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**PROF. DR. RAHIM MD. SAIL**  
Pusat Pengembangan dan Pendidikan Lanjutan  
Universiti Pertanian Malaysia



# **EXTENSION EDUCATION FOR INDUSTRIALISING MALAYSIA: TRENDS, PRIORITIES AND EMERGING ISSUES**

**Rahim M. Sail, Ph.D**

## **Introduction**

The launching of the Industrial Master Plan (IMP) in 1986 and the successes of the New Economic Policy have brought about significant changes in the socioeconomic growth and development of Malaysia. Malaysia's success in the economic field, with an 8% annual growth rate for the past seven years (since 1988) and a considerably low inflation rate of under 4%, has placed the country on a solid path to becoming a developed nation in the year 2020. This remarkable achievement presents a pride to all Malaysians as well as a challenge to ensure its continuity and even improve the present situation in the years ahead.

The focus of development in Malaysia has shifted from the agricultural sector to that of the manufacturing and service sectors, although agriculture remains an important sector providing food and raw materials to support the industrial sector. In line with this, one of the goals of the second National Agricultural Policy is to ensure the realization of a balanced development between the agricultural sector and that of the industrial sector through optimum utilization of agricultural resources to produce maximum productivity.

Traditionally, extension education has been closely linked with the field of agriculture and in fact, it has been the single most important strategy employed in the agricultural and rural development work. It will continue to be so in the future. However, extension concepts and approaches have penetrated beyond the boundaries of agriculture into the fields of preventive health, community nutrition, environmental protection, family planning and development, consumer education to name a few. In all these fields where extension concepts and approaches have been utilized, the focus has been on (i) change, that is, extension as an instrument for promoting change among the clients; (ii) decision-making, that is, securing and providing information to planners and policy makers as bases for making accurate decision; and (iii) information and knowledge systems, that is, interfacing among system components, information systems and networks, social systems and the consequences of technological change (Roling, 1983).

The scope of this paper will centre around the present and future trends, priorities and emerging issues of extension education in the context of an industrializing Malaysia. Also, the paper will trace the development of extension education, especially its philosophy, concepts and approaches as well as the underlying theoretical bases from which extension education emerges. Finally, the paper will address the roles of extension education at tertiary level, drawing experiences of Universiti Pertanian Malaysia.

## The Evolution and Development of Extension Education

Extension education originated in British universities where it became customary to have one educational programme available on campus, and a second programme away from the campus (Baker, 1989: 49). The "away from campus" educational programme was known as extension education or what would be popularly known now as a distant education or off-campus education. Cambridge University officially started extension education in 1873 although education through extension existed long before that. Japan was the second country to follow the concept of extension education and began implementing it in 1893 followed by the United States of America in 1914. In Malaysia, extension had its roots with the establishment of the Department of Agriculture (DOA) by the British colonial government. What could be interpreted as extension activities carried out by DOA in 1946 and 1947 were grouped under the general term of educational propaganda. In 1948, extension activities were grouped as extension and propaganda and placed under the responsibility of the Field Branch (Mohamad Jamil, 1974). Extension then was viewed mainly as carrying out the regulatory functions of the Department of Agriculture. Extension education as an academic discipline began in the middle of 1960's when the College of Agriculture Malaya began offering extension education courses with the help of Ford Foundation visiting professors.

As a discipline, extension was first developed as a specialization of rural sociology focusing on inducing voluntary behaviour change among target clients through communication. Those who are responsible to bring about changes are called "change agents" and they are usually



employed by organizations entrusted to provide services in the form of dissemination of information and knowledge (or technologies) to benefit the clients.

As extension evolves and develops over the years based on the results of research and experience with the implementation of extension programmes, it begins to borrow and integrate heavily concepts of sociology and anthropology, psychology, economics, political studies and communication into its discipline. For example, the application of social demography, community, organizations and leadership, family, change, motivation, adoption and diffusion of technologies, and social action process are borrowed from sociology and anthropology; the concepts of human development as postulated by Erikson (1950), Jung (1979) and Levinson (1986) to explain human behaviour are borrowed from psychology. The integration of opportunity costs, enterprise selection and time value in planning extension projects are borrowed from economics; the linkage between politics, education, development and political presuppositions in extension approaches are based from political studies; the usage of print media, electronic media to support extension strategies are based on the concepts and practices of mass communication (Blackburn, 1989). The accumulation of these concepts in extension studies and the experience of extension practitioners have made it possible for extension to evolve as a body of knowledge in the social science, especially in adult education and human resource development.



## Definition of Extension

Generally, extension can be defined as a system of non-formal education which provides advisory services using the educational process to help clients in acquiring knowledge and skills to cope effectively with needs and problems facing them in their own socioeconomic contexts.

As a system of non-formal education, extension seeks to induce voluntary behaviour change among its clients through their involvement in the planning, implementation and evaluation of extension programmes. These programmes are usually based on clients' needs and problems and thus, to benefit them directly by participating in the programme activities.

As an advisory service, extension disseminates an array of information on new knowledge and technologies, skills and strategies based on research results to help clients fulfill their needs and solve their problems. These advisory services can be in the form of teaching-learning situations, study tours and demonstration - discussion groups with the aim of creating awareness, interest and inspire clients into action to solve their own needs and problems.

