

THE DYNAMICS OF TECHNOLOGY AND GENDER ROLES

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Summary

The paper examines technology and its impact on men and women in society, with the presumption that changes in technology cause social changes. Since the characteristics of a society play a major role in the decision of which technologies are to be adopted (or not adopted), the same technology may have different effects in different societies and situations. Both gender relations and technology have evolved from a process of gradual change. Neither changes in technology nor changes in gender relations appear as flashes but they are developed from existing technology and from existing social and gender structures. In view of the close inter-relationship between gender relations and technology, gender analysis can be used as a tool to further understand the complexity of technological changes (or lack of changes) in the society. Examples taken from various countries and sectors further discuss the origins and consequences of technology changes and changes in the division of labour between men and women.

1. Introduction

Major international changes in technology and labour processes have taken place during recent decades as a result of globalization and economic restructuring, technological

transformation systems and “flexibilization” of labour-markets. New conditions of competition for the world's economies are emerging as new technologies and organizational structures of production are quickly and constantly introduced to the market; this has increasingly enabled resources to be used where they are most productive.

The expansion of globalization is also assisted by evolving advances in information and communication technologies. The spread of the new technologies, in particular Internet, has left almost every business in the world facing new questions. Modern technology generation and development has become increasingly supply or push-led (i.e. technology is first invented and then applied to the problem), as profit and competition increasingly determine direction, content and location of innovation. Practical experience suggests also that science and technology interventions have been focused on productive rather than on reproductive needs. Hence, they take on a gendered nature, and may favour male concerns over female ones.

Following the above scenario, the issue of understanding technology has become a central factor. This paper will examine technology and its impact on men and women in the society, with the presumption that changes in technology causes social changes. The characteristics of a society play a major role in the decisions relating to the choice of technologies to be adopted and the same technology may have different effects in different societies and situations.

As technology can be described as "how things are commonly done or made" and "a method of organizing human labour and knowledge" and as it depends on human choices, the gender dimension will enter as a natural perspective in examining technology and technology changes. Gender, as a part of human identity, describes the ways people see themselves and their lives as men and women. It also plays structural roles defining societal barriers and boundaries. Gender differences are created by people, men and women and are part of particular historical contexts. So, technical constraints and human choices decide upon the invention, design, production and use of technological systems and artifacts.

Both gender relations and technology have evolved through a process of gradual change. Neither technology nor gender relations appear as flashes but are developed from existing technology and from existing social and gender structures. Gender roles and technology are, therefore, closely inter-linked. Giving attention to gender relations and roles may be seen as a tool for understanding the complexity of technological changes in all societies.

This paper also describes the inter-linkages between globalization, technology and gender division of labour. The new global trends are not only affecting the direction, composition and volume of international trade but also the industrialization process and national and regional labour markets. Moreover, technology influences the form of organization of production. Some technologies are more amenable for decentralization, that is, some technologies are more used in outsourcing and sub-contracting of production, than others are.

Many academics have argued around the view of how the global trends, i.e. globalization, industrialization and the emerging technologies, have and are affecting women and men differently. Some researchers argue that the process has *marginalized* women, whereas others maintain that women are being *integrated* to economic development and that the new technologies have opened up new career paths for women. A third position is that the new technology and therewith the new conditions are more harmful than beneficial to women and that women are being *exploited*.

In order to understand the effects of globalization and technological changes on men and women in different societies, these arguments will be used throughout the discussions of this paper, including four selected sectors; the textile and garment industry, agriculture, biotechnology, entrepreneurship and the household sector.

2. Global Trends in Trade, Technology and Division of Labour

Creativity, access to finance and high responsiveness to market signals are among the major determinants of competitive advantage. The current global trends are often described as the shift from manufacturing to services in developed countries, the shift in the structure of output and employment from agriculture to manufacturing and services in developing countries, increased and intensified competition, the speed-up of technological innovations and the increasingly important knowledge generation in creating wealth, rapidly changing skills requirements and labour cost competition.

Moreover, variation in product demand, market turbulence, flexible technology and flexible labour force are other characteristics of the global trends. Development of new transport and communication technologies and the liberalization of trade and investment add to the increase in competition. The concept of globalization may not be new but its contents are now very different: the pace of technical change, and within it the role of information-based technology, is unprecedented.

