

**ENABLING ANALYSIS: ACROSS THE DEVELOPMENT DIVIDE**

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**ABSTRACT**

It is argued in this paper that at least certain strands of operational research (OR) carried out in less developed countries have intriguing similarities with community operational research. It follows that community OR, which is still short of accounts of actual practice, might learn from OR aimed at promoting the self-reliance of communities in developing countries. The paper starts with community operational research - its origin, nature, clientele, and methods. This is followed by a parallel discussion of the characteristics of operational research aligned with third-world community development. A final section explores the common themes between the two literatures and practices.

**KEY WORDS:** community operational research (OR);  
OR in developing countries; alternative clients; problem types; methodology.

**1. INTRODUCTION**

Operational research (OR) for non-hierarchically structured organizations has a brief recorded history. Before the inauguration of the Operational Research Society's "community OR" initiative in 1986 there were some scattered published reports, notable those of Ackoff (1970) and Jones and Eden (1981); by a stretch of definitions, Sandberg's (1979) collection of Scandinavian projects with trade unions and Dombey's (1975) account of a physicist's battle against a shopping developer's gravity model might also be included. Since

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1986 the record has grown; see Rosenhead (1986), Jackson (1987), Thunhurst (1987), Jackson (1988), Mar Molinero (1988), Parry and Mingers (1991), Rosenhead and White (1991) Thunhurst *et al* (1992) and Thunhurst and Ritchie (1992). However, most of these contributions consist principally of analysis of opportunity or advocacy of endeavor. Few descriptions of the actual practice of community OR exist in the established literature. Nonrefereed periodicals, such as *OR Insight* and *Acorn*, contain further accounts, but largely of an episodic or anecdotal nature. There is, overall, a paucity of reported experience and, also, of considered reflection on experience. It can be argued, and I do so in the body of this paper, that at least certain strands of operational research carried out in less developed countries have intriguing similarities with community operational research. [This has been suggested earlier by Thunhurst (1991) and Vidal (1991).] Operational research in developing countries has a better-developed literature than does community operational research, including such landmarks as the works by Ghosal (1967), Vidal (1973), Ackoff (1977), and Luck (1979) edited collections such as those by Luck and Walsham (1982) and Jaiswal (1985); special issues of journals, notable those of Rand (1986) and Bornstein *et al* (1990); and a regular presence in the proceedings of IFORS conferences over 15 years. Though this literature is certainly now quite extensive, only a fraction of it deals with subject matter which can hope to throw light on the practice of analytic support for nonhierarchical groups.

This paper starts with community operational research - its original, nature, clientele, and methods. This is followed by a parallel discussion of the characteristics of operational research aligned with third-world community development. The final section explores the common themes between the two literatures and practices.

## 2. COMMUNITY OR AND ITS RATIONALE

Community operational research as a deliberate innovation was formulated (Rosenhead, 1986) as a counterweight to the perceived bias in the clientele of

the dominant OR practice. The proposal emerged from a gathering critique of this practice, which was in part political (Thunhurst, 1973; Chesterton et al 1975; Rosenhead, 1976; Jackson, 1982; Rosenhead and Thunhurst, 1982; Tinker and Lowe, 1984), and in part methodological (Ackoff, 1979; Checkland, 1981; Eden, 1982; Tomlinson and Kiss, 1984). That these two aspects are linked was recognized at least in the more politically orientated contributions, where the power and purposes of OR's traditional client organizations were seen as shaping the subject's approach and techniques.

### **2.1 Hierarchy, Control, Power - the Clients of Orthodox OR**

One facet of the radical version of the critique is its view of orthodox operational research as supporting the imposition of top-down control. This is seen as true at both the ideological and material levels. Thus at the tangible level of daily life, OR is seen as relevant to and conditioned by the imperative of maintaining control in hierarchical work organizations. But, equally, the promotion of the ideal of technocratic optimization serves to legitimate as scientifically determined what would otherwise have been transparent as the simple exercise of power. Critics have located OR within Burrell and Morgan's (1979) functionalist paradigm (regulative perspective, with knowledge taken as objective) and related it to Habermas's (1974) technical (as opposed to practical, let alone emancipatory) cognitive interest.