As a process, extension links clients on a continuous basis with evolving research-based and tested knowledge, technologies, procedures and perspectives that may be in their own interest, and potentially useful to their own purposes (Boone, 1989: 2). In this regard, extension mission is to help people to develop their capacity and potential to manage and



cope with changes in their environment.

### The Nature of Extension

The on-going debate on the nature of extension education still goes on for the last four decades despite its obvious implications on theory, training and practice. The debate is on the philosophical position as to what extension is about. There are several views on what should be the nature of extension. Some view extension as information dissemination and technology transfer. According to this view, extension should disseminate information and/or transfer technology from research organizations to potential users. Roling (1985) termed this view as the "Technical Innovation Tradition" of extension while Cater (1993) called it as the "Conveyor belt" philosophy. The major criticism of this view lies in the fact that too much emphasis is given on the transfer or dissemination of technology with little or no concern at all to the recipients of the information or technology. In other words, the human elements are absent which are as critical as the technology itself in the success of any technology transfer strategies.

Another popular view is extension as education<sup>1</sup> and extension as a change process. Mosher, as early as 1958, had suggested that "any method or activity which is not education is not part of the extension

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1. Education is being used in a broad sense to denote the process of an individual's capacity and potential to use information disseminated to make decisions on his/her own whether to accept or reject a change introduced to him/her based on his/her needs, problems and socioeconomic situations.



process . . . . Thus, pure service functions or regulatory functions, in and of themselves, without education, would not be considered true extension" (p.12). According to this view, extension should provide information (knowledge) and skills to create awareness and interest among clients and to use them (knowledge and skills) as bases to make decisions on whether to accept or reject a change or a technology introduced to them. The focus, according to this view, is the development of the individuals' capacities and potentials to manage their own affairs. This philosophical base of extension has often been referred to as the "human resource development tradition" (Roling, 1985). Extension is an educational process which assists individuals in making use of advancing science and technologies (and other forms of knowledge) in improving their own circumstances - - - their lives and livelihoods (Carter, 1993: 6 and 1989:1). In other words, science and technologies should be treated as means to achieve an end, an end being able to help people learn to better cope with their existing circumstances that affect their daily lives and existence.

Besides the two dominant views on the nature of extension as described earlier, other views indicate that extension as a policy administration instrument and extension a community development process. With the policy administration instrument, extension is viewed as an avenue or a forum by which government plans and strategies, usually from a central agency, are extended to a population that would be the potential recipients or users (Baker, 1989: 49). The nature of extension, according to this view, follows the theoretical base of the diffusion of innovation and adoption postulations of Rogers and Shoemaker (1971). The basic assumption of this theory is that technology

transfer will have its maximum impact if it is relayed to innovators and early adopters among the population because they usually have the means, support facilities and more important, are in better positions to take risks in adopting new technologies (Rahim M. Sail et. al, 1993). The criticism of this view of extension is that it is élitist in nature.

Extension is also viewed as a community development process. According to this view, extension initiates and assists the community in strengthening local economic and social institutions so that these institutions could better serve the community's needs and problems. The areas of focus in any community development programmes are varied and depend largely on the goals of the community development workers and the organizations they represent. Example of areas of focus in community development work are to increase the economic activity of the population, to shift the political power structure and to be concerned with the preservation and development of culture. The strength of extension in community development lies in the fact that it guides and allows the local population to take the lead by providing them with training programmes in the technical, leadership and management aspects to ensure gradual and planned progressive change for the community.



## Extension Models and Approaches

There are several extension models and approaches in the literature. Some of these models are generic and conceptual in nature while the approaches are somewhat overlapped. Bennett (1989) describes three generic models of extension: (i) research-transfer models; (ii) adult education models; and (iii) interdependency models.

According to the research-transfer models, extension major role would be to transfer research results from research agencies to potential users. In cases where the research results are not appropriate to the potential users, then extension role is to carry out adaptive research (sometimes in collaboration with researchers from the research agencies) to produce location specific technologies. This arrangement has been found to be effective with the research-extension linkage pilot projects in Indonesia that led to the establishment of the Institute for the Assessment of Agricultural Technology under the auspices of the Agency for Agricultural Research and Development (Rahim M. Sail, 1995). A secondary role of extension in this model is to relay problems and needs of clients to researchers.

Extension's role in adult education models is to ensure that extension programmes are based on the clients' needs and problems as well as on other information that would fulfill their needs and solve their problems. Also, under adult education models, extension's role would be to educate clients so as to ensure that they develop their capabilities and potentials to the maximum level. The premise behind this role is to ensure that the clients are progressively made to be

achieve their own goals and set their own directions to achieve those goals.

Interdependency models call for the integration of research and extension roles to maximize benefits for the clients. In many ways interdependency models are similar to the adult education models in that they use needs assessment and relevant information as bases for extension programme formulations. The distinct difference between the two lies in their starting points - - the research-transfer models begin with research agencies' programmes while the adult education models begin with extension agencies' actions. The interdependency models, however, begin concurrently considering the actions of research agencies and extension and follow concurrently their respective actions as well as their interrelationships (Bennett, 1989:121).

