



How should engineers respond to “gender”?

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A RESEARCH PROJECT on mainstreaming gender in water projects is being undertaken by WEDC, Loughborough University, UK with collaborators in South Africa and India. The main output of the project will be a Practical Guide for Engineers and Managers in the Water Sector, and a previous paper (Smout and Coates, 2000) described consultations held in India and South Africa with engineers during 2000.

Throughout the research we have been exploring why engineers’ contributions to non-technical issues are limited and how engineers can improve the development impact of their work, and increase the involvement of groups of people normally excluded from engineering projects – especially women but also poor men and children. This paper considers the role of engineers in this context.

What is the primary task of engineers?

Engineers’ primary task is to complete a project, usually a product or service, via the shortest sequential steps possible. This method influences the outcome, in the quality of the product or service and the efficiency of the task. Engineers are concerned with the physical needs of society (water supply, transport, shelter). However society may have other considerations such as:

- financial (e.g. degree of poverty),
- natural resources (e.g. environmental degradation),
- human (e.g. lack of education, poor health) and
- social (e.g. inequalities, politics). [Ashley and Carney, 1999]

Engineers clearly have a lead role in providing physical resources, but what responsibility do they have for these other issues? Poverty, women’s issues and environmental degradation are important human development issues, but should engineers be involved and do technical issues impact on these socio-economic issues?

Product and method

Some of the links between technical and socio-economic resources are clear. The physical *product* of an infrastructure project can influence the finances of a community (e.g. improved transport links) or better natural resources (e.g. dams to store water and control flooding). Human resource capital can be improved through the health benefits of sanitation. The impacts on social resources are less tangible and maybe negative, for example, poorly planned settlements leading to social unrest.

An engineer’s focus on what is being produced rather than the process of its production can have socio-economic impacts. For example, different methods of procurement of construction can produce the same *product*, but with different impacts on the livelihoods of people. Employing local builders and using local materials contributes to the local economy. Adapting the designs to suit the local conditions can make best use of these local resources and reduce reliance on external supplies. Training local builders to enhance their skills develops local human resources; providing piped water reduces the burden of transporting water, reducing physical stress and freeing that human resource for other more valued activities. Involving the community in construction and management can enhance social resources. Using external contractors produces the same product but without the additional benefits local procurement can provide.

What are the needs of society?

Society is not homogeneous – rich and poor, urban and rural, men and women, old and young have different needs – both physical and social.

Physical needs – adapting the product

Men and women are different biologically and this can have an impact on infrastructure use. For example, in sanitation services, men urinate standing up, women squat and also have to dispose of sanitary towels and children are physically smaller than adults. Adapting the engineered product, in this case the latrine can address these issues.

Social needs – targeting the product

Men and women also have different social roles. Women have an important role as household manager. Men perform a greater role outside the home, publicly and commercially. Thus irrigation may be required for commercial agriculture and domestic vegetable gardens. Both forms of agriculture are vital to the local economy, but only one is registered as an ‘economic’ activity. Engineers can support both forms by targeting irrigation design to meet the end-users’ needs.

Short term needs – providing the product

Engineers can provide solutions to some of the burdens that men and women face in low-income communities. Women and children have a recognised role in the collection of water. Designing the tap-stand so containers can be filled easily can make this less painful and frustrating. These

practical responses and physical services make life easier for women and children but do not necessarily address the social inequities that cause inequitable distribution of burdens.

Long term needs – social engineering

Changing the social position of a group within society is a longer-term process, whether it is promoting racial, political or sexual equality. This requires a *strategic* plan to change the attitudes of both the *dominant* group and the *disadvantaged* group. Dominant groups have to give those excluded greater public acceptability. The socially excluded need the confidence to take on roles previously denied them – supported by the training to carry out these roles. Thus if women or the poor are to have any influence on infrastructure projects and participate in their management, society (men) have to realise the benefits of including and involving women in decision making, whilst the women need to be *empowered* to take up this new role.

These strategic actions may have engineering implications, but are engineers responsible for bringing about cultural change?

Who is responsible?

Consideration of strategic issues to ensure that the engineer's technical brief addresses the specific needs of men and women is outside usual engineering parameters. Is it the responsibility of an engineer or is it the role of the social scientist, to work with the community to identify issues to be resolved? The strategic issues are important, but to an engineer?

Why don't engineers consider gender issues?

Focus groups of people working in water and sanitation development and emergency situations worldwide found very little understanding of the term "gender". Various definitions focused on vulnerable people or men and women. There were problems translating the word, which is considered by some people to be a word used in writing proposals but of no concrete or practical application. The English word is often inserted rather than translated and it is perceived as 'jargon'. The knowledge of responses also is limited on both the practical and social inequalities.