Certainly operational research's established clientele consists almost without exception of organizations with a bureaucratic, top-down formal structure - corporations, the military, government departments, public agencies, public utilities. Nor is there much evidence of OR work on issues which cut across the spheres of influence of a number of such bodies. So complete has been the discipline's orientation toward hierarchy that it is as if other forms of organization, of which practitioners might be actively aware in other aspects of their lives, become invisible when viewed from a professional perspective. This selectivity of client type also implies (and is implied by) a bias toward work for

organizations whose controllers exercise power over considerable natural, technical, and human resources. Such agglomerations of power are most commonly controlled through elaborated management hierarchies. Thus OR's work for hierarchies carries with it the attribute of strengthening those interests which are already strong, while OR work *within* hierarchies facilitates the control of the subordinate by superordinate client. This bias can certainly be seen as having an ethical dimension (Rosenhead, 1989a).

## **2.2 Developing an Alternative Clientele**

The idea, at least, of community operational research has received wide support within the British OR community. It would be surprising if there were not a variety of reasons for this phenomenon, but equally surprising if the morally doubtful posture of a profession which works almost exclusively for the powerful were not among them. Perhaps less widely or explicitly felt was a discomfort with a mode of work restricted to operating only within organizationally bounded islands of autocracy, though the social sea which surrounded them was celebrated for its democratic qualities. An initiative, such as community OR (COR), could perhaps assist in extending the self-determination of disadvantaged groups, rather than (as with orthodox OR) compounding their disadvantage by making the advantaged more effective.

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Certainly concerns of these kinds were among those which shaped the COR initiative. The characteristics identified by the Operational Research Society for the initiative's potential clients were that they should be groups which

- (i) exist to protect or advance the interests of their members,
- (ii) possess scant physical or financial resources,
- (iii) have no articulated management hierarchy, and
- (iv) operate internally through consensus or democracy.

While clients of community OR might offer goods or services for sale (as, for example, with production or other cooperatives, this would not be their principal purpose (Rosenhead, 1991).

These characteristics reflect the linked concerns to assist groups which are both nonhierarchical in structure and process, and disadvantaged. There was no desire to take special steps to enhance the self-determination of the already powerful, or to improve the chances of success of groups which, though currently feeble, were organized on an autocratic top-down basis.

Many of the early clients of the Community Operational Research Unit, Centre, and Network (the three main organizational manifestation of COR) have met these conditions unambiguously - a parent teacher association, a housing cooperative, a group campaigning to influence the provision of new birth facilities, and so on. Others have indicated the existence of grayer areas - Councils for Voluntary Service, a community development project.

### **2.3 Community OR for Intermediary Groups**

The organizations which fail to fit the pure model of alternative client are intermediary groups, standing between the community operational researcher and the members of the relevant community. To be more specific, they are examples of what Keys (1987) calls community service agencies - organizations which exist to provide services to the community. Community service agencies range from local government social services departments through autonomous voluntary community work agencies. There has been no suggestion that community OR should embrace social services departments as clients; they violate, to a greater or lesser extent, all of the four criteria enunciated above. It is the category of voluntary community development agency which is marginal case. They are commonly very poorly resourced, have at most a vestigial management structure, and operate as collectives with a strong commitment to the ideal of equal participation. However, it is not their own interests which

such an agency exists to advance, but the interests of the community to which it relates. It is quite possible to identify other such groups which straddle the suggested defining characteristics of community client - trade union branches are another arguably ambiguous category. The interest in exploring these boundary conditions lies not in semantics, but in the light which such discussion can throw on the organizational field.

The purposes of those engaged in community development are in general consonant with the social priorities which underlie the community OR initiative. (The governmental fostering of the voluntary sector is, of course, based on quite different principles, as part of a strategy of weakening the welfare state and the powers of local government.) Thomas (1983), quoted by Keys (1987), identifies three themes present in community development work - the reconstruction of communities which have lost their cohesion in the social and economic restructuring of the post-war period; the enhancement of the social position and organization of minority and low-status groups; and the activation of the community's own potential to improve the social and economic welfare of those who make it up. These themes are linked by a concern for the empowerment of the disadvantaged.