From the three generic and conceptual extension models, several approaches are derived to implement extension and non-formal education programmes. Some of the common approaches identified are (Pickering, 1987):

- (a) The Commodity-focused approach: extension programmes are based on a specific commodity or crop with the aim of increasing productivity or efficiency and/or incomes from engaging in that commodity. For example, rubber extension or oil palm extension or livestock extension are commodity-focused approach. This approach is based on the research-transfer model of extension which emphasizes the transfer of research outputs to clients. The approach is based on the



concept of specialization and specialization promotes efficiency. Criticism of this approach lies in the fact that little attention is given to the training of the clients and as such the efficiency it is supposed to promote becomes inhibitors to the success of the approach because the clients do not understand the technology fully to accept it.

(b) The community development-cum-extension approach: this approach follows the general themes of the adult education models. The extension agent is given too many tasks and responsibilities to develop the community and loses focus of his/her major roles. This approach is a classic example of trying to do too much and ending up in achieving very little. Another constraint of this approach is that the agents's technical knowledge is limited and very rarely would they be updating their technical expertise.

(c) The technical innovation-centered approach: this approach follows the premise of the research-transfer extension models. Technologies generated and developed from "outside" are to be transferred to the clients without determining their suitability and relevance to the clients' problems and needs. As with the commodity-focused approach, this approach pays little or no attention at all to the clients' training needs.

(d) The training and visit (T & V) system approach: the major premise of this approach is based on the adult education models where training of the clients as well as the agents are given prominence. In some aspects the T & V system approach follows the

interdependency extension models where both the clients and extension agents are given regular training to update not only their extension and communication skills but also their technical expertise. One of the weaknesses that has been observed with the T & V system approach is that participation by clients in the training sessions starts off quite well and begins to dwindle down after a few months. In some cases, training sessions have to be cancelled due to poor response by the clients.

(e) The 'animation rurale' approach: this approach uses the interdependency extension models where elements of adult education and research-transfer are present. The most important element of this approach is participation of clients in rural development programmes activities that are planned and implemented based on mutual understanding of the situations existed. Extensionists and researchers join hands with clients to carry out verification and adaptive trials to produce location-specific technologies.

### **Extension Education in an Industrialising Malaysia**

At the outset of this paper, I have indicated that the concept, principles and approaches of extension education have already been applied beyond the fields of agriculture. The evolution and development of extension education as a discipline of study and practice over the years has made it to become important reference points and a source of knowledge in the application of social science concepts, especially in the areas of adult and continuing professional education



(ACPE) and the dissemination of technical-innovation information (TI). These two areas are critical in ensuring the success of any socioeconomic intervention programmes where there are both the technical-innovation aspects to be disseminated and the education and training of the clients or the HRD aspects to be implemented. Both aspects must go hand in hand and must be given equal emphasis to ensure a continuous and sustained development. In the jargon of extension, this is referred to as the research-extension-client linkage system (see Figure 1).

Figure 1 shows a three-partnership systems of R & D, extension/dissemination and clients working side by side and interdependent with each other. Neither system could function effectively alone. They need the inputs of the other systems to function effectively. For example, the extension system needs the inputs of the client system in terms of needs and problems as well as the R & D system in terms of new knowledge and technologies to base its programmes and services. Similarly, the R & D system needs inputs of the extension system in terms of needs, problems and socioeconomic environment of the clients to base its R & D programmes so as to ensure that the technologies produced are relevant to the clients' needs. The R & D system needs the clients system (and the extension system) to carry out verification and adaptive trails on the clients' premises to ensure relevance and suitability of the new technologies. The client system, of course, needs the R & D system as well as the extension system for new knowledge and technologies and the delivery of such new knowledge and technologies to benefit their enterprises.

