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PAPER 024-A

Stimulating competitiveness through technology transfer: a focus on micro enterprise activity in construction

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ABSTRACT

The role of globalisation and innovation in fostering continuous improvement for both the private and public sector has received increased emphasis within the last decade. The activities of micro-enterprises in stimulating and adoption of innovation, both as a practice and its nurturing within any economy plays a key part in this respect. Innovation from any large organisation is often visible due to its scope and impact. Similar developments by their smaller and micro- counterparts, however, have to involve a critical mass of such organisations for its impact to be seen. This is particularly the case in developing economies where organisations classified under small and micro-size, normally form part of the informal sector or hidden economy. The mechanics by which innovation occurs within such smaller and micro organisations and how it translates to the national economy is in many cases therefore, not fully appreciated.

This paper sheds some light on the mechanics of innovation at the micro level by presenting how technology transfer from a developed to a developing economy was employed to bring about innovation among small and micro organisations that operate in construction and its related sectors. It briefly describes innovation and technology transfer as it relates to the context of this paper and how globalisation contributes to both factors. It discusses the mechanisms for the transfer of the technology, and focuses on the aspects of innovation achieved through the impact of the technology transfer. It also identifies some of the difficulties associated with stimulating innovation among the small and micro organisation within the construction sector.

Keywords: Built environment, micro-enterprise, innovation, technology transfer

INTRODUCTION

The activities of micro-enterprises in stimulating and adoption of innovation, both as a practice and its nurturing within any economy plays a key part in this respect. Innovation from any large organisation is often visible due to its scope and impact. Similar developments by their smaller and micro- counterparts, however, have to involve a critical mass of such organisations for its impact to be seen. This is particularly the case in developing economies where organisations classified under small and micro-size, normally form part of the informal sector or hidden economy. The mechanics by which innovation occurs within such smaller and micro organisations and how it translates to the national economy is in many cases therefore, not fully appreciated.

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INNOVATION AT MICRO ENTERPRISE LEVEL

The importance of technological innovation and capacity development for micro-enterprises is a theme that is shared by all economies. In developing countries, this assumes a greater significance for achieving economic development objectives (Kumar et al., 1999). The role of micro enterprises is crucial in these economies because they often play a critical part in the embedment of technology and know-how transferred from developed economies. The ability of small enterprises to adopt, adapt and transform existing technological applications and know-how from other environments into relevant and appropriate economic solutions, organisational processes and technological products to match the socio-cultural context of their regional or local industry sector is crucial in bringing about innovation. Innovation in this context is an activity that is often instigated by an external agency, as individual actors involved in such innovation from a developing economy perspective often do not have the capacity to initiate the process. Their essential contribution to the process of innovation however, lies in the transfer of technology and know-how for capacity development.

CONTEXT OF TECHNOLOGY TRANSFER

Technology transfer often presents a complex process that has varied meanings to different audiences (McMaster et al., 1997). In general the context of technology transfer adopted within this paper can be described as the process by which technology, knowledge and/or information developed in one organisation or economic environment, for a particular purpose is applied and utilised in another organisation, or economic environment, for a similar or another reason. The transfer transpires as a gradual process described by Rogers (1995) as a diffusion of innovation. Such diffusion is characterised by a strong personal component whereby any know-how or innovations involved in the process are often transferred through friendships, or close collaborative networks which engender some degree of personal confidence in the host organisation (Robinson, 1988).

THE TRANSFER PROCESS

This section provides an outline on the basic steps of the transfer process as well as the key participants involved in the diffusion of the know-how. Figure 1 presents a schematic approach for achieving a continuous know-how and technology transfer.

The schematic approach comprises eight key stages that are further elucidated in the Table 1 below. The process of transfer depicted in Figure 1 presents the ideal case and in very many projects a deviation from this ideal is somewhat unusual because of the uncertainties intrinsic in technology transfer. In some cases, the transfer process could include only some of the sequences shown in Figure 1.