Another way of putting this congruity between community operational research and community development agencies is that the existence of both is predicated on the same situation - the relative powerlessness of those they wish to assist. This powerlessness has many aspect but is commonly manifested in a lack or weakness of internally controlled institutions. This factor is more problematic for COR than for more conventional community development and offers a rationale for community OR to work with community service agencies rather than directly with grassroots organizations.

Although there are exceptions, operational research as worked almost exclusively for organizations rather than individuals - the dilemmas of group

decision-making are more likely to reach the complexity of factors, uncertainties, and interests which can make OR of benefit. In any case, operational research work with particular disadvantaged individuals is an implausible way of building a meaningful community, which depends on the achievement of formal and informal networks of relationships which are mutually "owned" by community members. It follows that while community OR can, in principle, assist groups to be more effective, and may therefore indirectly assist in recruitment and mobilization, it is relatively ineffectual in the absence of a pre-existing level of community organization. This limitation does not apply with equal force to more conventional approaches to community development, which can be used to assist in the establishment of groups around shared interests.

In these circumstances the case for community OR to work, when appropriate, with and for intermediary organizations which have compatible aims, rather than directly at the grassroots, is persuasive. Such community service agencies are, in any case, easier to work with. They have less fluid membership and will tend to have full-time staff accustomed to a professional work-style. Their purposes will have been made at least partially explicit, if only as a precondition for obtaining funding.

These advantages, however, have their obverse side. The break with OR's traditional work situation is less complete, so that the impulse to radical methodological innovation is reduced. The organizational framework is more recognizable; the motivation, more safely instrumental. Furthermore, the extra resources of the community service agency are commonly obtained from outside sources, notably the local national state in a variety of guises. Though the agency may be nominally independent, it must relinquish some of its autonomy in the grant giving/receiving transaction (Keys, 1987). Thus the community operational researcher working with such an agency may be

operating with objectives at some removes from those which motivate members of the community itself.

It is plausible to expect that those activities which receive the approval of state or established charitable funding bodies will not, by and large, be ones which directly challenge powerful social interests. Working through community service agencies may thus lead to a truncation of the spectrum of possible project work. This truncation will affect not only substance but method. The exclusion of potentially confrontational situations will offer a lesser role for those OR methodologies which take the complexity of conflictual interaction as their subject matter. It can be argued that the further development of these approaches, in practice, should be a priority not just for operational research, but as a contribution to the methodologically underdeveloped practice of policy analysis (Rosenhead, 1992).

Some, but not all, of these difficulties lose their force if the community service agency is regarded not as proxy for the community which it is attempting to service, but as the direct client of community operational research in its own right. There is a case for doing this - such agencies can even be seen, perhaps, as prototype forms of self-managed activity, attempting to put into practice on a small scale the antihierarchical principles of the 1960s counter-culture. A comparison with Friedmann's elaboration of these small-scale, nonhierarchical working groups uniting around important social tasks provides a passable model for many social service agencies, even if his design for such units and their assemblies to constitute the entire guidance system is impracticably utopian.

With the community service agency as client, the range of application of community OR is likely to be skewed toward the internal complexities of the organization rather than the external complexities of its environment. One account (Rosenhead and White, 1991) gives three examples of the former type of assistance - internal allocation of resources, determination of requirements



for a computer system, and negotiation of a shared problem focus. Only in the third of these did analysis of conflict play a significant part - and the conflict was internal between group members. (Evidently there is no case for believing that absence of hierarchy implies unity of purpose.) However, in each case, it is argued, either the substance of the problem, the methodology applied, or both were significantly shaped by the nonauthoritarian internal structure of the client group.

#### **2.4 Methods for Alternative Clients**

This discussion leads on to the final point in this selection of issues in the practice of community OR - that of "hard" versus "soft" methods. Hard methods are those which find a best solution to a completely specified problem, by mathematical operations on quantitative variable. Most commonly these operations are computational, the application of preset algorithmic routines, though some types of problems are solved by analytic manipulation. (This is a strong definition of "hard methods". A weaker version would extend its coverage more broadly to those methods which rely on the manipulation of measures of the problematic situation and exclude any handling of interaction or judgement except in so far as they can be reduced to quantitative form.) Soft methods are those which use structured versions of the complexity of the problem situation to renegotiate the problem focus and gain commitment to the actions which this new perspective implies. The formal manipulation of the complex subject matter consists of partially defined sequences of logical mathematical operation, interspersed with interactions, either among participants or between facilitator and participants, which guide the move to the next type of formal manipulation. These two contrasting approaches are poorly represented by the descriptions "hard" and "soft"; a more informative labelling is of "problem solving" versus "problem structuring" methods.