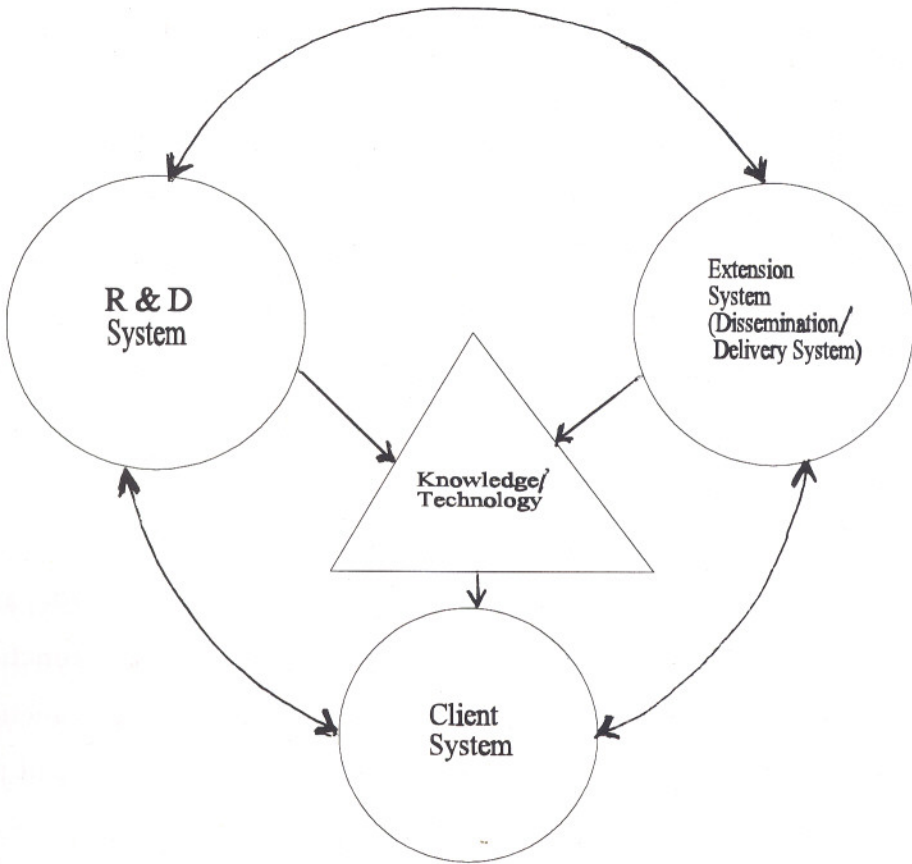


Figure 1: The Research-Extension-Client Linkage System

The research-extension-client linkage system expanded the concepts of the two critical areas, that is, the adult and continuing professional education (ACPE) and the technical-innovation (TI) information to ensure success of any socioeconomic intervention programmes. Can these two areas (ACPE and TI) and other concepts, principles and approaches of extension education described earlier be



used in an industrial setting? Given the flexibility and latitude of extension concepts, principles and approaches, I am confident to say that they are applicable in an industrial setting as they have been applicable in other settings, especially in the rural and agricultural settings. My optimism lies in the fact that other disciplines such as environmental protection, consumer education, preventive health, family planning and development and community nutrition programmes have met with some degree of success using extension concepts, principles and approaches.

In any setting (agricultural or industrial) a strong R & D system is essential to ensure a continuous supply of new knowledge and technologies to increase productivity and improve quality of products produced as well as to have the competitive edge over the competitors. This is survival kit number one to ensure success and continued progress and development. A well-developed extension system, especially adult and continuing professional education (ACPE), is as essential to ensure a well-trained workforce dedicated to the achievement of the organizational mission and goals. Also, a strong extension system would allow a smooth flow of new knowledge and technologies to potential clients. In an industrial setting such as the automotive industry, the education and training of the workforce and transfer of technology are two basic elements to ensure survival of the industry. In line with this, Paul Low, President of the Malaysian Automotive Component Parts Manufacturers Association (MACPMA) made a vivid comment on transfer of technology and trained workforce when he says, "Having the people with the skills and intellectual

capacity to absorb, and more importantly, translate designs into commercial production, is vital". This would account for the speed by which technology is transferred (Cheng, L.S., New Sunday Times, 4 June, 1995: 12).

The client system in an industrial setting may represent manufacturers and service operators of small and medium scale industries (SMIs). They too, as with farmers in the agricultural sector, need the advice and guidance from specialists as to which technologies are most appropriate for their enterprises and how would they adopt these technologies to increase their productivity and improve the quality of their products and services. The client system, under an industrial setting, needs the R & D system as well as the extension system in order to function effectively.

Let me recapitulate what has been discussed on extension education in an industrial setting. I have indicated the research-extension-client linkage system that has been in the rural and agricultural setting to be applicable in the industrial setting, especially in the areas of ACPE and TI. The situations in an agricultural setting are similar to that of an industrial setting, especially the interrelationships of the three systems (R & D, extension and clients). Given the similarities of the two situations, the concepts, principles and approaches of extension can be accommodated to cover the industrial setting as well. This new area of study and practice could be called industrial extension.



## Major Features of Industrial Extension

Science and technology are strategic factors to build a progressive Malaysian society capable of producing technology-intensive products such as semiconductors, electrical goods and electronics besides providing efficient services to improve the quality of life of the population. Science and technology generate knowledge and new knowledge is generated at a fast rate and being applied in the manufacturing and service sectors to increase efficiency and improve quality. Knowledge is an important factor in an industrialized economy. In the words of Peter Drucker (Dialogue, 1994:13), "... knowledge is now fast becoming the one factor of production, sidelining both capital and labor ...."

Given the scenario above, what would be the major factors of extension in an industrial setting? As mentioned earlier, extension concepts, principles and approaches are applicable in an industrial setting as they have been applicable in the rural and agricultural setting. Some of the major features are:

(a) Extension focuses on the people, the farmers, fisherman, entrepreneurs, operators, supervisors and managers who are extension clients. The clients become the most important subjects in any social and economic intervention programmes. The clients are provided with learning situations where they require learning experiences to improve themselves socially and economically using new knowledge (or technologies) contained in the intervention programmes. However, it

must be noted that extension programmes are not purely economics-driven, but rather the development and growth of the individuals are given emphasis using new knowledge or technologies to improve clients' socioeconomic well-being. Usually, the process of providing learning situations and acquiring learning experiences is done through the non-formal education means where the development of the clients' capacity and potentials becomes the primary focus. Carl Rogers, one of the most influential psychologists who pioneered the concept of person-centered counselling used Lao-Tse's philosophy as a basis of his beliefs about human growth (Nelson-Jones, 1995:27):

*If I keep from meddling with people, they take care of themselves,  
 If I keep from commanding people, they behave themselves,  
 If I keep from preaching at people, they improve themselves.  
 If I keep from imposing on people, they become themselves.*

(b) Extension programmes and activities are planned based on clients' problems and needs. This is critical to ensure success as such programmes and activities must be relevant to the situations the clients are in. Any programmes that are "brought in" or "handed down" to clients without taking into consideration clients' problems, needs and contexts are running the risks of meeting with failures because the programmes, in most cases, do not reflect the real needs of the target audience.

