Moreover, while some web designers started out designing by codes, various software programs with graphic user interfaces are making the job less complicated.

Horizontal knowledge structures

The professionals in 'the middle-group' do not only prosper from the nature of technologies or activities. They also profit in the mode in which knowledge and skills in certain arenas are learned, e.g. through the Internet. As a means of transmitting information and knowledge, the Internet results in the creation of horizontal, proactive structures of knowledge which broaden the traditional vertical hierarchies of information and knowledge transmission via the state, national media, religious institutions, colonial and postcolonial structures, and multinational corporations (Youngs 2000: 8). Ruben, a Filipino software architect in the US, describes the horizontal knowledge structures in online communities as "the total (or almost total) absence of hierarchy". In a horizontal structure, there is no one true source or dispenser of knowledge. In online communities, "attempts of companies to monopolize the discussion in the communities they sponsor usually fail...Individuals could not flaunt titles, peerage or 'attitude' (or could only do so in a very limited way) lest they get booted out of the community" (Ruben, e-mail, 26/02/2000). This means that in horizontal knowledge structures, the emphasis is on one's ability to respond to the current need and less on the individual's social position.

There is no formula as to how one learns information technology: some learned by studying an existing webpage or doing online tutorials, others learned by taking jobs at a multinational company, still others learned by enrolling in short-term programming courses. But all answers exhibit similar patterns: some information technology skills are learned by doing and this is facilitated by access to technologies and information (e.g., online information and online-user groups).

The possibility of learning information technology on one's own is relevant to the 'middle group' for whom access to existing technologies and knowledge is a pre-requisite to the creation of new technologies and knowledge. Feminist writers (e.g., Cockburn 1985, Cowan 1985, Wajcman 1991, 1995) point out that technology is the privileged possession of certain social groups. This understanding is supported by Nissen's research experience in Sweden where he was unable to find a female hacker. To explain why hacking of computer games in Sweden

involves men/boys, Nissen shows that hacking is connected to earlier activities and contexts which are considered masculine. For example, computer games appeared as arcade games which eventually became a masculine domain, computer clubs were dominated by men, and computer magazines were placed in shelves aimed at male readers (Nissen 1996: 243-244). In the light of horizontal and proactive structures for learning, there has been widening access, not only to information and knowledge, but more importantly to the tools and know-how of information technologies. As noted by Youngs (2000), horizontal and proactive structures of learning have an empowering effect on social groups who have their own ways of dealing with technologies.

This however does not mean that some information technologies cannot be learned formally in structured settings. Indeed, in the school year 2000, CHED projected the third largest number of enrollees in information technology courses, after maritime and business education courses. Given the possibilities for 'self-learning', how important is formal education[9] to information technology?

There is a view among Filipino information technology professionals that a foundation in math, sciences and English is more important than a background in computers. It is argued that having this foundation in the elementary and secondary levels would allow college students to learn a computer language by themselves.

In practice, passing an aptitude exam is driving out a preoccupation with college degrees. The importance of self-learning is highlighted by the fact that one of the criteria for employment is familiarity with the tools and programming languages being used by the company. Considering that computer languages can change every year, much of the effort to keep up with the developments in the field happens outside of formal learning structures. Self-learning is however closely related to formal education. Aptitude examinations for higher-end information technology work demonstrate a bias for those who have visited higher education institutions. One reason for this is that higher education institutions provide the foundations in math, science and English as well as work ethics which are essential to passing these exams. These institutions also provide students with access to technologies, which in turn preconditions them for self-learning.

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[9] Formal education in the Philippines comprehends both vocational/technical non-degree programs and BA, MS, and Ph.D. degree programs.

Hybrid arenas

The 'middle group' does not only benefit from 'user-friendly technologies' and horizontal knowledge structures. The group also traffics in some arenas of information technology which are characterized by the amalgamation of disciplines such as computer science, business and industrial management, communication arts, etc. Interdisciplinarity is essential in generating knowledge in order to solve problems or innovate (Weingart and Stehr 2000: xii), two of the supreme goals in the information technology industry.