There are, of course, borderline cases between the two categories. Simulation is the prime example of these. (Simulation uses computational methods, though

not in order to identify optimal solutions. While it does lend itself to option scanning, this is at best a highly restricted form of problem structuring, involving only the varying of parameters.) There is also the repetitive employment of problem solving methods by sophisticated practitioners to achieve a limited problem structuring capability (Beale, 1980). These are not questions which are addressed in this paper.

It has been suggested (Rosenhead, 1986, 1989b) that problem structuring methods (PSMs) are particularly appropriate for working with community groups. A counterview (Thunhurst, 1987) is that community OR must be methodologically pragmatic and the applications are likely across the range of hard to soft methods. This question will ultimately be resolved in practice, but as theoretical arguments may have a role in directing that practice there is good reason to pursue the question further.

It is quite plausible that there may be categories of problem confronting community organizations for which one or other of these groups of methods is more likely to be appropriate. The four defining characteristics of community OR's potential clients referred to in an earlier section of this paper relate to questions of internal organization and external relationships. It is reasonable ~~therefore to make a distinction between problems whose focus is primarily~~ internal or external - and each of these categories may be further subdivided.

One class of internally focused problems is those which concern the organisation's own operations. These may be thought of analogically as physiological problems. The organization needs to operate effectively and to survive. There can be rostering problems (whether voluntary or paid staff), questions of cash flow, the definition of information requirements, and the purchase of computing hardware or software. These problems are among those \*for which, in OR's conventional client organizations, problem solving methods are commonly employed. Because of community organisations' relatively small

size and limited complexity of operation, this type of community OR problem is unlikely to require state-of-the-art methods. There may well be an internal division of labour, which will obviate the need to use methods simple enough for exposition to and comprehension by the members as a whole. In other cases, however, the need for transparency may put some limit on the application of high-tech problem solving methods, or alternatively, familiarity with PSMs gained on other types of issues may give them an advantage with the organization's members (Rosenhead and White, 1991). In almost no cases will the ability of problem solving methods, to generate supposedly optimal solutions be of importance. The data for calibration will be too limited, the uncertainties too great, the length of any period of stable conditions too short, for there to be any discernible payoff from optimization.

Another class of internal problems is those concerning the resolution of internal differences or the agreement of strategic directions. The emphasis on proceeding via internal consensus can make these problems crucial, and the absence of formal hierarchy prevents the resolution of differences through the exercise of power and authority. In these situations problem solving methods are irrelevant, and PSMs (see Rosenhead, 1989b) come into their own. Their participative nature, coupled in some cases with an explicit treatment of alternative perspectives, facilitates the process of attitudinal shift and accommodation by which such organizations can move forward.

This last type of situation has much in common with some problems whose focus is external. Here the issue is not to agree internal priorities, but to decide how to maneuver in a volatile and possibly hostile world so as to obtain desired advantages. Community organizations typically have limited ability to control their environments and, therefore, both to understand the organization's strategic position (threats, opportunities) and to negotiate based on that understanding. There are a number of PSMs which analyse situations in these terms and in a participatory mode which assists group ownership.

There is a second type of external problem with which community OR is likely to engage. These are situations where analysis is needed in a form specified by, or persuasive to, an external agency. Examples include the preparation of a business plan or the conduct of market research to back up a cooperative enterprise's request for a loan or financial support, the ongoing evaluation of existing or proposed activities as part of an application to a funding agency, and the criticism of other bodies' formal plans by exposing errors or exploring the consequences of alternative assumptions. In most of these cases the call will be for a calculative format based on unambiguous problem definition: counterplanning will need to start from the original plan format of the external agency, while financial justifications need to satisfy the accountability requirements of the funder. Therefore in this area PSMs, with their tolerance of ambiguity and partial definition, will have less to offer than will hard methods.

This preliminary survey of some potential application areas does, indeed, support the argument that there is scope for both traditional and problem structuring methods within community OR. The analysis goes beyond a simple pluralist assertion to suggest specific types of situation in which particular approaches are likely to be more fruitful.