(c) Knowledge is an important resource in extension work. Without new knowledge or technologies, extension is faced with the



difficult task of being a credible source of information for the clients. Therefore, the linkage among research, extension and clients in the extension system is vital to ensure continuous progress and development. R & D's major role is knowledge (technology) generation while extension's role is knowledge (technology) dissemination and the client's role is knowledge (technology) utilization. An effective research-extension-client linkage is a prerequisite to successful implementation of extension programmes and knowledge (or technology) becomes an important connection in the linkage through which clients learn to improve themselves and their situations.

(d) Extension process follows the basic principles of democracy where the individuals are given the freedom to choose from amongst the alternatives provided by the extension service. The clients are supposed to choose the alternatives that best fit their situations. This concept is based on the assumption that the individual knows his/her situation, needs and problems better than anybody else and therefore, is in a better position to solve his/her problem using the knowledge (or technology) provided for by the extension service.

(e) Change in knowledge, attitudes, skills and aspirations (KASA) among the clients are the focus of extension programmes. This concept and strategy fall in line with extension's emphasis on developing the capacity and potentials of the target audience so that they will be able to use the new knowledge (or technologies) introduced to them to affect changes in themselves as well as in the operations that affect their socioeconomic well-being. The KASA changes are best

introduced through planned and systematic educational means emphasizing cognitive, psychomotor and affective domains. Only through the educational means, one can hope the KASA changes to achieve some form of permanency among the clients.

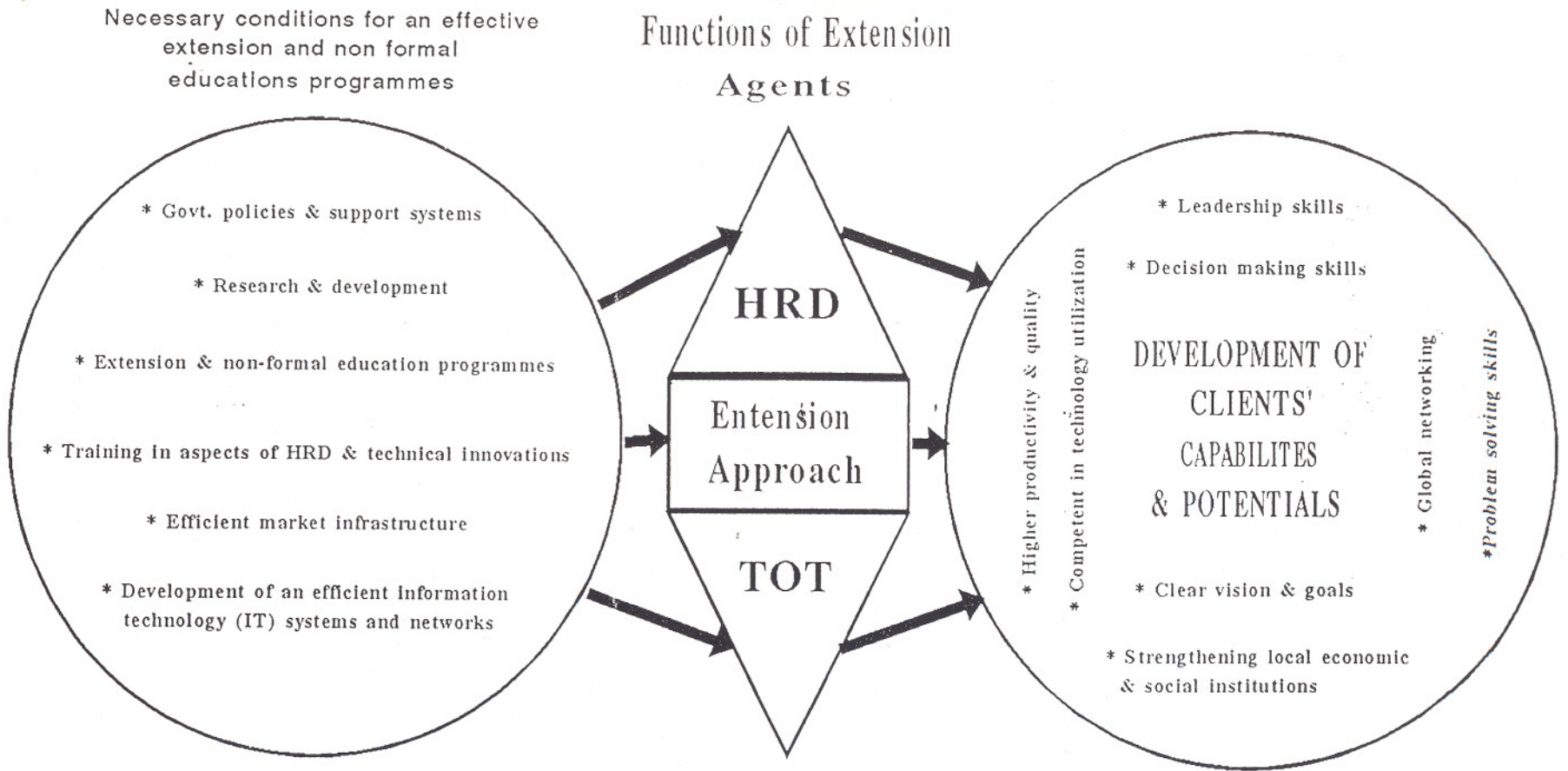
(f) Extension agents who serve as links between research and clients must be well-trained in a technical subject-matter as well as in the adult education or andragogical aspects. Besides these two basic areas, extension agents must be trained in advisory and helping skills. Examples of advisory skills an extension agent should possess include advice on the latest technology, cost-effective measures, effective marketing strategies, establishing an effective networking system, etc. Some examples of helping skills required by an extension agent include how to make accurate decisions, how to use technologies effectively, how to increase productivity and improve quality, how to cut costs and still remain competitive, etc. At a glance, an extension agent must be trained practically in many areas in order to do an effective job, but if one were to examine closely there would be only three major areas an extension agent must be competent in. These areas are: a technical area (e.g. engineering or computer or environmental studies, etc.), adult education or andragogical aspects and some basic management/business studies. The basic ingredient to be an effective agent is to follow current events closely either through reading or attending training programmes or seminar.