The restructuring of the global economy has had distinct implications for women's status and for their position at home, because of their increased participation in the labour market. Women have been pushed into the labour market in order to supplement family income, as stabilization measures, structural adjustment, and recession have increased the financial pressure on households. Economic development has led to changes in the composition of labour force, changes in family structure and patterns of fertility and mortality. According to United Nations (1999), the share of women in employment, for example, has steadily increased during the last two decades all over the world. It has been particularly significant in countries such as Indonesia, Malaysia, Singapore, South Korea, and Sri Lanka. According to Sen (1999), it is a result of the (i) population growth and change in age structure and (ii) the faster increase in women's participation in the labour force than men, following a transfer of female labour from the unpaid household and subsistence sector to the paid economy. The gender division of labour may therefore be affected by changes in demography, technology and the economy.

Historically, the transition from simple hunting-and-gathering communities to agrarian technologies entailed a major shift in gender relations. History is repeating itself and the

shifts from agriculture to manufacturing and services have strong impact on the division of labour. For example, the pattern of full time wage employment has changed to a more diverse pattern, that is, flexibilization and casualization of employment through outworking, homework, part-time labour, contract labour and other forms of labour that are unprotected by standard labour legislation. In recent years, this kind of labour has contributed much to the growth in employment in both developed and developing countries. The trend can be seen as the private sector's response to the changing conditions of competition caused by globalization.

The increased economic competition may have both benefits and costs. The advantages may be, for example, an increased number of choices for consumers and lower prices, better services, more job choices and increase standard of living. However, it may also imply job instability, higher turnover and insecurity, downward pressure on wages and increasing inequalities.

Brittan (1998) argued that globalization is not necessarily the only factor driving down the relative wages of unskilled labour. He said that it is a matter of dispute how far rising income differentials is due to trade and how far due to technological change. Cline (1998) held that the effect of technology was widening differentials and that this effect was more than three times more powerful than the effect of increasing trade and increasing immigration combined.

Three major macro-economic factors could be held responsible for the current global trends: (1) liberalization of policies, which gives emphasis to export production and greater international mobility of capital and greater flexibility of the labour market; (2) technical changes: miniaturization and modularization of products and processes; (3) Organizational changes; for example, increased sub-contracting, home-based manufacturing, just-in-time production.

These factors are discussed below along with current learning processes. A discussion on the different views on the effects of globalization, with all its entails, on women will follow in the end of this chapter.

2.1. Liberalization and global restructuring

World trade has increased enormously since the 1950s. For example, United Nations (1999) figures show that the volume of world exports increased 16 times while total world output increased only 6 times during the period 1950 to 1996. In 1998 about 15% of the world output was exported, compared to 7% in 1950.

The recent global trends are, however, not only affecting the volume of international trade but also the direction and the industrialization process of national and regional labour markets. They have given developed countries control of research and management, and have made developing countries manufacturers. In the 1970s and 1980s, improved telecommunication systems and transport facilities encouraged transnational companies to reallocate a significant amount of manufacturing to developing countries. Garments and electronics components were the two predominant and fastest growing products in developing country manufacturing exports.

In recent decades, several developing countries, particularly from the East and South East Asian region, have successfully adopted an export-led strategy for economic development. This new strategy, which led to a shift towards manufacturing for exports, expanded very rapidly. Countries consequently had opportunities to generate employment, increase economic dynamism, stabilize and diversify foreign exchange, build up a technological base and improve the skills of the labour force while directing the production towards exports. Many of these export-oriented industries came to employ a high proportion of women. The employment effects of export orientation was for instance visible in Bangladesh, as shown by Amin et al. (1998), where the number of garment factories grew from 4 in 1978 to 2400 in 1995, employing 1.2 million workers. Some 90% of them were women younger than 25 years old.

Technological diffusion, through trade or investment, shapes the comparative advantages of countries and contributes to their economic restructuring, which results in changing compositions of employment. One of the easiest ways to import foreign technology is by encouraging foreign capital investment. Foreign Direct Investment (FDI) is also seen as one of the most dynamic, increasing international resource flow to developing countries. The transnational corporations (TNCs), deploying the FDI, have become important players in the international economy. They may affect development by complementing domestic investment, and by undertaking trade and transfers of knowledge, skills and technology. TNCs search for greater access to markets and improved competitive abilities has placed them as important players in the global restructuring. They have formed complex networks of intra-firm relationships and inter-firm alliances built around a hierarchy of technological capabilities, comparative advantages, and production practices. Significant increase in the speed and volume of cross-border trade, technology, capital and information flows are the results.