In the context of a company selling accounting software, 'technical' is defined as familiarity with the hardware and computer network, as well as with the accounting processes (since every business and manufacturing transaction produces an accounting entry). The cumulative nature of knowledge and practices to be learned on the job requires familiarity with computers but not necessarily a degree in computer science. This implies that the information technology industry is not an arena of specific technical backgrounds, an important factor considering that CHED projections indicate that in 2000, those enrolled in information technology courses would only be a quarter of the enrollment in maritime courses, and a seventh of those enrolled in commerce.

A second dimension to information technology as a hybrid or mixed arena corresponds to the interface between IT skills and non-IT skills. There are tasks in the information technology industry that require more subject matter expertise than information technology expertise. For example, the pervasiveness of computers in everyday-life means that the task of encoding has now been farmed out to users who key-in information into databases themselves. As a result, encoders[10] are now almost gone from certain arenas (e.g., manufacturing), but specialized uses of encoders have emerged. Content processing (which includes the production, aggregation, distribution, syndication, administration of data) and meta-data services (which include machine-understandable content description, cataloguing, classification and taxonomy) are some of the specialized uses which are anchored upon processes that are resistant to full automation. An abstractor who works in the Philippine office of an American content processing company

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[10] This does not imply that the vocational-technical education system has stopped producing encoders in the sense of secretarial, office, and paper work. TESDA's data encoder vocational instructional program, for example, is a one-year post secondary program designed to prepare students for employment as "data typist, data encoder operator, computer operator, terminal system operator and word processor operator" (TESDA 1999: 17).

processes a range of magazine and journal articles. For each article, he or she writes down the main ideas in an 'indicative' not 'descriptive' form (a task accomplished by starting the entries with verbs) and classifies the main ideas according to pre-existing categories. In this case, both subject matter expertise and the ability to use word processors are required and signal that 'encoding' has broadened from the sense of routine 'punching cards' to active, creative work.

Bringing gender in

Technology started out as an arena which puts much value on physical strength and this is because "many machines have been developed precisely to substitute for human physical strength" (Cockburn 1985a: 56). An examination of gendered locations and 'female social spaces' must therefore consider that technology is historically and materially masculine. Thus I use 'female spaces' in the sense of 'hitherto male-spaces where women are found' and examine the social distribution of knowledge in the Philippine information technology industry as a 'gender order' (Lachenmann 1999: 6). The concept of 'gender order' acknowledges that gender means difference but that it is necessary to consider this difference as taking place at an interface (Lachenmann 1999: 6) of various factors such as overall supply chain of information technology professionals, nature of information technology work, global capital and technological flows, changing attitudes, etc. The 'gender order' in the information technology arena can be examined in at least three ways. One, by looking at the gendered social distribution of knowledge which serves to allocate women to, and usually segregate them in particular occupational areas. Two, by examining compensation structures that accompany the gender division of labor. And three, by looking at the social constructs that accompany the changes in the gender division of labor.

Gendered distribution of knowledge

I observed that in a company providing web solutions, there are more men than women employees, and that there are women web designers and web applications associates but not women network engineers. In an internet service provider (ISP) company, the technical support group has an equal number of male and female members. There is also almost an equal number of male and female abstractors in a content processing company. Finally in a hardware and software design house, software and hardware design engineers are mostly males and there is only one female (who was doing software design).

These findings suggest that the social distribution of knowledge in the information technology industry is gendered in the sense that certain job categories remain associated with men, and that women are found in specific job categories. It is notable that one, there are more men in hardware development and web designing; two, there is a more or less equal number of men and women in software development, content processing, and technical support services; and there are no arenas where women are predominant in number.

I will now turn to two general questions: why are women likely to be in certain arenas of information technology and why has their presence not resulted in the 'feminization' of such arenas.

Statistics[11] show that the gender tracking at the tertiary level of education in the Philippines is one where more females than males go to tertiary school. Business education which includes commerce and accounting courses has the third highest ratio of female to male students, after education and health-related courses. Among female enrollees, the highest percentage is enrolled in business education. The emergence of a number of arenas which require business background, a 'feminine' track, and alternatively arenas which do not specify 'masculine' backgrounds (e.g., engineering track) works to prevent the gender tracking in education from structuring occupational arenas.