## **An Extension Model in an Industrial Setting**

From the discussions on the generic and conceptual extension models and approaches as well as the major features of industrial extension, a generic and conceptual extension model in an industrial setting is proposed. The transfer of technology (TOT) cum HRD model follows the elements of the interdependency model where research and extension roles are integrated and move together harmoniously to maximize benefits for the clients. Transfer of technology (TOT) represents the research agenda whereas the human resource development (HRD) represents the extension agenda or the adult and continuing professional education.

In order to ensure effectiveness of the extension approach using TOT and HRD agenda, several conditions are necessary to be present. Examples of these conditions are government policies and support systems, R & D, regular and systematic training programmes, an efficient market infrastructure, information technology systems and networks( see Figure 2). With the necessary conditions in place and the TOT and HRD agenda implemented according to plan, the development of clients' capabilities and potentials will have maximum impacts. Some of the capabilities and potentials needed by clients in an industrial setting are clear visions and goals, decision and problem-solving skills, global networking, higher productivity and quality, competent in the utilization of technologies, etc. (Figure 2).



**Figure 2: TOT - cum -HRD Extension Model in an Industrial Setting**

TOT = Transfer of Technology  
 HRD = Human Resource Development



The TOT-cum-HRD model underscores the importance of the development of the individual clients using knowledge (or technology) and the adult and continuing professional education to achieve that goal in an integrated manner. Both the TOT and HRD agenda in the extension approach are initiated concurrently to achieve maximum results.

### **Scope of Industrial Extension**

Industrial extension covers small and medium scale industries' (SMIs) operators, supervisors, managers and owners. The SMIs cover both the manufacturing and service sectors. Women, youths, and urban dwellers are also the focus of industrial extension. The subject-matter of industrial extension covers a wide range of topics from the technical aspects such as engineering, computer and environmental science to management aspects such as marketing, finance and personnel to recreational and motivational aspects such as sports, leadership, quality control and total quality management. If one were to compare with agricultural extension, the subject-matter covered is similar when one talks about commercial agriculture with large operation and profit making is the major goal.

### **Issues and Priorities of Industrial Extension**

There are several issues and priorities of industrial extension which are quite similar to that of the commercial agricultural

extension. Some of the issues and priorities to be raised may apply directly to rural and agricultural extension, but there are nevertheless some obvious differences due to the nature of enterprises, scope and coverage of the services rendered. Some of the issues and priorities of industrial extension are:

(a) Cost of extension: in any business outfits, the issue of cost, and perhaps the issue of cost effectiveness is of paramount importance. This is also the case with commercial agriculture. If industrial extension were to be successful with SMIs, urban women, youths and flat dwellers, then it must be efficient and effective with the resources it has (staff and budget) to ensure the basic goal of the extension service is achieved, i.e., the development of the individual's capacity and potentials as well as to increase productivity and improve quality of products produced.

(b) Related to cost is the question "who should pay the cost of industrial extension services?" The obvious answer to this question is whoever requests and receives the services should foot the bill. If the industrial extension services were credible and effective in their dissemination and linkage functions and if the scope and coverage were wide, then the ministry (or agency) concerned should consider having its own extension service. The ministry/agency concerned should train a number of its core staff to man the extension division/unit. If they are small, then they need others to provide the services so as to ensure efficiency and cost-effective. There are at least six (6) ministries (there could be several more) and several agencies under each



ministry that are responsible to provide industrial extension services to entrepreneurs and the "would be" entrepreneurs. The newest of them all is the Ministry of Entrepreneur Development, the Ministry of International Trade and Industry (the manufacturing sector), the Ministry of Culture, Arts and Tourism (the service sector such as tour agencies, hotels and development of tourist attractions), the Ministry of Domestic Trade and Consumer Affairs (consumer education and consumer protection), The Ministry of Rural Development (business ventures among its subsidiaries), and The Ministry of Land and Cooperative Development (cooperatives and business ventures). If we talk about women and youths, then we have the Ministry of National Unity and Community Development and the Ministry of Youth and Sports.