### **3. OPERATIONAL RESEARCH FOR DEVELOPMENT**

Underdevelopment is treated here not as a state before development. Britain was not underdeveloped before the Industrial Revolution. Underdevelopment will be treated not as a state, but as a process which involves both developed and less developed societies. Development produced underdevelopment, and the latter is one of the preconditions for the economic success of the developed countries. Underdevelopment is to be understood not by its attributes (poverty, malnutrition, levels of unemployment, peasant farming, urban migration, monoculture, foreign debt, inflation, wealth and income polarization, political instability, etc.) but as a set of relationships. The external relationships of underdeveloped nations are characterized by dependency - cultural, technical,

and political as well as economic. These eternal relationships produce or sustain unequal and exploitative internal relationships among classes, economic sectors, and regions. [For a more detailed account of this position, see Bornstein and Rosenhead (1990)].

The predominant practice of operational research is in the developed countries. That third-world countries are less intensive in their use of OR is not surprising: both industry and financial institutions are less available than in the developed world, where they serve as prime clients for OR. It has also been argued (Bornstein and Rosenhead, 1990) (i) that locally owned private institutions, because of their size and family ownership, are, in general, uncongenial environments for a sophisticated managerial hierarchy and the techniques which go with it and (ii) that local arms of transnational corporations engage in relatively limited and mundane analytic tasks, with more significant work reserved for headquarters staff. Innovative OR practice in less developed countries is disproportionately concentrated among public agencies - government departments, public utilities, state-owned industries. Overall, as Kembell-Cook and Wright (1981) found, there has been a lack of work on critical development problems and, indeed, a lack of work for indigenous clients.

Operational research in the third world, then, is still an activity of limited scale and range. However, within that circumscribed area, only one segment is the concern of this paper. The practice which, it is claimed, has potential parallels with community OR is not OR in developing countries, but OR for development. It is necessary to explain in what sense this term is used.

Since the condition of underdevelopment is characterized by dependency, development consists in the reduction of this dependency and the achievement of a larger measure of autonomy. This is not the same as a higher level of industrialization or a reduction in the intensity of any subgroup of those common attributes of underdevelopment listed above. Increased autonomy

means an increased ability of those who live within particular boundaries to control their own destinies. This desirable condition is the goal of Habermas's "emancipatory" cognitive interest.

It is by no means necessary, therefore, that (for example) operational research work on problems related to industrial production, or to public infra-structure, constitutes OR for development in our terms. That must depend on the impact which the subject activities can be expected to have on internal and external relationships of dependency. Commonly that impact will be to strengthen rather than weaken dependency - for they will arise out of, or at least be compatible with, a local structure of power relations which is itself an outcome of dependency. This is not a question of black and white but, rather, of position along a spectrum. Nor is it being argued that operational research work which serves to increase dependency is an evil to be avoided; indeed, the activity to which it relates may well serve to increase incomes, or increase health standards, while its simple absence could scarcely be seen as a major emancipatory achievement. The argument here is, rather, a definitional one. This is that OR work relating to activity which is neutral, negative, or ambiguous in terms of dependency is not what we mean by OR for development. The reason for the emphasis on the latter category in the current paper is that it has certain interesting properties.

### **3.1 Development as Community Development**

What can be unambiguously identified as OR for development? Most of OR's traditional clients are, in the third word, among the leading agents of a dependency-inducing modernization program, if only through the medium of technological dependency. OR work with them will always carry with it developmental ambiguities, if not contradictions. Such contradictions may be minimized when operational research is carried out for and with those who are disadvantaged, even by local standards. Such potential clients have least to gain from a continuation of dependent relations. Helping them to strengthen

their position is, to put it as its lowest, unlikely to be a significant step in the further entrenchment of dependency. And regardless of any claims which might be made for wider social effects, such work, if successful, generates increased autonomy for its direct clients. There is no requirement that development's boundaries need be national ones.

For our purposes, then, development can most securely be identified with community development, not economic development. It is true that the local autonomy achievable through community development will remain limited, contingent, and fragile, so long as the nation state within which it is set remains dependent. Such larger-scale autonomy can be achieved, however, only by qualitatively different forms of collective activity. Whether these could develop out of locally based community development is a question which goes beyond the limits of this paper.