Statistics likewise show that while there are more females than males enrolled in higher education courses, women enrollees are still a minority in vocational/technical courses in automotive, machine shop, electronics, refrigeration and air-conditioning, welding and electricity. The chief curriculum specialist of TESDA explains that they designed the curriculum for information technology courses "so that both men and women can do it":

> "We know that IT is a light work, especially data encoder and computer programming. There are many women who enroll in these courses. But this is also true in other industrial skills program. Like in automotive. I think women don't like going under the car. It's dirty work. But now women are encouraged to enroll in welding because we have had a champion woman welder. So we find women in heavy industries. When women want to do it, they will do it." (Gil, 09/06/2000)

Given the 'masculine' history of vocational/technical courses, the social perception of some information technology courses as 'light', in the sense that they lead to occupations that have a

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[11] From selected statistics presented by Illo (1997: 19).

strong resemblance to feminine secretarial work, creates optimism that the choice of information technology courses will finally become 'non-gendered', e.g., available to both men and women. But this same set of social perceptions might also work to ensure that gender tracking in vocational/technical courses would remain, with data encoding and computer programming being identified as feminine courses. Unless women actively choose hitherto 'masculine' information technology occupations of 'computer technician' or 'network technician' just like the women welders who have created 'female spaces' within the 'old' industrial economy, the entry of more women into information technology would only mean that women are not only the minority in the information technology arena, but the majority in limited lower-end information technology occupations.

The shift away from gendered disciplinary orientations also explains why content processing is, contrary to expectations, not predominated by women. One form of content processing that is being done in the Philippines is the indexing and writing of abstracts of English-language magazine and journal articles. These abstracts are then packaged in CD-ROMs for sale to various libraries in the world. In the Philippine office of an American content processing company, abstractors work through a variety of topics from general information to the natural sciences, from computers to the social sciences. The variety of topics, as well as the way in which materials to be abstracted are assigned (each abstractor gets a bundle of literature by lottery), give content processing companies no reason to specify courses. In one morning, Jill, a fine arts graduate from one of the best universities in Manila, has read, summarized and categorized main ideas of articles as varied as "Try shooting from behind instead of in front" which was an article on how to create a more compelling photograph, and "Geochemical and Nd isotopic evidence..." which presented neodymium isotopes and geochemical data for basin-filled strata of the Devonian Cordillera. Nevertheless, arenas such as these are not completely free of the gendered division of labor: a closer look at the social division of knowledge within the company shows that one division is doing the contract for engineering literature. Most of the abstractors in the division have backgrounds in engineering.

Compensation structures

Aside from preventing the gender tracking in schools from structuring the social distribution of knowledge in the information technology arena, hybrid practices also prevent a gender tracking in the compensation structure. While there is no reason to dismiss research

findings which indicate differential wages being paid to women and men (MacKenzie and Wajcman 1985: 22), the compensation structure in some arenas prevents the feminization of these arenas. This is illustrated by one applications software development company.

Software development involves requirements analysis, systems analysis/design, coding and testing (programming) and is being done by a team comprised of a project manager, systems analysts/designers, business analysts and programmers. In the requirements definition stage, the team meets with the users to determine user problems, needs, requirements. Systems analysis pertains to the logical design of the program, which in turn refers to the process of determining user-interface components (e.g., the appearance and scope of the applications system) and the database logical design (e.g., the structure for data maintenance, updating, and retrieval). The business analyst looks at the client's business procedures that are to be incorporated in the system. Aside from the logical design, an applications system has a physical design which refers to the program codes itself. Based on the requirements definition and logical design, programmers, using application development tools, construct the user interface prototypes as well as the data schema and production database. In the iterative development paradigm, the team moves on to the logical design, or 'how' the applications systems should be built, even before the 'whys' and 'whats' have been determined.

The president of a software development company says that "in the old, old days of computing, there were only programmers". Over decades, software developers recognized a process of software development that involved requirements analysis, system design, and coding and testing (programming). Programming then ceased to become the only job description in the industry, and the job category of 'systems analyst' offered women an entry point to the industry. It is however to be noted that there has been no formal position for women. "It just happens that over time we have experienced that women are more suited to systems analysis than men," he says. "Possibly because by nature they like to communicate more. Or perhaps managers and users who are predominantly male like to deal with women." This development confirms Wajcman's (1991: 150) observations that women are more successful in entering new jobs requiring new skills than in breaking into traditional male preserves.

