Routledge
Taylor & Francis Group

Construction Management and Economics

ISSN: 0144-6193 (Print) 1466-433X (Online) Journal homepage: www.tandfonline.com/journals/rcme20

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D. C. Ignatius Imbert

To cite this article: D. C. Ignatius Imbert (1990) Human issues affecting construction in developing countries, Construction Management and Economics, 8:2, 219-228, DOI: 10.1080/01446199000000018

To link to this article: https://doi.org/10.1080/01446199000000018

Construction Management and Economics, 1990, **8**, 219–228

Human issues affecting construction in developing countries

IGNATIUS D.C. IMBERT

Department of Civil Engineering, The University of the West Indies, St Augustine, Trinidad

The inhibiting effect of underdevelopment of human resources on construction in developing countries is examined and the need for education, training and research emphasized. Developed-world involvement and its often adverse effects, social and otherwise, are discussed, the provision of shelter being given as one major example. The fact that most large-scale infrastructural work is undertaken through arrangements with developed-world organizations is given prominence, the inappropriate nature of many contract procedures being emphasized. The importance and extent of informal construction is also highlighted.

Keywords: Education, construction, contracts, human, management, research, underdevelopment

Introduction

The term *developing countries* is loosely used to classify those countries which lie outside the small group of developed, industrialized nations. The populations of these countries constitute the majority of the human race and, if the demographers are to be believed, will total almost 5000 million people by the beginning of the twenty-first century.[5] It has become evident that construction activity on a much increased scale will be required if basic infrastructure and facilities are to be provided for these people to achieve a minimally acceptable standard of living. This scale of construction is presenting developing countries with unprecedented challenges, complexities and problems of which the human ones are perhaps the most important. Moreover, the construction process is affected by a number of economic, political, social, psychological, historical and/or religious factors which are human in origin and dimension. A discussion of these human issues and their ramifications is the central theme of the paper.

Underdevelopment of human resources

An issue of fundamental importance is that of the development of human resources and it has become evident over the last few decades that their underdevelopment is the major factor inhibiting effective planning and implementation of construction projects in developing countries.[1] The problem is not only one of scarcity of skilled personnel at all levels and across a wide range of crafts and professions but also of major deficiencies at the managerial level, a situation aggravated by a dearth of managerial competence in the society at large.

0144–6193/90 $03.00 + .12

If we examine the issue of management deficiencies closely, we find that it leads, amongst other things, to poor planning, organizational instability, excessive bureaucracy, unnecessary legality, slow decision making and low productivity. These factors manifest themselves in a variety of ways, some of the most important of which are mentioned here. First and foremost, the inadequate financial resources which generally exist pose the question of choice of projects in both the public and private sectors and the capability for making such choice is often limited or, in some cases, even non-existent. The results of poor choice are to be seen throughout the developing world. Secondly, delays in budgetary allocation and the establishment of channels for the flow of funds often leave implementing agencies without adequate resources for starting or completing projects. Thirdly, delays in completing legal and administrative arrangements are commonly experienced. The effect of such delays is especially acute where more than one implementing agency is involved. Fourthly, the early appointment of project managers and other key staff and the necessity for them to be involved at the outset of planning and design seem to be matters which receive scant attention. The developing world is replete with examples of projects which have experienced poor conception, long delays and increased cost as a result. Fifthly, arrangements for procurement of goods and services are usually badly organized and delivery often takes much longer than anticipated.

Deficiencies in management and technical skills also manifest themselves in physical areas such as land, communications, equipment and materials. Land may not be available when required because of poor planning and lack of foresight in recognizing difficulties likely to be created by ownership problems, environmental permits, rights-of-way, legal formalities and bureaucratic delay. Even when these difficulties are resolved, uprooting a community to make way for a project becomes a social and political problem, thus causing unnecessary delay and increased cost. Communications, especially the critical ones of telecommunication and transportation, are often poor and, in the case of the latter, the effect on site inspections and the movement of workers, equipment and materials is incalculable. In the case of equipment, breakdowns often occur because of poor maintenance management, low-skilled operation and inadequate procedures for purchasing and stocking spares. Moreover, poor equipment management frequently leads to idle time and increased cost.