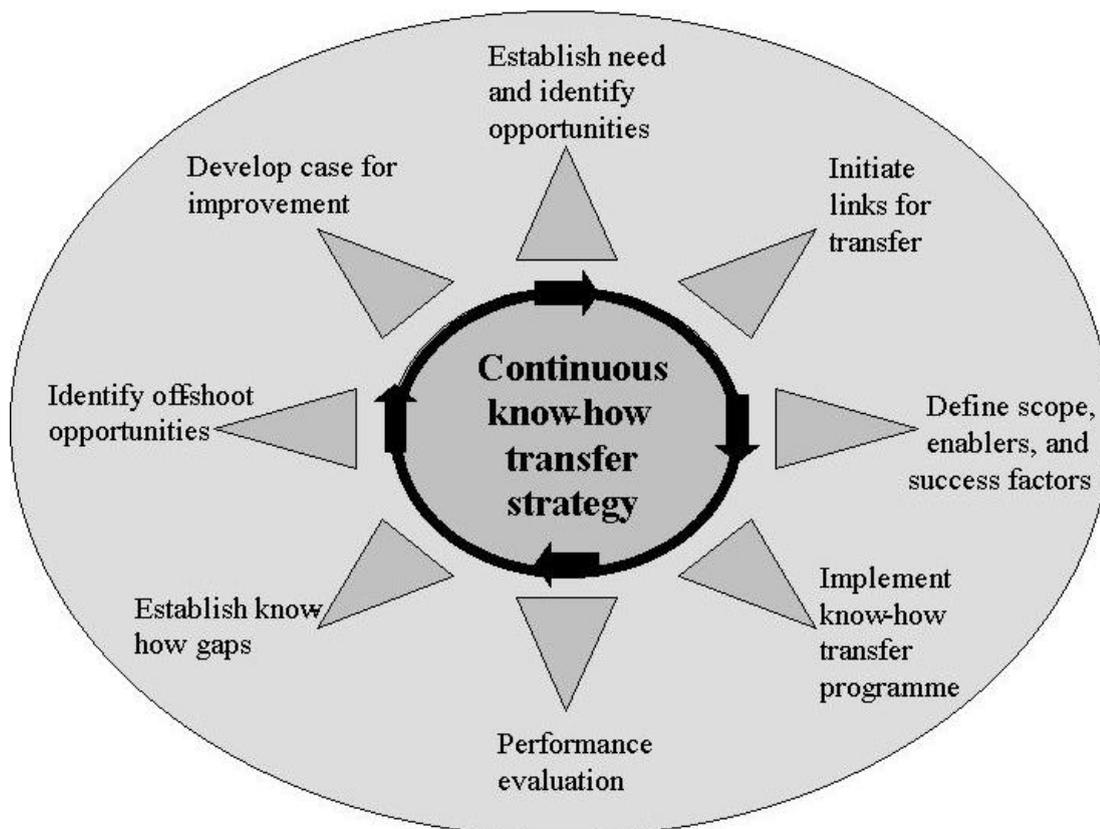


Figure 1. Process for continuous know-how and technology transfer

Table 1 Elucidation of key transfer stages

Stage	Operational activity
I	Establish need and identify opportunities for transfer of technology and know-how.
II	Initiate links for the transfer of know-how. It is essential that the initiation of links take cognisance of the personal element associated with effective technology transfer.
III	Define the scope of the transfer scheme, ascertain close and remote enablers and constraints as well as success factors. This stage forms the transfer appraisal stage.
IV	Devise and implement an appropriate programme for the know-how and technology transfer.
V	Undertake performance evaluation of the transfer scheme based on prior established metrics at appropriate milestones.
VI	Establish know-how gaps between milestones metrics and actual performance as well as projected impact of the whole scheme.
VII	Identify off-shoot opportunities and spin-offs that arise as a result of the implemented transfer scheme.
VIII	Develop case for improvement of implemented scheme or any new opportunities for further transfer.

Depending on the degree of formality associated with the transfer the various stages of the process may proceed in a different sequence. Equally, the duration of each stage might last a few days or several years depending on the nature of the transfer project and its scale of implementation. Stage VI of the process is particularly significant, as many know-how and technology transfer programmes are known to progress along paths depicted in Figure 2.

The gap between the realised transfer and unrealised transfer in Figure 2 provides the scope for improvement or new transfer programmes.