How does the company's compensation structure look like? In this company, there is a shallow U curve between business and technical orientation. Programmers, designers, systems analysts have computer science backgrounds, and normally share the same salary scale. The business

analyst may get a higher pay depending on whether this person has an MBA. Individuals get promoted within job categories suggesting the absence of a ladder-type structure. This means that a programmer does not have to become a systems analysts or vice versa in order to have a higher pay. This arrangement is relevant in the light of prevailing observations among information technology people that men are good programmers (e.g., technical-oriented, working with the specifics of an applications system), and that women are good systems analysts (e.g., business-oriented, working with ambiguous entities such as assessing what customers need). Gender tracking in systems analysis and programming therefore does not need to result in feminization of the tasks.

Social construction of 'female spaces'

Women can be excluded from the traditional technological arena (as opposed to the new arena) for a variety of reasons, among them women's lack of physical strength and the threat that activities pose to women's welfare. Alternatively, social perceptions can also include women into specific arenas. Mirza (1999: 146), examining the market integration of lower-middle class women into the office sector in Pakistan, notes that this integration has concentrated in technical occupations (e.g., architectural drafting, designing and computer related-occupations such as computer operators, hardware repairers) and secretarial occupations (e.g., secretaries, receptionists, telephone operators). According to her, technical occupations recruit women on the basis of their qualifications, while secretarial occupations recruit workers on the basis of beauty and outward appearance. In the Philippines, examples of recruitment according to societal perceptions of what is feminine and masculine work abound in the manufacturing and semi-conductor industries, e.g., women do most of the production processes since these require 'nimble fingers' while men do the packing since this activity involves moving heavy objects and packing end-products.

It can be observed how 'female spaces' inhabited by the 'middle group' are constructed by actors in these arenas. An anecdote that was narrated to me a by male information technology professional shows how social constructs of the gender and technology relationship emerged in the context of and in reaction to observable 'female spaces' in the information technology industry. It also reflects the dominant attitude expressed by information technology professionals: that the practices in the industry are about the inclusion, rather than the exclusion, of women.

"At the start, when we were hiring technicians they had to be males. Because they had to carry things. Somebody came to my office... and I was trying to avoid being sexist, this segregation of males and females. She passed the exam, although I was hoping that she would fail. So I told her, "do you realize that you have to move all these equipments, that you are going to get dirty because you are going to install cables, network." She said, "sir, just give me a try."...When I sent her to the customers, the customers were asking for her. They found out that it is easier to shout at a man than at a woman. She was a plus factor for me because when we made mistakes, they magnified these mistakes....You are bound to make mistakes regardless of whether you are male or female. But if a girl handles it and the one who is repairing the machine is a girl, they are more patient." (Titus, information technology consultant, 11/08/2000)

One reading of this anecdote is that within the information technology industry a utilitarian view of women's ascribed skills (e.g., people-skills) still remains. However, the presence of and more importantly the everyday-encounters with women professionals have, to some extent, resulted in the re-calibration of the taken-for-granted assumption that technology is a man's world.

This reading shows that while the presence of women is facilitated by the miniaturization of technologies and the shifts in the paradigm norms of technology work from heavy, physical work to knowledge work, women have also actively created this presence by engaging in 'male' norms of technology work (e.g., 'getting dirty', 'going under'). Conclusions regarding user-friendliness of technologies must therefore consider that when a new technology is implemented, users do not just have to be qualified and to 'accept' the innovation: they must change their own work routines, find their ways around problems and difficulties (Holtgrewe 1996: 113), and even work towards the reconstruction of both technologies and the mental set accompanying the introduction of technologies in the spheres of work (Webster 1996b: 4). One way of interpreting the statement "sir, just give me a try" would be to use Schutz and Luckmann's (1973: 19) and Long's (1992: 23) treatment of 'agency' as one that is about how an individual, in this case, a woman information technology worker, being acted and enacted upon by actors around her, is able to attain her desired pragmatic concerns. Yet, while these constructs acknowledge that women actively create their presence in these arenas, Wajcman (1991: 2) warns that it may likewise suggest that women have to exchange aspects of their identity for a masculine version.