The materials problem is particularly acute, locally produced materials tending to be in *chronic short supply due mainly to poor management and development of natural resources*, inadequate financial investment and inhibitory laws and government policies. *Moreover, the development of local materials industries is not pursued with much vigour.* This is partly because many local professionals simply lack the competence or will to study the properties of local materials *and encourage their use and partly because the trader mentality* prevalent in so many developing countries makes it more convenient to import materials *ready-made* from the developed world. *It seems to matter little that importation is often accompanied by delays and increased cost related to matters such as shipping*, insurance, documentary credits, foreign exchange controls, customs regulations and queueing in an international market.

A particular factor to be considered is the quantitative nature of management deficiencies as distinct from the qualitative. Thus, there may be (and often are) competent local managers to be found but not sufficient in number for the work required. The result is that either some projects or activities have competent managers and others do not or the competent managers become so overburdened with additional work that they are rendered less effective than they would otherwise be. *Either way, the construction industry as a whole suffers.*

The reasons for the underdevelopment of human resources in developing countries are

many and various. Some are historical, with particular countries being technologically advanced in earlier times and subsequently losing and never regaining that position through warfare, conquest or internal decay while others have never been particularly advanced. Geographical reasons, such as remoteness from centres of industrialized civilization, play an important part in some cases and it can indeed be argued that the recent upsurge of some of the nations of South-East Asia is attributable in part to their proximity to the Japanese economic miracle. One specific reason is the inhibiting effect of inadequacy of financial resources on the setting up or expansion of requisite educational institutions and programmes.[4] What appears to be a particularly important reason, however, *is the lack of perception on the part of planners and executors of economic policies.* They seldom recognize the role of *skilled technical manpower* in development and in the reduction of technological dependence on the developed world. Even less do they understand that technological skills and capacity have political and economic significance. Thus, the creation of a reservoir of appropriate skills is often institutionally divorced from direct efforts at social and economic development[6] and left to Ministries of Education rather than made a central instrument of economic policy. It should be noted, however, that the issue of underdevelopment of human resources, with all its attendant consequences, varies from country to country because of diversity in culture, education, stages of development and political structure. This is also true of regions within countries, especially the larger ones.

Education, training and research

The nature of the human resource problem and its pervasive effects indicate the need for extraordinary action to upgrade managerial and technical skills, broaden their range and increase their totality. Education and training are, consequently, needed at all levels and across a wide spectrum of technical disciplines. Considerable research is also required.

Education and training

Much is already being achieved in the fields of education and training in some countries but many have a long way to go. Moreover, even where reasonable strides have been made, these have often been lop-sided, with professional skills being emphasized at the expense of craft training. This approach tends to be politically and socially popular in many countries and, because of the small numbers involved, relatively easy to organize. That craft training should be given equal importance is now being recognized but its introduction and establishment on the wide scale needed are often inhibited by inadequate financial resources and paucity of technical teachers. The latter is itself one of the consequences of underdevelopment of human resources.

Because of their inability to achieve the objective of improving skills with their own resources, many developing countries have recourse to external aid. Thus, personnel may be trained in developed countries, specialists from those countries may conduct training locally and/or joint ventures may be set up whereby local institutions and programmes are established or expanded. *One of the major problems with such external aid is an orientation towards ideas, techniques and materials* with a developed-world bias.

The situation is changing to meet the needs of the times but there is still a great deal to be

done. Indeed, what is required more than ever before is a highly-trained cadre of people who are alive to the needs and realities of their own societies, sensitive to cultural values of intrinsic worth, conscious of the social nature of design and imbued with a philosophy which leads to the efficient use of indigenous materials and techniques. Thus, technical competence must be combined with political sagacity, cultural sensitivity, social conscience and economic wisdom. Insufficient attention to the need for these characteristics has led to errors of all kinds and many cases of disharmony with the environment.