In industries such as clothing and electronics assembly, women workers account for most of the employment generated by foreign affiliates in developing countries. This trend has been called the "feminization" of labour force and is in particular a characteristics of the Export Processing Zones (EPZs) where women may account for up to 80% of the production-line employment. In this context, several academics, such as Joeke (1982) and Pearson (1992), have argued that the industrialization has been as much female-led as export-led.

EPZs are special industrial zones which are set up by developing countries to attract FDI, transfer new skills and expertise to local human resources, boost the export sector, earn foreign exchange, introduce new technology and generate employment. As indicated in Table 1, the most predominant industries with regard to the high female labour participation in EPZs are the garment, leather, shoes, electronics, food and flowers industries.

Traditionally, FDI has been concentrated in countries and regions with comparative advantages in cheap and unskilled labour. However, TNCs are not locating plants in developing countries to take advantage of cheap labour to the same extent anymore but are now locating their industries in countries with cheap, skilled and flexible labour. Moreover, due to the widespread use of new technologies in the production process, the education level of labour will have an impact on the future locations of TNC

production. Lack of human skills and capabilities in fields such as computer programming and operations, may constitute a major constraint in such locations. For example, Blomstrom (1994) argued that many transnational corporations in Thailand have been hindered to expand their activities by shortage of human resources.

Country	Number of women workers as a percentage of all workers	Main industry
Bangladesh 1998	69	Garments, leather , shoes, electronics
Domanican Rep. 1998/1999	58 a	Garments, electronics
El Salvador 1997	80 b	Garments, electronics
Fiji 1999	80 c	Garments, food
Haiti 1998	69	Garments
Jamaica 1997	90	Garments
Madagascar 1997	60	Garments, leather
Mauritius 1997	68	Garments, flowers
Nicaragua 1997	72	Garments, flowers

a. In maquiladora

b. In free trade zones

c. In apparel only

Source: Van Heerden, 1999, in World Investment Report 1999, UNCTAD, Geneva.

Table 1. Women's employment in selected EPZs in developing countries

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Bibliography

Acerro L. (1995). ‘Conflicting demands of new technology and household work, Women’s work in Brazilian and Argentinian textiles’, in S. Mitter and S. Rowbotham (eds) *Women Encounter Technology, Changing Patterns of Employment in the Third World*. Routledge: London and New York.

Amin S., Diamond I., Naved R.T. and Newby M. (1998). Transition to adulthood of female garment factory workers in Bangladesh, *Studies in Family Planning*, Vol.29, No.2, pp.185-200.

- Bhattacharya (1999). *The Post-MFA Challenges to the Bangladesh Textile and Clothing Sector, in Trade, Sustainable Development and Gender*. UNCTAD, United Nations: Geneva and New York.
- Blomström, M. (1994). Newly Emerging Technologies: Impact and Challenges for Developing Asian Countries, in M. Blomström (ed) *Transnational Technology Towards the Year 2000 in the ESCAP Region*. Monograph No.1, ESCAP/UNCTAD. Document No. ST/ESCAP/1071. United Nations: New York.
- Boserup (1987). *Women's Role in Economic Development*, 2nd edition. Gower Press, Aldershot.
- Brittan S. (1998). *Essays, Moral, Political and Economic*. David Hume institute, Edinburgh.
- Brown, I., Kane H. and Roodman D.M. (1994) *Vital signs 1994: The Trends that are shaping our Future*. Worldwatch Institute, Washington, D.C.
- Brun E. (1994). Technology Appropriate for Women?, in E. Gunnarsson and L. Trojer (eds) *Feminist Voices on Gender, Technology and Ethics*. Centre of Women's Studies, Luleå University of Technology, Luleå.
- Chambers R., Pacey A. and Trupp L.A. (eds.) (1989). *Farmers First: Farmer Innovation and Agricultural Research*, Intermediate Technology Publications, United Kingdom.
- Chen M., Sebstad J. and O'Connell L. (1999). Counting the invisible workforce: the case of home-based workers, *World Development*, 27 (3), pp.603-610.
- Cline, W. (1998) *Trade and Income Distribution*. Institute for International Economics, Washington, DC.
- Dauber R. and Cain M.L. (eds.) (1981). *Women and Technological Change in Developing Countries*. West View Press, Inc., Colorado.
- Economic and Social Council (1995) *Science and Technology for sustainable human development: the Gender Dimension*. Report of the Panel, Substantive themes: (b) The gender implications of Science and Technology for Developing Countries, E/CN.16/1995/3, March 1995, Geneva.
- Elson D. and Pearson R. (1981). The Subordination of Women and the Internationalisation of Factory Production, in K. Young et al (eds) *Of Marriage and the Market: Women's Subordination in International Perspective*. CSE Books, London.
- Ernst D., Ganiatsos T, and Mytelka L.K. (eds.) (1998) *Technological Dynamism and Export Success in Asia*. Routledge: London.
- ESCAP (1996) Asian and Pacific Developing Economies and the First WTO Ministerial Conference, Issues of Concern, Studies in Trade and Investment No.22, United Nations: New York.
- Everts, S. (1998) *Gender and Technology, Empowering Women, Engendering Development*. Zed Books Ltd: London and New York.
- Fälth A. (1996) *Closing Gender Gaps in Education*. Unpublished Master's Thesis, School of Economics, Lund University, Lund.
- FAO (1996) *Women and the Green Revolution*. Food and Agriculture Organization, Rome.
- Ghosh J. (1998) *Impact of Globalization on Women: Women and Economic Liberalization in the Asian and Pacific Region*. ESCAP regional meeting on the Impact of Globalization on Women, which was held in Bangkok 22-24 June 1998.
- Gunnarsson E. and Trojer L. (1994) *Feminist Voices on Gender, Technology and Ethics*. Centre for Women's Studies, Luleå University of Technology, Luleå, Sweden.
- Hale A. (ed.) (1999) *Trade Myths and Gender Reality – Trade Liberalisation and Women's Lives*. Global Publications Foundation, International Coalition for Development Action, Women Working Worldwide, Uppsala.
- Harvey, D. (1989) *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change*. Basil Blackwell, London.
- Hewitt T., Johnson H. and Wield D. (1992) *Industrialization and Development*. Oxford University Press in association with The Open University: United Kingdom.