### **3.2 Enabling Analysis in the Third World**

Research aimed at guiding the development of self-reliance in developing countries has been conducted within a number of frameworks (e.g., Abell and Mahoney, 1978; Hall, 1981). Vidal (1991) draws attention to the work of the Centro Latinoamericano de Trabajo Social, through which social workers participating in the struggle of oppressed groups have also attempt to systematize their practice. The contrary movement, from an explicitly analytic perspective such as that of operational research towards participative involvement, is less in evidence.

A recent paper (Bornstein and Rosenhead, 1990) identified a number of examples of "mold-breaking" operational research in less developed countries, of which four could be argued to have a significant participatory element. These examples deal with work on the location of grain storage facilities for small farmers in Brazil, some Mexican experience with the systems analysis of rural exploitation, an OR-based management development program in Indonesia,

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and the movement around "optimum seeking methods" in China. Some further analysis of these case is attempted here. To help in this interpretation, reference is made to parallel experience reported by contributors to a recent book (Annis and Hakim, 1988). This describes a range of grass roots development projects carried out in Latin America, in which operational research played no part.

### **3.3 Agricultural Cooperatives**

The work on grain storage in Brazil (described by Bornstein and Villela, 1990) is treated here at some length, as it is less well-known than some of the other grassroots projects which are discussed below. The problem was initially formulated as one of choosing the location and sizes of warehouses. The impetus was a technological innovation - the design of a small, cheap silo employing solar energy for the drying process, which in principle permitted storage at individual farm level. The model originally developed would have identified the number of locations in which small warehouses were to be preferred and, hence, the potential economic viability of the small silo.

In the region of Brazil where the (small) size of farms and the (relatively high) incomes of farmers made the investment in such a silo at all feasible, most farms are grouped into cooperatives both for marketing and for purchase of inputs. Therefore the analysts visited such a coop for data collection. It was at this stage that the entire problem formulation was called into question.

In discussion it was realized that the whole position of cooperatives relative to transnational corporations was relevant to the study. Coops had been extending their share of grain production and were now establishing a presence not only in production and trading but also in processing. Coops were already effective in achieving markedly higher selling prices for their members than were available to individual farmers, and this new development compounded the threat to the position of transnational agribusiness. The move to introduce the



new small silo was backed by the Brazilian government, on which the transnationals had substantial leverage.

In this new light, the small silo could be recognized as a threat to the solidarity of the cooperative movement, through the encouragement it would give to economic individualism. The project was therefore reformulated, with the participation of the management of the coop. The new problem, successfully tackled, was to identify locations for a network of service stations providing access to agricultural inputs and technical advice. The improved service to members was seen as a way to increase membership of the cooperative further.

This work, quite unusual in reported OR studies for its political sensitivity, can usefully be considered in relation to an extended assessment of the functioning of cooperative associations in Bolivia (Tendler, 1988). These groups were found to provide few direct benefits to "the bottom 40%," since this consists largely of landless and near-landless poor. Cooperatives organized around the supply of services to agricultural producers necessarily exclude these most disadvantaged. It even appears from Bornstein and Villela's account that coops are more viable in regions where small farmers are relatively better off.

Tendler's analysis brings out many problematic features in establishing and running cooperatives. Coops, like private sector businesses, experience economies of scale, whether in marketing produce or in supplying necessities through local stores. The growth necessary to success may be choked off by the need to create a new local coop each time it is wished to expand into a new community. However, this logic pushes the organization away from a bottom-up, democratically rooted structure toward a more centralized, top-down form of organisation.

Other factors complicate the simple picture of unitary purpose. Among the function of cooperative, Tendler finds, agroprocessing and marketing were

better performed than others, notable the running of stores and the management of credit. Both the latter functions are highly visible to the membership, who expect coop store prices to undercut those in the private sector and do not support tough or rigorously enforced loan repayment policies. The result can be under-pricing, which fails to cover costs, and the steady dwindling of capital for both store and credit operations. There are also problems of accounting competence in keeping track of a mass of small transactions. These difficulties do not exist in processing and marketing. Setting prices at what the market can bear benefits all members, and improvements in the management of these functions are often technical and so "invisible" to the members and, in any case, do not require unpopular sanctions against individuals.