Another set of constructs indicate that while the distinction between 'male' and 'female' in some arenas is dissolving, gender differences can be viewed as very useful in other arenas. In some contexts, such as web designing, societal perception of feminine qualities are not phrased in

utilitarian terms, but rather in terms of 'epistemic privileges' on so-called feminine tastes and preferences:

> "I want to have female programmers because our product is being developed by programmers. For whatever, I want to have everything. It is very important to know what visuals work with women. A 'true blue' woman will really tell me what clicks with them. It is really hard to find women programmers. Gender composition is very important. Generational, too but mostly, we have young people with us. This more on the interface side of the thing, on what people see." (Dom, founder, free e-mail service company, 10/04/2000)

Central here is "'a true blue' woman will really tell me what clicks with them." Dom's point of view acknowledges a basic tenet in Feminist Standpoint Theory: that one's positioning as a woman is a factor in gaining knowledge and understanding of other women. Finding women programmers is however not the only problem faced by Dom. His intention of creating products from the standpoint of women's experiences must also contend with the critique raised against the Feminist Standpoint Theory: that there is no single privileged position from which to view women's social experiences (Harding 1986: 18ff). The diversity of women's social positions and experiences is therefore matched by the diversity of women's points of view. However not everyone shares the view that the creator's social identities become expressed in artefacts. One web designer believes that one 'cannot judge a web designer by the web site he or she has done'. This is because company policies and procedures (e.g., 'total client satisfaction') ensure that outcomes (e.g., interface, what people see) were unstructured by gender.

Non-gendered practices

Having argued that the information technology industry is gendered, I now want to add that while gender structures knowledge requirements, it is not the only criteria[12] in the organization and segregation of the information technology industry in the Philippines. Following Lachenmann (1999: 4) who suggests an analysis of the social organization and segregation of markets and the social networks guiding them according to different criteria, I look at how the information technology industry is informed by the interaction between

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[12] Wajcman (1991: 162) for example lists down militarism and capitalist profitability as among other powerful forces shaping technology.

macro- and micro-processes. This approach is important in gaining entry into an arena that generally views gender relations as non-problematic.

The president of a subsidiary of a German hardware and software design company narrates an incident while he was on training at the company's headquarters in Germany: someone had asked a German worker for help but she had answered that it was not her job. When asked if conclusions were to be made about the difference between Asian and Western women, he concludes that:

> "the typical reaction here (in the Philippines), not only of women but for all other employees would have been to sit down and help, even neglecting your own work." (Yeng, 16/03/2000)

Feminist studies of information technologies highlight the culture of masculinity in the work process. Hayes (1989: 84) argues that there is a machismo about working individually without helping or cooperating with fellow programmers. However from Yeng's point of view, this is not only about gender but is more about culture, where the Filipino culture is seen to be more conducive to teamwork.

In some instances, the evaluation of skills is also structured according to criteria other than gender. Observers note that age is now a mediating factor in the reorganization of work, and this is irrespective of gender so that younger men and women replace older female and male workers (Kelkar and Nathan 2000: 10). In certain arenas of the information technology industry however, I would like to point out that age is being considered as a factor but not in the sense of marginalizing one age group by another. The school director of a new computer college informs me that difference between the 'other' schools and his college lies in the structure of the faculty:

> "The faculty members in other schools are tied to the school and this means that they no longer have time to work for the industry. Fifty percent of our staff are composed of consultants, who eat and drink IT everyday. We also tap retirees who have 20-30 years of experience. You need their expertise in the upper courses on project management, systems analysis because the basics remain the same. This way, we teach our students to respect the older ones. Theories afterall are related to experience." (Jojo, 17/03/2000)

Age, rather than gender, was also seen as the major determinant in the so-called 'Y2K brain drain' in the Philippines. In 1997 and 1998, companies around the world were looking for computer professionals whose task was to revise computer programs that failed to consider the

shift from the year '1999' to '2000'. But contrary to popular views, the bulk of Y2K jobs done by Filipinos were done in the Philippines. Unlike software development which requires proximity to the user for the prototyping, the part of the program that contained the problematic two digits can be easily exported into the Philippines. Thus, while those who left the country for Y2K jobs in 1997 and 1998 are more likely to be people with considerable experience in the industry, the Y2K shortage was mostly a shortage of young graduates whose job was to search for the things to be modified in the program. Connie explains why this is so:

> "...Because the Y2K bug needed our kind of expertise. Because you will work with the internal workings of the computer and the language is COBOL and very few young people know anything about COBOL." (Connie, 22/06/2000)

Conclusions

The 'social distribution of knowledge' within the Philippines information technology arena is characterized by activities which are embedded in the interfaces of the global division of technological labor. As a result of these interfaces, certain forms and arrangements characteristic of assembly work persist to exist, but spaces have also been created as exemplified by the 'middle group'. This social distribution of knowledge is also gendered, where some arenas such as software development and consultancy and technical support services are more conducive to the creation of 'female social spaces' than others. Considering the masculine culture of technology, these 'spaces' are spaces where women are, more or less, no longer the numerical minority.