Education and training have a dimension beyond that of direct improvement of the level and spread of skills. These skills must themselves be so imparted as to create an intrinsic capacity for the generation, assimilation, adaptation and utilization of technology. In this context, it is important to recognize that technology relates *to the capacity of a society to use scientific knowledge, technical skills and mechanical means for the processes of production.* The concept of technology as being society or country oriented implies that developing countries must invest heavily in the improvement of *their own technological resources*, thus reducing their technological dependence on the developed world. Hence, programmes of education and training at all levels should have as one of their prime concerns a philosophy of technological progress and change which leads to the development of innovative methods and techniques which are compatible with local conditions. Indeed, the growing pressure being created by both the abundant supply of labour and the endemic scarcity of capital and foreign exchange is making it a matter of necessity that methods and techniques which are labour-intensive and favour local industry and materials be developed. In this context, it must be remembered that an abundant supply of labour constitutes one of the major resources of the developing world and that the employment of people is socially desirable, economically beneficial and politically advantageous.

Although formal programmes of education and training are increasing in number and extent, they are still far from the minimum required in most developing countries. It has been recognized in the more advanced of these countries that this deficiency can be reduced by the establishment of in-house or on-the-job programmes in the form of short courses, workshops and seminars. These are becoming a feature of education and training in both the public and private sectors and are undoubtedly leading to an increase in skill improvement.

Research

Programmes of education and training, especially those geared towards innovative construction methods and techniques in developing countries, require considerable research if they are to be effective. For such research itself to be effective, there must be both a commitment to it and a sufficiency of highly trained personnel to conduct it. This is often not the case in many countries and herein lies a fundamental weakness. Research in the construction process itself is also essential because of the necessity to control cost in these inflationary times, ones in which developing countries have been hard hit by the international economic situation and a massive burden of debt.

A particular aspect of research in construction relates to the gathering, processing, distribution and use of information. This is one of the areas of severe deficiency in many developing countries which not only affects the organization and implementation of projects but also creates problems for external aid organizations, thus providing potential sources of conflict, error, delay, increased cost and the like. The nature of the deficiency is wide in its extent and covers many areas. For example, the absence or paucity of cost information from

completed projects makes estimating at the design and bidding stages very difficult and diminishes the capacity of owners and builders to establish cash-flow trends for different types of project. In the case of international contracting, it has often proved extremely difficult to obtain information on resource availability and local conditions sufficient to prepare workable bids, organize work effectively and achieve successful implementation without cost over-runs. Many countries have, however, recognized the importance of information and have successfully taken active steps to improve the situation.

Research also needs to be done into the manner of introduction of alternative practices, methods, techniques and materials. People in developing countries tend to be conservative in nature for historical, religious, social and other reasons. Thus, the opinions, prejudices and values prevailing in a particular society, the existing organization of the construction industry, the vested interests of builders and materials suppliers and the system of education and training of professionals and craftsmen exert a powerful influence and need to be carefully and extensively studied before action is taken. Indeed, it is one of the psychological paradoxes of the developing world that people will often accept foreign technological ideas and practices wholesale while rejecting those which are locally produced and proposed.

Involvement of the developed world

The combination of underdeveloped human resources, inadequate financial ones and technological dependence has forced many developing countries to seek external aid for construction projects, principally from the developed world. This involves agencies and professionals who usually suffer from two main disabilities. First, they possess limited knowledge and understanding of conditions in developing countries, both generally and with reference to specific countries or regions and secondly, they have a tendency to deal with circumstances from the standpoint of the experiences and practices of their own environments. Allusion to these disabilities has already been made in the discussion of education, training and research.

Looking at the first disability, we find numerous cases of projects being adversely affected due to issues related to local culture, politics, history, religion, geography, topography and/or the level and extent of skills, equipment and materials. In this context, it is worth noting that developing countries exhibit great diversity, having considerable variation in size, climate and topography. A few have reasonably good infrastructure, facilities and supplies of materials but many have not. Some have populations who are generally well-educated and literate whereas the reverse is true of many others. A few are on the threshold of becoming modern industrial states while several are economically backward and others are desperately poor. The necessity for any particular country or region to receive careful study before projects involving external aid are started should, therefore, be abundantly clear. The situation is often complicated, however, by the fact that aid may be coming from more than one developed nation at the same time in any one developing country, with the resulting confusion caused by different perspectives and languages.