Training and experience

Engineering training focuses on technical issues; the breadth and depth of the knowledge required to produce infrastructure requires long periods of study and experience. The training therefore excludes issues not directly related to the primary task. This training will influence the awareness of issues relating to men and women's particular needs. Even if there is an awareness on the part of the engineer, they may not have the practical knowledge of how to respond – as an engineer. The complex nature of engineering tasks means people rely on standard designs and tried and tested

(technically and administratively acceptable) solutions rather than adapting the product and process to meet "unusual" requirements. The lack of previous examples and relevant guidelines hampers both the training and the practice of providing infrastructure that meets social as well as physical needs.

Skills and aptitude

Many of the methods of addressing the needs of local men and women (such as focus groups or participatory techniques) rely on good communication skills; this is another area where engineers perhaps lack either the training or aptitude to carry out this task.

The lack of female technical staff is often noted. However female engineers go through the same training as their male counterparts and have to compete for promotion in a male dominated environment so they are not necessarily better equipped to identify the needs of men or women and the appropriate engineering response. Socially they can have a "male" role although biologically they are female.

Duration of involvement

Engineers play a very important part in the provision of infrastructure, spending the majority of the budget in terms of the design and construction costs. They are however only involved for a short period in the whole project cycle, with limited contribution to both policy formation before the project starts and the subsequent operation and evaluation of the project (see Figure 1). The social issues (such as changes in the social status of women and other vulnerable groups) take a long time to both address and produce results. Many of the practical needs of men and women will only be apparent during the operation of a scheme, when engineers have little involvement. This situation raises questions about the perceived and actual responsibility that engineers have in relation to changes in the social status of women and other vulnerable groups.

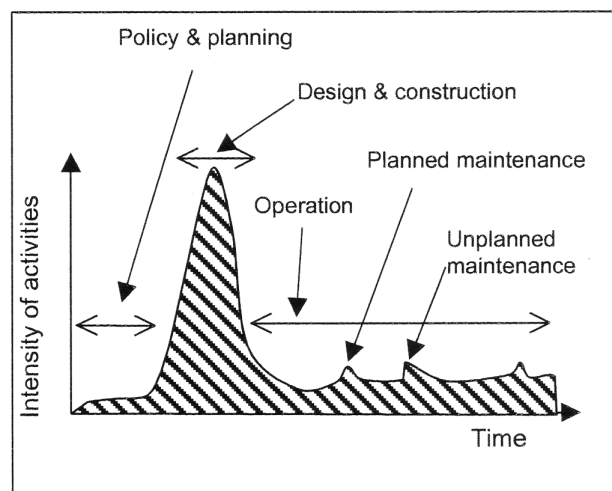


Figure 1. Project resources (after Wearne 1993)

Relations with other professions

Other professions are also involved in the development process – the four resources identified above all have their own specialists. They have skills and knowledge appropriate for the task – such as ecologists and hydrologists (natural resources), economists (financial resources), trainers and medics (human resources) and social scientists and gender experts (social resources). However this expertise also makes them less appropriate for tasks outside their core competency. Gender experts may be able to analyse social differences and inequalities, but can they design latrines to meet the needs of men and women and do they have any authority to alter the design process?

One method of addressing the various resource issues is to manage each discipline separately. Whilst this may allow an expert approach to each issue and show that it is being addressed, this may limit the possible responses. Unless a gender expert knows that project procurement can influence social policy, they are unlikely to suggest it as a practical or strategic option for social change. Each discipline will experience the limits to their responses due to their training, understanding and experience.

This division of labour and demand for specialists in each field can ignore the real links between the various resources and how people use them in practice. If the *product* is going to reflect this cross-disciplinary approach, the engineering *process* will need to reflect this.

What is the engineers' response?

WEDC is working to produce guidelines for technical staff on appropriate responses to the issue of “gender”. The guidelines have evolved in response to the target audience. The outputs attempt to achieve two goals:

- to raise awareness that the needs of men and women are issues for engineers, and that some of these issues can be tackled with engineering interventions
- to provide practical guidance on appropriate responses.

A related goal has recently been identified – *to raise awareness of the possible engineering responses amongst social scientists.*

Redefining the primary task

The technical task is focused on the product, so any method of raising awareness of the social issues has to take this focus into account. Accounts of how the product can be achieved more efficiently and its use made more effective and sustainable through the involvement of men and women are more likely to relate to engineers' experience than references to policy or abstract “rights”. The motives of the technical staff have to be recognised and acknowledged.

In order to re-focus the primary task, it will need to be defined in broader terms, both in terms of process and product. This will change how engineers work, within their organisation and with the community. The indicators defining the primary task will need to address engineering

parameters as well as socio-economic issues. These indicators will need to be varied to express the whole of the project cycle (i.e. involvement in design, construction and operation) and include all sectors of society. For example a simplistic indicator of the number of educated, articulate women on a committee is not addressing the practical *or* strategic needs of poor men and women.