The creation of spaces within the social distribution of knowledge in the information technology industry is uneven. Some arenas and activities seem to be more conducive to the creation of such spaces, but within these arenas, there is also uneven development so that while women are now found in the client support group, the sales group is still male-dominated. For some, programming is a male job while systems analysis is a female job. Yet for others, programming is a domesticated job, a passive endeavor that is suited for women. Although 'going out' (e.g., client visits) is a female job in web designing and in hardware maintenance, it is a male job in a software house. This variability in the construction of gendered jobs points out that masculine culture of technology is flexible (Wajcman 1991: 145). There is however a downside to such flexibility. Using engineering as an example, Cockburn notes how men identified with physical

engineering and dismissed the intellectual world as 'soft' but "at the next moment, however, they need to appropriate sedentary, intellectual engineering work for masculinity, too" (Cockburn 1985b: 190).

An analysis of the creation of 'female spaces' in hybrid arenas is incomplete without addressing the question of resistance and networking that characterize interfaces (Lachenmann 1997: 9). Dannecker (1998: 204), in a study of garment workers in Bangladesh, documents forms of resistance that included sporadic acts of individual or group defiance, as well as other forms of 'social control from below' such as hiding information, exchanging jokes or making fun at supervisors and male colleagues. My view is that certain conditions such as being a numerical minority (in contrast to the numerical predominance of women in assembly work) and informal office cultures that favor males shape the ways female members of the 'middle group' create spaces for themselves.

Kay's experience as head of a web design team whose members are all males, illustrates one aspect of the creation of female spaces:

> "...I head the 'external' team...Right now, J (a male colleague) is in-charge of the 'internal team'. I see the difference in running the team. Like when we have meetings. When it comes to implementation with company policies, J gives in more. I mean, he is lenient. I am not. Like you know we have a difference in opinions. I don't know, maybe it is a guy thing. Or they can always say, 'pare, we can't make that work'. To me, work is work. So for example, deadline has not been met. I demand for an explanation why it was not done, while J will probably think of ways why the person is not able to do it. He'll consider it, while I think of the company policies. It may also be J. It's just that most of the people who are involved are guys and a woman has a different relationship with the guys. Guys are more open to talk with guys than, you know. And it is a male-dominated profession, so they actually prefer to talk with the guys." (Kay, 27/04/2000)

Women are expected to carry human preoccupations into the job: nursing, teaching, and social work (Cockburn 1985a: 58), and it seems that by imposing company norms, Kay has reneged at these societal expectations. Yet, the narrative illustrates that because the creation of 'female social spaces' in some information technology arenas is still on-going, the gendered social distribution of knowledge is one where women are still a numerical minority in some arenas. This implies that women are outside the informal workplace culture of the company which makes guys, as Kay puts it, "more open to talk with guys".

Tierney writes about how informal workplace culture benefits the career progression of men in an Irish software company. The informal workplace culture which includes playing football and poker, eating lunch and drinking together works in favor of men because being sponsored by someone higher (on account of the masculine culture of technology, usually a male sponsor) is a pre-requisite to moving up (Tierney 1995: 202). Although there is no evidence that the informal work culture has disadvantaged Kay's career, her experience shows that it does affect how men and women relate to one another.

By looking at the information technology arena in the Philippines in terms of interfaces, I have shown that this arena is characterized by a broadening and diversification of activities and actors. The scope of the broadening and diversification is however still contested but its activities show that information technology in the Philippines is about the creation of spaces within the international division of labor and the gender division of labor. This study, which departs from the preoccupation with women as assembly workers and end-users of information technology, is a step towards gaining an understanding of the doing of information technology in developing countries.

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