The situation may be illustrated by a few examples. The first relates to the necessity to import large quantities of pipe into a particular country, transport them about 500 km inland and lay them along 40 km of pipe trace in indulating bushland.[9] There seemed to have been no awareness at the design end that 40 km of access roads had to be constructed for the purpose and the contractor had to wait several months for the appropriate variation order.

Meanwhile, the pipes were off-loaded and put in storage. The resulting cost, including re-transportation to site and time lost, was $200 000. The second concerns the cost of delay which can occur when contractual arrangements formulated in a developed country become so complex that the responsibilities of the various parties are not clearly defined. In a particular case in Latin America, made even more complicated by poor communication, a project estimated to cost $380 million finally cost $500 million.[3] The third is the story of geotechnical specifications for a project in a poor African country which prescribed the use of certain types of roller for particular soils.[10] None of these was available when the process of physical construction started and no plans had been made to import any. The field engineer, on his first assignment abroad, found himself totally at a loss whereas the specifications engineer was of no help because in his country the equipment concerned was easily available and specified as a matter of course. The fourth has to do with specifications for materials and methods of construction being often rendered useless or leading to considerably increased cost because of unavailability of the required resources. The fifth and final example deals with the problems created by the lack of understanding on the part of supervisory staff from the developed world of the culture of the particular country where they happen to be working.[7] They often have no framework within which to analyse their subordinates' behaviour and, although technically competent, are often ill-prepared to function effectively, especially if the host environment or work-force is itself multi-cultural or multi-ethnic, as is the case in many developing countries.

One aspect of the situation described in the fifth example should perhaps be emphasized, namely, the effect of differing motivational forces on construction workers. Industrialized societies tend to assume economic motives as being predominant, because that is their experience. There are, however, many societies in the developing world which have a different view of material gain. Religion may be one basis for the difference but so may be social norms, status within groups, family or tribal structures or the importance of gaining the favour of traditionally paternalistic or authoritarian leaders.

With respect to the second disability, unless they have considerable experience of projects in developing countries or are blessed with unusual vision, those involved in aid from the developed world tend to transfer practices, methods and techniques which are familiar and well-known rather than modify or adapt them to conform to local situations. This was specifically mentioned at the United Nations Conference on Science and Technology for Development in Vienna in 1979, it being stated that the experience of more than a quarter of a century had clearly indicated that the technology of the developed world was 'too big, too expensive and not well suited to the economies of developing countries'. Moreover, it militated against the creation of 'the jobs needed to absorb the rapidly expanding labour forces in countries' already possessing 'an abundant supply of labour'.

One of the laments heard so often in the developing world is that, despite the number of agencies involved in external aid in construction, little progress has yet been achieved in the transfer of skills and knowledge to local populations, especially in the areas of management and organization. This is a damning indictment of the so-called technology-transfer which is touted so much by agencies in the developed world. On the contrary, what really gets transferred is usually an assemblage of unsuitable techniques and costly equipment accompanied by cultural forms and social information which act as a type of subtle influence on the receiving society, thus affecting its productive and social patterns. The more technologically dependent a society, the more this occurs, with the consequent possible loss or disturbance of its cultural identity. The situation is often complicated by the fact that the

presence of expatriate workers from the developed world and their high expectations regarding salaries, benefits, accommodation and work environment lead to the creation of a privileged foreign elite resented by the local population. Conflicts, social problems and loss of productivity on the part of the latter usually result.

A contributing factor to the conditions described in the foregoing is the insistence by many aid agencies and donor nations that designs take place where the funds originate, thus both inhibiting the transfer of skills and knowledge and giving the entire construction process a developed-world orientation. One of the areas in which the effects of such orientation can be clearly seen is that of housing. This is taken as an example because the provision of shelter is probably the most pressing construction problem facing developing countries and one which is not within their capacity to handle adequately. Thus, aid is constantly being sought from the developed world and usually carries with it the practices and techniques of that world. The sterile, disfunctional and disharmonious housing environments which often result can be seen throughout the developing world.