- Huyer S. (1997) Supporting Women's Use of Information Technologies for Sustainable Development, Women in Global Science and Technology (WIGSAT), paper submitted to the Gender and Sustainable Development Unit, IDRC, Ontario, Canada.
- ILO (1981) Women, Technology and the Development Process, in R. Dauber and M.L. Cain (eds) Women and Technological Change in Developing Countries. Westview Press Inc. for the American Association for the Advancement of Science, Washington, D.C.
- ILO (1995) *Invisible workers in Viet Nam*. Report published by the Programme on Women, Development Policies Department, International Labour Office, Geneva.
- ILO (1998). World Employment Report 1998-99- Employability in the global economy, How Training Matters. International Labour Office, Geneva.
- ILO/UNCTC (1988). Economic and Social Effects of Multinational Enterprises in export Processing Zones. International Labour Office, Geneva.
- Jezkova P. (1995). Changes in Textiles, Implications for Asian Women, in S. Mitter and S. Rowbotham (eds) *Women Encounter Technology, Changing Patterns of Employment in the Third World*. Routledge, London and New York.
- Joekes S. (1982) *Female-led industrialisation: women's jobs in third world export manufacturing - the case of the Moroccan clothing industry*. IDS Research Report No.15, Institute of Developing Studies, University of Sussex, Brighton.
- Joekes S. (1987) *Women in the World Economy*. Oxford University Press, New York and Oxford.
- Kaur M. (1988) *Rural Women and Technological Advancement*. Discovery Publishing House, Dehli.
- Lerman N. E., Mohun A.P. and Oldenziel R. (1997) Versatile Tools: Gender Analysis and the History of Technology, *Technology and Culture*, Vol.38 No.1.
- Mansell R. and Wehn U. (1998) *Knowledge Societies: Information Technology for Sustainable Development*, for the United Nations Commission on Science and Technology for Development (UNCSTD), New York.
- Mitter, S. (1995) Who Benefits? Measuring the differential impact of new technologies, in Missing Links, Gender Equity in Science and Technology for Development, Gender Working Group of the United Nations Commission on Science and Technology for Development, Ottawa.
- Moghadam, V. M. (1990) *Gender, development, and policy : toward equity and empowerment*. World Institute for Development Economics Research, WIDER: Helsinki.
- Moghadam, V. M. (1993). Gender and the Development Process in a Changing Global Environment, Research for Action, World Institute for Development Economics Research (WIDER), The United Nations University: Helsinki.
- Moghadam, V.M. (1995). Economic Reforms, Women's Employment, and Social Policies, World Development Studies 4, World Institute for Development Economics Research (WIDER), The United Nations University: Helsinki.
- Mytelka L.K. and Tesfachew T. (1998), *The Role of Policy in Promoting Enterprise Learning During Early Industrialization: Lessons for African Countries, African Development in a Comparative Perspective*, UNCTAD, Geneva.
- North-South Institute (1985), Women in Industry, North-South Connections, North-South Institute, Ottawa.
- Østergaard L. (1992). Gender and Development, A Practical Guide, Based on a study for the Directorate-General for Development, Commission of the European Communities, Routledge: London and New York.
- Pearson R. (1992). Gender Issues in industrialisation. In Industrialisation and Development, T. Hewitt, H. Johnson and D. Wield (eds), Oxford University Press in association with the Open University: New York.