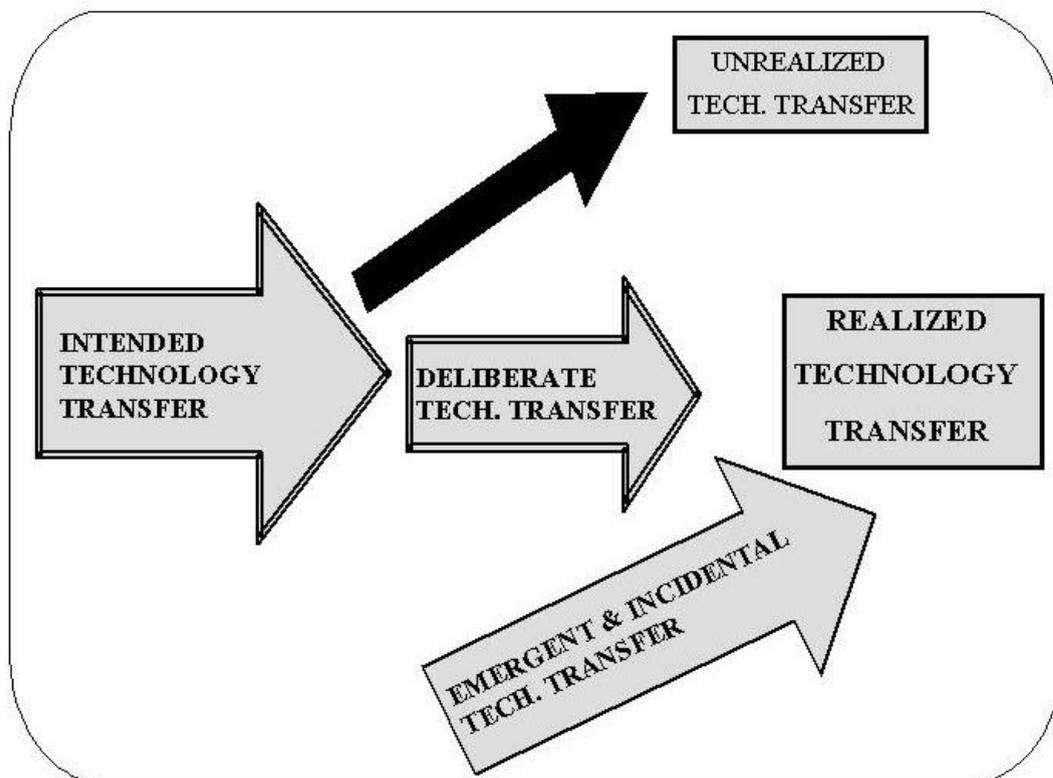


Figure 2 Nature of input-output effect of technology transfer programmes

KNOW-HOW TRANSFER CASE

In many developing economies the conventional financing mechanisms have not been able to serve the people in real need due to the constraint posed by creditworthiness of the poor and lack of appropriate procedures to cater for groups with incomes below national averages. The conventional requirement for collateral such as assets and the evidence to demonstrate that such assets exist practically often excludes the lowest income group. It is therefore common to find small and micro-businesses and local enterprises that are financed entirely from equity, thus limiting the scale of projects and orders their organisations can take up. This situation is not limited to construction and in this case the solution did not emerge directly as a first time transfer of know-how within construction, but rather as a secondary development. What effectively constitutes a spin-off from technology transfer programme implemented in another industry sector.

As a response, to the perennial problem of lack of finance for small enterprises, the Grameen Bank in Bangladesh, emerged as an innovative financing mechanism in the form of *micro-credit* in place. As part of the mechanism put in place was the implementation of know-how transfer on capacity development and financial management. The citing of this case is only for illustrative purposes, and the underlying concept of the micro-credit has found application in several developing as well as advanced economies.

Key participants

The origin of the scheme can be traced back to 1976 to an action research project launched to examine the possibility of designing a credit delivery system to provide banking services targeted at the rural poor. In conformity with the features associated with successful transfer of know-how, the scheme was driven through the personal commitment of Professor Yunus, then Head of the Rural Economics Program at the University of Chittagong, Bangladesh. Successful implementation of the scheme in a village adjacent to Chittagong University saw the extension of the scheme to cover first one district and later to other districts within Bangladesh. In October 1983, the scheme, which had come to be known as the Grameen Bank Project was transformed into an independent bank by government legislation. Currently the Grameen Bank is predominantly owned by the rural borrowers that account essentially for its market. Borrowers of the Bank own ninety per cent of its shares, while the remaining ten per cent is held by the government of Bangladesh.

Micro-credit

Micro-credit is the extension of small loans to entrepreneurs too poor to qualify for traditional bank loans and essentially is was devised as a means for the alleviation of financial barriers faced by micro enterprises. In Bangladesh the scheme provides credit to the poorest of the poor in rural areas without any collateral. The rationale of the scheme at Grameen Bank is to provide credit as a cost effective means to mitigate the effects of poverty and serve as a catalyst in the overall development of socio-economic conditions. Currently, the scheme in Bangladesh provides services to approximately two million borrowers including women from the rural areas although initially it was not planned to cover that scale.