(c) Related to 'b' above is the issue of coordination to ensure effectiveness in the usage of our limited resources. In putting forward the issue of coordination, I realize that it is easier said than done. So much has been discussed about this issue either locally or internationally, but the fact remains that coordination is a tough nut to crack. I believe in all sincerity that a little bit of overlapping is necessary sometimes as it reinforces an idea as it goes along. What is to be avoided is the obvious overlappings that amount to wastage and ineffective use of our limited resources.

(d) An emerging priority nowadays is the consideration for privatization or at least on a full-cost recovery system of extension services. In the field of agriculture, the private sector has been

companies (e.g. seed, fertilizer, insecticide and weedicide) have been involved in advising farmers on the usage of certain inputs to increase productivity. Whatever advice these companies give, they have the vested interest in selling their products. Similarly in the industrial setting, the big companies usually spawn some SMIs into producing component parts for their operations under such arrangement as the vendor system and the umbrella system. The big companies or the "parent" companies usually provide training and advisory services to the SMIs to ensure they get constant supply of quality component parts. This reciprocal arrangement meets the interests of both parties.

(e) Information technology is to dominate the industrial sector and as such, industrial extension should gear itself to be equipped with the latest IT equipment so as to be efficient in disseminating information to the clients. In the information age, we are now talking not only accurate information but also how fast the information can reach its target audience. Accurate and timely information ensures whether or not you are successful over your competitors.

(f) Labour is one of the major constraints in the development of both the industrial and agricultural sectors. Importation of foreign workforce is not a definitive solution to our labour problems. A more definitive and long-term solution to our labour problems would be to have a well-trained workforce capable of handling high technology to automate our work place. In relation to the extension service, we need more people to be trained in both the technical and extension subject-matter to provide for the pre-service as well as the in-service training



programmes.

(g) R & D is definitely one of the critical areas if we are to progress into a fully-developed country in the year 2020. We have to expand our R & D base and support to ensure that our industries are supplied with the latest technologies so as to have the competitive edge. We have to train more scientists so as to ensure that we have an adequate number to carry out our R & D programmes effectively. We have to have adequate financial support and incentives for our scientists to work on to produce the desired results. In line with this, Cetron and Davis (1991) indicated that developed countries have 10 times as many scientists and engineers per capita as the developing world. The gap between their spending on research and development grew threefold from 1970 to 1980. We have to work hard to match the developed countries in providing support to our scientists so as to ensure that we can maximize the utilization of science and technology in our growing economy.

### **Extension Education at the Tertiary Level**

As a matter of record, UPM was the first university in Malaysia to offer extension education courses when it began its academic programme in 1973. As a matter of fact, extension education courses were first introduced in the middle of the 1960s at the College of Agriculture, Malaya, the forerunner to the establishment of UPM. The close linkage between the field of agriculture and extension education

has given the impetus to the development of extension education as an academic discipline and with the focus of agricultural development in the 60s and 70s, the establishment of the Centre for Extension and Continuing education (CECE) in UPM in 1976 was to enhance the teaching, research and extension services rendered to both the students and the community at large.

To-date there are at least 14 courses in extension education offered by CECE to undergraduate students. The courses offered range from basic concepts of extension education to programme development and evaluation in socioeconomic intervention programmes to project papers in extension-related topics for final year students. At the graduate level, we can take pride in the fact that CECE is one of the leading centres in Asia that provides graduate programmes in extension education and development communication. As a matter of fact the Consortium of Graduate School sponsored by SEARCA (Regional Centre for Graduate Study and Research in Agriculture) has identified CECE as the centre for graduate programme in extension education in this region. Students who apply for SEARCA Scholarship to do graduate work in extension education are directed to apply to CECE. At the graduate level, CECE has developed 22 courses that cover from history, philosophy and principles of extension and adult education to leadership and community development to masters and Ph.D. thesis.

Where do we go from here, especially with current scenarios at the local and international levels? At UPM I believe we subscribe to



the philosophy of liberalization of education with the aim of broadening of students' minds through the offering of social science and humanity courses in the curricula of physical and biological programmes. More and more of the technical programmes are "opening" their doors to accommodate social science and humanity courses. This is indeed a healthy sign as it allows flexibility in the curriculum and a broad-based approach in educating our students. Extension education (and communication) courses form an integral part of the liberalization process of our technical curriculum.

The goal of student development, as I see it, should be focused on developing students to become active thinking individuals, capable of engaging themselves in active self-directed lifelong learning habits in the pursuit of knowledge and competencies as well as to cultivate and nurture positive affective characteristics so as to prepare them with the intricacies of modern living in a dynamic technological environment. This goal represents an ideal (and some may even put it as an abstraction which is easier said than done). In a dynamic technological environment of today, we can no longer afford to say what is learned today will not become obsolete by tomorrow. For this very reason we need a liberalized and broad-based curriculum to ensure flexibility and adaptability of our graduates to face the challenges and the ever changing technological work environment of the future. The balanced proportions of technical, social and liberal art courses coupled with a well-planned co-curricular activities will ensure a holistic student development capable to lead and manage change in a dynamic technological environment.