The provision of shelter is not only a process of physical construction of houses but also one requiring a careful study of the social, cultural and psychological forces affecting it. These forces, which are country specific, are often diffuse and nebulous and frequently function at an intangible and abstract level. Personnel from the developed world who are not tuned into these nuances have little chance of success in producing appropriate housing environments. Indeed, personnel from the developed world experience culture shock when they encounter the slums and large squatter settlements which are to be found on the periphery of so many of the cities of the developing world and consider them to be swelling cancers to be excised wherever possible. Consequently, well-intentioned schemes of slum clearance, followed by replacements with new buildings or relocation elsewhere in new housing estates, have been implemented in many countries. Most of these have failed because of community resistance to this reforming approach and slums have soon re-appeared in the same areas or elsewhere.

A particular aspect of housing which needs to be mentioned here is that relating to the choice and use of materials which constitute its predominant component and which determine the methods and techniques of construction and total utilization of resources. So-called modernizing techniques and developed-world attitudes have frequently led to designs which depend on high-grade manufactured materials. Such materials are usually costly, their production being capital-intensive, and often have to be imported. The experience of enlightened designers and builders in the developing world has shown, however, that alternative materials such as stabilized soil blocks, clay tiles, lime, pozzolans, fibre-reinforced composites and bamboo frames can be just as good, and in many cases, more suitable.[12] They are also cheaper to produce as a rule and are much more labour-intensive in production. Indeed, because of bitter experience, a reversal of *modernizing* tendencies has begun to take place without in any way sacrificing the scientific approach and advanced technology. Building research institutes are beginning to play an increasingly influential role in this area in many developing countries.

In all this discussion of the involvement of the developed world, it must be noted that the more technologically advanced developing countries also get involved in aiding the less fortunate ones and that cultural diversity has created social problems not dissimilar to the ones already mentioned in this paper. Examples of this were quite common during the days of the oil boom in the Middle East when skill-starved countries with a lot of money were forced to import workers, and construction organizations from elsewhere in the developing world, particularly the Far East.

Civil engineering construction

Apart from housing, much of the major construction work required in developing countries is what is generally described as civil engineering construction. This relates to items such as roadwork, airports, seaports, dams, water-supply and waste-disposal systems, drainage and power supplies. Even in the case of housing, there is much civil engineering work required for the provision of basic infrastructure and services. Most of the large-scale work tends to be contracted out to organizations from the developed world, mainly because of inadequate financial resources and/or the scarcity of management and technical skills. The involvement of the developed world may be through international tenders, bilateral arrangements between governments or through international agencies such as the World Bank.

The history of contractual arrangements has shown clearly that due consideration is often not given to their appropriateness.[8] Some of the reasons for this are now briefly discussed. First, there is the prevalence of neo-colonial attitudes which treat contracts in developing countries as foreign trade, with profit-making the chief objective. Thus, attention is concentrated on financial matters such as credit arrangements, cash-flow, inflation and currency exchange, with the resulting tendency that designs, practices, methods and techniques are chosen for economic convenience. Unless prior information and experience indicate that the expatriate organizations will be economically discommoded, local needs and interests are usually disregarded. The foreign-trade mentality also leads to exploitation in the form of provisions that equipment and materials be imported from specified donor countries. Secondly, the costs of feasibility studies which would reveal appropriateness or otherwise are often high and expatriate construction organizations are not inclined to spend time on such studies unless they can see a profit somewhere. The most they are prepared to do, in their economic interests, is to send out scouting parties or engage the services of local agents to give them relevant information. Thirdly, contract agreements and provisions are usually based on civil engineering procedures which, despite the advent of allegedly international standard documents, have a developed-world bias. These are widely used by international and regional agencies, which are the principal sources of funding for major projects in developing countries, and rarely contain provisions for amendments to suit local conditions. The contract documents used are often very complex and lengthy, refer to a variety of developed-world standards and codes of practice which are not easily available and are usually inflexibly applied by representatives of designers and agencies. Misinterpretation and disagreements between parties frequently result, situations not being made any easier by language barriers and communication difficulties. Government advisers in many developing countries do little to improve the situation, preferring to rely on those procedures out of some mistaken belief that this is the only way to achieve high construction standards or because they are simply too lazy, incompetent or fearful.