Some related points are made by Flora and Flora (1988) in connection with community stores in rural Colombia. These stores are not just businesses, but have a social vision of cooperative action which guides their economic agenda. Thus the aims include lower or stable prices, fair weights and measures, a better return for local farmers, and access to credit for those with seasonal incomes. But the intention is also to accumulate surplus to fund other joint enterprises, e.g., in education. These objectives operate at cross purposes, with the surplus for community projects often failing to materialize. There can be other negative effects on community cohesion - for example, if a prudent credit policy results in money being lent to those who can best pay back rather than those most in need.

### **3.4 The Systems Analysis of Exploitation**

The second example of OR-like grassroots analysis is that of Szekely, which has little formal documentation. His work was carried out with and for local peasant community organizations in Mexico. Based on this he has set down certain lessons for "promotores" (professionals who volunteer for field-work to promote development). One insight, which has already been obliquely touched on, is the

existence of sharp divisions of interest within the disadvantaged. The achievement of objectives generally necessitates the assembling of a coalition, elements of which may monopolize the benefits if the objective is achieved. Szekely proposes an ambitious role for practitioners of the systems approach - the construction of a strategy to inform the adoption and pursuit of tactical demands to the advantage of the community, broadly defined.

Such aspirations are for the future. Szekely also reports more short-term work, in which at least informal systems analysis has been used to identify the multiple processes by which local power-brokers maintain their grip and siphon off any economic surplus from economic activities - control of credit, operating the administrative machinery, monopolizing access to markets, links to state or federal political groupings, etc. The purpose of the analysis was to identify what forms of initiative (to gain new resources, to set up new forms or organizations, to achieve outside support) were most likely to be effective.

Evidently complex processes, worthy of analysis, maintain an uneasy, unequal status quo in the countryside (and elsewhere). Tendler (1988) touches on issues internal to agricultural cooperatives which could benefit from similar analysis. She identifies factors which, in particular cases, tended either to encourage egalitarian development or, alternatively, to increase existing economic differentiation and so stoke up internal discord. Thus in one cooperative the local crop (cacao) can be grown regardless of nearness to roads and is amenable to home processing if the farmer does not have ready access to transport. The long distance to consumer markets was a great equalizer, which afflicted better-off and poor farmers alike.

In a second cooperative, however, poorer farmers grew rice usually at some distance from roads, using the slash-and-burn system, which requires repeated moves. Better-off farmers grew sugar cane on land mechanically cleared of tree stumps and ploughed by tractor, and with good access to roads, Hired labour is

needed to cut the cane. Cane, because of its perishability and low value-to-weight ratio, needs to be near good transport.

The first coop engaged in marketing and transport of cacao which benefited better-off leaders, poorer members, and poorer nonmembers (a valuable spillover effect) alike. The second coop provided rental of agricultural equipment, credit to hire labor, reliable transport, and access to a sugar mill. These were of little or no value to poorer farmers, who could benefit only if able to shift from rice to cane. There was little or no spillover effect. Social and economic inequalities were therefore intensified.

Tendler gives other examples of this sort, indicating a broad scope for systems analysis of the factors operating in particular local circumstances. Such analysis could be of value to a number of parties, including state development agencies or nongovernmental aid organizations in determining funding policies.

### **3.5 Barefoot ORSA**

Under this title, Luck (1979) described a management development program in operational research/systems analysis (ORSA) conducted for the Indonesian Ministry of Health, widely regarded as a classic. The program, designed for health service managers and researchers, started in traditional textbook, classroom style but, in subsequent modules, moved to a process of learning from the practical experience of tutors and students on real problems "in the field." This field training program involved an assessment of the operation of a rural health centre - its coverage of its catchment area, quality of care, administration and management - with a view to making recommendations for improvement. But it also included an exercise to formulate a systems view of the rural community, to assess the factors which influence health and sickness, and to make suggestions for community development.

There are no close parallels with this work in Annis and Hakim's (1988) book, since the latter deals only with activities whose principal purpose is community development. Luck's account is of *management* development, even if those managers are being trained, in part, for a role in community development. The closest analogy is with the type of intermediary, community service agency discussed previously, though in this case the agency is state-run rather than voluntary. As a means of developing self-confidence and self-reliance within that agency, the Indonesian program was both imaginative and effective. Many of Luck's "propositions for the growth of ORSA," derived from his experience, have a wider resonance. Proposition 9 - Development precedes research - relates to the practice of action research. Proposition 10 - Management must grow from the front-line - has much in common with Revans' action learning.