The concept underlying the financial arrangement involved in micro-credit has international applicability (Srinivas, 1993). Within Europe and North America this instrument is regularly used, both in government policy formulation, as well as the private commercial sector as part of their lending approach to bridge the income divide for new business starts. The essential features of the scheme in Bangladesh include:

- very small loans given without any collateral (average loan size \$100)
- loans repayable in weekly instalments spread over a year
- eligibility for a subsequent loan depends upon repayment of first loan
- individual, self chosen, quick income generating activities which employ the skills that borrowers already possess

- close supervision of credit by the group as well as the bank staff
- stress on credit discipline and collective borrower responsibility or peer pressure resulting in a repayment rate in excess of 98%
- special safeguards through compulsory and voluntary savings to minimise the risks that the poor confront
- transparency in all bank transactions most of which take place at centre meetings.
- simultaneous undertaking of a social development agenda addressing basic needs of the borrowers
- design and development of organization and management systems capable of delivering programme resources to targeted clientele.

Table 2 presents the performance of the scheme over the last four financial years. This shows a gradual decline in the volume of lending operations (clearly observable in the Housing category). The reduced level of lending is a result of previous borrowers improving their financial capacity and thus, undertaking subsequent task without recourse to the facility provided by the scheme.

Table 2. Performance of the Grameen Scheme

All figures are in USD (Million)

Yearly Loan Disbursed	1998	1999	2000	2001
General (including other infrastructure)	393.90	316.76	268.62	188.49
Housing	20.64	4.58	1.41	0.82
Overall repayment rate (%)	93.52	90.71	88.73	89.57
Number of houses built	491012	511583	533041	543743

Source: <http://www.grameen-info.org/mcredit/index.html>

SECONDARY TRANSFER TO CONSTRUCTION

While the original scheme was set up to provide finance for agricultural activities, its success has seen an expansion into personal loans to cover other sectors including:

- housing development,
- sanitary projects
- drinking water projects.

This is a clear reflection of the transfer process depicted in Figure 1 and further elucidated in Table 1. More specifically, the identification of other opportunities has assisted in the growth of the transfer scheme to other sectors beyond its originally conceived scope. Equally, there are several rural development projects in infrastructure that are often too small for the well established construction companies to undertake as their size does not provide adequate financial coverage for the higher overheads associated with these bigger organisations. The lack of finance, however had in previous times served as a setback for local entrepreneurs taking up these rural projects. Equally, in many countries beside Bangladesh (including Sri-Lanka, Pakistan and Tanzania), where the public sector is often constrained by resources in the provision of municipal services through traditional contracts, this system of community contract normally provides the solution. The system enables the public sector to engage local people to execute the work, supervise part of the work, and in some cases even fund the infrastructure. The underlying rationale of this approach is that users as contractors not only procure the services but also create a sense of belonging for the works and services created. This had a positive effect on the operation, maintenance and sustainability of the infrastructure. In Sri-Lanka this initiative has been scaled up, to serve as one of the mainstream procurement options.

RELEVANCE TO CONSTRUCTION INDUSTRY

Ofori (2002) reiterates the role of the ILO in facilitating construction industry development economies and identifies the improvement of business environment and organisational capacity as a

key aspect. While the ILO addresses the organisational capacity through formal training schemes, the case presented in the paper provides the alternative, whereby transfer of know-how for a scheme in another sector diffuses to facilitate organisational capacity development in construction. As part of the spin-offs from the micro-credit scheme in other sectors, the potential for a similar scheme to alleviate the constraints faced by the local micro contractors was identified. Construction projects by nature demand financial outlays that often no one entrepreneur at that micro-enterprise level could sustain. As an innovative feature for the transfer of the scheme to construction, the introduction of partnerships emerged. This ensured that several micro-contractors could pool together their collective credit facilities to undertake projects that hitherto had been beyond their capability. The shared goals and common socio-cultural context contributed to bring about an effective partnership (Bossurt and Geert, 1994).

IMPACT OF THE SCHEME

The immediate impact of the scheme in Bangladesh is best appreciated through the contribution it makes to the national economy. For the period 1994, 1995, 1996 this amounted to a GDP contribution of 1.50% 1.33% 1.10% respectively. In addition the scheme has enabled the following:

- Capacity building at micro-contractor organisational level
- Industry sub-sector development
- Local industry capacity development (ability to undertake works as subcontractors for major contractors)
- Employment generation
- Wider socio-economic benefits

SUMMARY

The transfer of know-how from a developed economy in the form of micro-credit implementation and management to Bangladesh provided an innovative solution for addressing the financial constraints associated with rural micro enterprises. One of the major spin-off of this transfer was the adoption of the scheme to serve the needs of rural construction contractors. The level of finance provided in the case of the Bangladesh scheme has also served as a catalyst for the growth of local partnerships in order to bring about a better financial capacity often required to undertake rural community infrastructure projects. The success of the scheme is attested to by its growth, as well as the degree to which it is reducing external finance requirement for micro-contractors.

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