Standard procedures are now beginning to contain built-in provisions which allow modifications and amendments to suit local conditions. This development is the fruit of much bitter experience, some of it very costly, and the fact that many an expatriate professional has found himself equipped with the latest tools from his own sophisticated society, only to discover his tool kit lacking in the basic essentials for coping with seasoned and established local practices. The use of *ready-made* imported construction practice is still alarmingly high, however, and much needs yet to be done. What is required in fact is not just the building-in of appropriate provisions but a positive philosophy that standard procedures, while retaining a general framework, be altered to accommodate local situations

and, radically so, if necessary. It is only thus that innovative practices, methods, techniques and specifications will develop. Moreover, such a philosophy must actively highlight local participation in planning, design and implementation, the consequent improvement and expansion of skills and the use of locally existing raw materials.

Proof that suitably altered procedures can achieve adequate standards may be found throughout the developing world in works undertaken by local contractors and government departments. These are usually small-scale to medium-scale projects within the resources locally available. An important aspect of these works is that, while being implemented as efficiently as possible, they do not attempt to achieve standards higher than those required for the particular purpose. The author well remembers having to design concrete mixes and construct structures, in his early practice as an engineer more than a quarter of a century ago, with fine aggregates that every developed-world standard proclaimed as having totally unsuitable grading. Not only was good concrete produced, using scientific methods and efficient quality control, but it has successfully withstood the test of time. In another instance, he had to replace a bent-bar, shear-resistant, so-called economic reinforced-concrete design by one with vertical stirrups because the workers were able to deal with the latter more quickly and easily, thus compensating for any cost due to additional weight of reinforcement.

Informal construction

In most discussions of construction in developing countries, it is the formal delivery of built facilities which predominates. There is, however, a considerable amount and variety of informal construction which constitutes a substantial proportion of the total. Informal construction has, in fact, become a major factor in the provision of housing for the low-income population and is contributing in no small measure to the rapid urbanization taking place. Such construction has indeed been classified by one author[2] as an advanced form of technology in Latin America.

It is already clear that the skills obtained in this type of construction are proving very useful, informal builders showing considerable ingenuity in the use of materials. A recent World Bank evaluation[11] has estimated that people building on their own in this manner can do so at costs as much as 30% lower than the conventional construction sector does. Government planners and authorities are taking advantage of such knowledge, with the result that arrangements to encourage informal construction and the economic activity which it generates are being put in place in many countries.

In the field of housing, for example, the site-and-services approach is being increasingly adopted. This is an approach whereby serviced sites containing basic infrastructure are provided for people to build their own houses according to their means and way of life. Construction is usually undertaken on a self-help basis or with a limited amount of hired help. It is usually a slow process, the builder proceeding as he earns and living initially in a small completed core of the house. Extension and upgrading gradually occur and settlements begin to take on a well-ordered appearance with time.

Conclusion

Human issues affecting construction in *developing countries* are examined in some detail in the paper, it being stressed that the underdevelopment of human resources is the major factor

inhibiting effective planning and implementation of construction projects. The paper emphasizes the need for the establishment of programmes of education, training and research in order to correct the situation, the aspects of orientation towards local conditions being given particular attention. The unavoidable involvement of the developed world in construction projects is discussed at some length, with particular reference to the adverse effects of alien attitudes and ignorance of local conditions. The provision of shelter is given as a major illustration of these effects.

The paper states that most large-scale projects are implemented through contracts with organizations from developed countries. The inappropriate nature of many contract arrangements, procedures and provisions is discussed and the point is made that the situation has at last begun to change, albeit at a much slower rate than required. Finally, brief mention is made of the considerable amount of informal construction which takes place, especially in the field of housing.

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