Changes to the product

Redefining the primary task in terms of the product is not insurmountable. Engineers can be innovative and produce solutions to meet defined technical problems. Case studies and examples can provide inspiration, especially where a new technical approach is being called for. Guidelines and standards can provide support for what may initially be seen as a usual response to a “standard” engineering issue. Defining these problems however is not so straightforward and requires a change of process.

Changes to the process

In order to find out what men and women want from an engineering project they have to be able to voice their concerns. Women, poor men and other socially excluded groups by definition have less of a voice in project design. The process of product development therefore has to specifically include these groups. This requires communication expertise and knowledge of methods such as participatory appraisal techniques. These are skills that engineers need to gain, or at least have an awareness of.

Some of the concerns voiced will not have a physical response. A need to provide washing facilities can be expressed and a suitable solution designed. A need to have control over the allocation of water is harder to quantify and address in engineering terms. How engineers can address the strategic issues as well as the practical matters may mean greater changes than just refining the product in response to a revised process.

How do engineers organize their work?

Any organisation has to have a system to achieve its primary task. This system is the way in which groups of people within the organization fit together. Early organizational theory and practice has been based on large factories and bureaucracies, where the primary task is broken down into small repetitive tasks. This style of organization has a sense of internal order but rules and routines can overshadow the task and this is particularly the case in engineering environments. Engineering organisations can only define what people have to do if they can predict what relationships are required. Projects vary in size, risks and importance. External demands are not steady and not all changes are predictable. Unpredictable problems demand “organic relationships”, that are flexible, informal and uncertain. The least division of work is appropriate to enable innovation, motivation and flexibility of individuals and avoid the separation of interests and objectives. Thus an organization needs the simplest appropriate system to meet its primary task.

Changes to organization

Engineering organizations should therefore tend to have flat organizational structures to respond to the changing nature of their work. However, even if the engineering section of a project team has a limited hierarchy, it is only one component of the larger development process. In the project cycle, engineers only lead the work in one section of the cycle, with other people taking the lead throughout the rest of the project's life.

The effect is to create an organisation that has horizontal divisions and more layers of decision making. This will be less responsive to coping with the bespoke design approach required for development work as there will be fewer opportunities for communication between the different professions.

The response has been to integrate the professions and create multi-disciplinary teams. Problems occur when there is little cohesion and synergy in the mode and operation of such teams. Experts' hold their designated team position. Job boundaries are emphasised rather than skills, knowledge and experience pooled. Rather than teams, groups are formed. The presence of a sociologist does not equal a change in the attitude or role of the engineer or their product. A further development of this has been to "mainstream" issues, so subjects like gender become part of the engineers' primary task.

Creative tensions

The ultimate expression of this multi-disciplinary approach would be to employ staff who are equally able to carry out technical and social tasks. However, even within the technical field, civil engineers already specialise for example as structural, hydraulic or geo-technical professionals. Although they each have an awareness or perhaps a knowledge of each other's specialist area, they would defer to the expert in each field. Expecting engineers to carry out all the roles of a social scientist is not realistic – even if they had the aptitude to do the work. Similarly social scientists cannot be expected to double the amount of time they spend training so as to learn about engineering.

In order to meet the wide brief of mainstreaming the core competencies of the whole team need to be assessed. The whole team needs an awareness of each other's roles and motives. Individual skills need to be recognised and valued. There needs to be a development of the areas between specialities however, to fill the knowledge gap that has arisen. Attitudes and traditionalism must be challenged.

As an example, there is no profession with the skills for the design of sanitation facilities specifically for women – it is outside the core skill areas of both engineers and social scientists. Nor is anyone responsible for identifying the strategic contribution that an infrastructure project can provide to empowerment of the excluded – it does not fit into the time scale of either profession.

Conclusions

- Providing infrastructure to meet the demands of men and women can be achieved by changing the project

methodology or process to involve all sectors of the community in the development cycle. This will identify practical issues that engineers can resolve, given adequate training, guidance and support.

- Practical issues are not sufficient if socially excluded groups such as women are not enabled to become involved in decision-making. This requires long-term, strategic actions to include the excluded.
- Integrating social issues requires the organisation of the project team to reflect the wider scope of the primary task. Multi-disciplinary teams are one step towards this goal however such teams require orientation and professional support to be effective. *Mainstreaming* is a further approach to ensure that the design team considers all the community's assets.
- Professions (technical and social) do have a role to play, but they cannot be expected to perform outside their skills and aptitudes. Training and re-skilling may be necessary to widen people's abilities and challenge attitudes of old.
- Support to engineers must address the concerns of the profession. Engineers primary task is technical and their training and experience does not necessarily make them aware of gender issues – or even understand the concept of "gender".
- Capacity building for technical and social professionals must have a 'development' and 'educational' focus in addition to skill training. This has implications for undergraduate and postgraduate learning and teaching as well as in-service training.

Acknowledgements

This paper is an interim output from a research project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

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