Taking the cue from a balanced curriculum to meet future challenges and changes, university education at the undergraduate level should provide basic knowledge and competencies for an individual student. The basic knowledge and competencies acquired by a student are analogous to a base camp at the foot of a mountain. The actual climbing of the mountain has not begun yet with university education; it is only a preparation to climb. The act of climbing a mountain is the actual test of the application of knowledge and the utilization of competencies acquired through university education. There is the tendency in some technical programmes ( even in some social science and humanity-based programmes) to teach the techniques of climbing the mountain, knowing very well they do not have the capacity nor the means to do so. The success or failure in the act of climbing the mountain depends on how well the climber adapts and adjusts his/her knowledge and competencies to changing situations. Therefore, the liberalization of the curriculum into a balanced proportion of technical, social and liberal arts components would allow the flexibility required to lead a successful career in the future. Specialization and indepth study of a discipline should be done at the graduate level. Extension education has been, in most cases, a graduate level programme of study and should remain to be so unless some form of integration with other disciplines is done.



## Teaching and Research Agenda of Extension Education

With industrial extension, the teaching approach has to be oriented to suit the setting of industries so as to ensure its relevancy. Most of our lecturers came out of the agricultural mould and used agriculture and its setting as a basis to acquire knowledge and competencies in extension. With the present and future focus of extension in the industrial setting (including agricultural industry), then there should be a shift in the teaching and research focus from small-scale agriculture to the manufacturing and service industries. As indicated earlier in the paper that extension concepts, principles and approaches are applicable in the industrial setting as well as they have been applicable in the agricultural setting and as such, our lecturers should begin to carry out their research efforts in the manufacturing and service sectors so that they could use cases and examples of industries to illustrate extension concepts, principles and approaches to students. As we all are aware of research and teaching complement each other so well that lacking in one would hamper, to a great extent, the function of the other.

One of the immediate teaching agenda is to up-date the examples used in our teaching notes from small-scale agriculture to large-scale farming enterprises with profit making as a major concern. This is to be done by visiting commercially operated farming enterprises and learn their operations from the aspects of "up-stream" as well as "down stream". The same could be done for the industrial setting, i.e., by

visiting manufacturing and the service factories and learn their operations, problems and needs.

As with the research agenda, once we have a general understanding of the operations, problems and needs of the industrial sector, then we are quite ready to engage ourselves in indepth studies to understand further and deeper into some extension-related phenomena which would enhance greatly our knowledge in the field. As an illustration, a team of researchers from CECE has submitted a research proposal for IRPA funding to study factors influencing acquisition and transfer of technology among small and medium scale industries (SMIs). The major objectives of this study are to examine strategies used in technology acquisition and transfer among SMIs as well as to assess impacts of technology adoption by SMIs on social, health and the environment. The findings of this study would provide current scenario of technology acquisition and transfer to SMIs, reveal issues and constraints related to technology acquisition and transfer; unveil strengths and weaknesses in technology acquisition and transfer; reveal status of impacts of technology adoption on social, health and the environment; and provide recommendations for alternative policies and strategies to further enhance technology acquisition and transfer.

### **Service Agenda of Extension Education**

In the field of agriculture, extension service has been instrumental in helping farm operators to increase productivity and

improve quality of their products. The teaching and research in extension in the field of agriculture began some four or five decades ago and as such it is a well-developed discipline of study. Would extension work in the industrial sector be as successful as it has been in the agricultural sector? Yes it would be. Given time, industrial extension would be able to provide its services to its industrial clients as it has been giving its services to its agricultural clients. Industrial extension needs more research to be conducted to examine extension-related factors that are relevant to an industrial setting. Only when we have more knowledge and understanding of the industrial settings and their relationships with extension-related factors will we be able to provide the needed services.

In-service and refresher training programmes are the traditional area of services provided by the extension service. Extension training through the adult and continuing professional education (ACPE) ensures its contributions in the HRD programmes of an organization. As it has been discussed earlier in the paper, HRD programmes are critical to ensure success of an organization. With distance education to be implemented soon by UPM, I foresee ACPE to play a big role in recruiting students to enroll in some of the programmes offered by distance education.



## Conclusion

Although the focus of my paper has been on the applicability of extension concepts, principles and approaches in industrial setting, it is not intended to take away from its original base, i.e., the rural and agricultural setting. As a matter of fact, if one were to look at agriculture as an industry, then the major themes of this paper should not be differentiated from that of the manufacturing and service sectors.

The concern that I have in presenting the themes of the paper in an industrial setting is that I would like to see an established discipline such as extension education to continue and flourish under different situations as the discipline is flexible and versatile. Although the focus of development is in the manufacturing and service sectors, the concepts, principles and approaches of extension education are as applicable in an industrial setting as they have been applicable in the agricultural setting. The focus of teaching and research, however has to shift considerably in order to ensure the relevancy of extension education as a discipline of study in an industrializing Malaysia.

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