- Pearson R. (1998). Nimble Fingers' Revisited. Reflections on Women and Third World industrialisation in the late twentieth century, in *Feminist Visions of Development: Gender analysis and policy*, Pearson R. and Jackson C (eds.), Routledge: London.
- Pedersen P.O., Sverrisson A. and M.P. van Dijk (1994). Flexible Specialization, The Dynamics of Small-scale Industries in the South, Intermediate Technology Publications, London, BPC Wheatons, Exeter.
- Pinstup-Andersen P. and Panya-Lorch R. (1994). *Alleviating Poverty, Intensifying Agriculture, and Effectively Managing Natural Resources*, International Food Policy Research Institute, Washington, D.C.
- Pyke F. and Sengenberger W. (1992). Industrial Districts and Local Economic Regeneration, International Institute for Labour Studies, Geneva.
- Sen, A. (1985). Women, Technology and Sexual divisions, written for INSTRAW and UNCTAD. United Nations: Geneva and New York.
- Sen, G. (1999). Gendered Labour Markets and Globalisation in Asia, Indian Institute of Management, Bangalore, Paper prepared for the Regional Policy Dialogue on "Globalization and Liberalisation which Promote Sustainable Human Development", organised by the International Centre for Trade and Sustainable Development in collaboration with UNCTAD and ESCAP, Bangkok, November 24-26, 1999.
- Szentes, T. (1988). The Transformation of the World Economy, New Directions and New Interests, Studies on Socio-cultural Development Alternatives in a Changing World. The United Nations University: Tokyo, Zed Books Ltd: London and New Jersey.
- Todaro, M.P. (1981). Economic Development in the Third World, 2nd edn, Longman, New York and London.
- Trojer L. (1994). Scientific Knowledge, Technology and Consequences in a feminist perspective, in *Feminist Voices on Gender, Technology and Ethics*, Edited by E. Gunnarsson and L. Trojer, No.2 in the series of publications from Centre of Women's Studies, Luleå University of Technology, Luleå.
- Ugwu, S.D. and Agbo C. H. (1999). Adoption of Agricultural Technologies by Rural Women under the Women-In-Agricultural Programme in Nigeria, African Technology Policy Studies (ATPS) Working Paper No. 17. Enugu State Agricultural Development Programme, Enugu, Nigeria, African Technology Policy Studies Network, Print Point Ltd, Nairobi.
- UNCTAD (1996), *Fostering Technological Dynamism: Evolution of Thought on Technological Development Processes and Competitiveness: A Review of the Literature*, New York and Geneva.
- UNCTAD (1999a). World Investment Report 1999, Foreign Direct Investment and the Challenge of Development, Sales No. E.99.II.D.3. United Nations: Geneva.
- UNCTAD (1999b). *Women entrepreneurs in Africa: Selected experiences and lessons for policy*, Geneva. (Chitras paper)
- UNIFEM (1999). Information given by E. Lundgren, Programme Officer at UNIFEM Mexico.
- UNIFEM (1999). Globalization, Gender markets, Strategic concerns for women in Micro Enterprise and homework, together with the Department for International Development (DFID), UK.
- United Nations (1999). 1999 World Survey on the Role of Women in Development, Globalization, Gender and Work, Division for the Advancement of Women, Department of Economic and Social Affairs, New York.
- Waldén L. (1994). Those Living Sewing Machines...or Is Male to Female as Technology to Humanism, in *Feminist Voices on Gender, Technology and Ethics*, Edited by E. Gunnarsson and L. Trojer, No.2 in the series of publications from Centre of Women's Studies, Luleå University of Technology, Luleå.
- Wall Street Journal (1999). Monday 28 June 1999.
- Ward, K. (1990). Introduction and Overview, in *Women Workers and Global Restructuring*, edited by K. Ward. Ithaca, NY: ILR Press.
- Zuboff S. (1988). In the Age of the Smart Machine, The Future of Work and Power, Heinemann Professional Publishing, Oxford.

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