### **3.6 Seeking the Optimum in China**

A number of papers have described the practice of experimental optimization at the workplace, carried out in China under the label of Optimum Seeking Methods during the 1970s (Chen et al., 1984, 1986; Ku, 1976; Yue, 1981). Where plant performance varies with parameter settings in an unknown fashion, trial-and-error methods can be applied. Teams of operational researchers found that systematic procedures such as the bisection method and the method of golden sections could be imparted to ordinary workers. Popularization was achieved, at one extreme, through lectures with audiences up to 100,000 strong. There was also a careful translation of the concepts and operations into ordinary language, and the dissemination of rhymes and doggerel to aid memorization. "Three-in-one" contingents of workers, cadres, and technicians were formed throughout the country, and thousands of problems were tackled in machine building, the chemical industry, textiles, health work, agriculture, etc. Technical experts touring workplaces found that the workers were not merely nominal members of these contingents. By virtue of their accumulated experience, they made key contributions - eliminating superfluous variables,

identifying domains which corresponded to a tolerable working environment, terminating experiments when further realizable benefits were implausible.

There has been no equivalent to this program in Latin America, or in any other country. It was an extraordinary expression of a period of Chinese history which is now several phases in the past. Opportunities for innovative community development are undoubtedly conditioned by the larger sociopolitical environment. On these grounds the prospects for workers self-management in Chile following the Pinochet coup of 1973 would not have seemed particularly favourable. And indeed, Scurrah and Podesta (1988) describe many false starts and failings in both the production cooperative sector in Chile and the "social property" firms established at much the same time in Peru. Yet the experience was not all negative (nor were the difficulties all due to government's intermittent hostility in Chile or avoided due to governmental support in Peru).

Among the more positive elements of the record in both Chile and Peru are self-management training programs, which teach job-related skills in a way which equips workers, individually and collectively, to manage themselves more effectively. In those programs the workers study and analyze what is concrete and familiar, gradually and accumulatively incorporating more complex realities. Thus workers might be taught the concept of the break-even point by organising groups to collect information about the costs, output, sales price, etc., of their most important machine and then moving on to the distinction between fixed and variable, direct and indirect costs. These experiential techniques were employed inductively, enabling training to be tailored to an enterprise's specific and most urgent needs.

Scurrah and Podesta comment that in this approach, "the factory or shop is transformed into a classroom where people learn how to analyze and adapt their everyday work habits." They describe these programs as using participatory "problem-solving methodologies" that preempt potential conflicts and

misunderstandings. In fact, from an operational research perspective they have a good deal in common with the “problem structuring methodologies” described by Rosenhead (1989b). There are also interesting comparisons to be made with the training programs in the Chinese and Indonesian experience described above.

In the Chinese initiative to install optimum seeking methods the training program embraced mass meetings and rhyming mnemonics. The principles of practice were to be memorized and then applied, though evidently that practice left scope for creative flexibility. The Indonesian training program was aimed not at the grassroots but at intermediary professionals. It regarded community development as one ingredient of an ORSA training, in which participants gained experience with the systems approach, while simultaneously gaining a deeper appreciation of the environment in which they would have to operate. The Peruvian and Chilean training programs, in contrast, used a method akin to operational research in order to facilitate community development at the base. The methodology adopted treated them not as absorbent sponges, or systemic exhibits, but as active subjects.

#### **4. ACROSS THE DIVIDE**

This concluding section draws together some of the common strands which run through the OR experience and potential, both for community groups and for development. The significant overlap in authorship among those who have written on community OR, those who have written about OR for development, and those who have mounted a critique of traditional operational research is itself suggestive of a common perspective. However, as yet there have been few attempts at making explicit connections.

##### **4.1 Clients and their situation**

The definition of OR for development adopted in this papers ensures that it, like community OR, has a community development focus. The clients and potential

clients of both activities are disadvantaged. They are at the weaker ends of systems of power relationships which lead out of the community to more potent social actors.

There are thus objective problems confronting such groups. Their world is always vulnerable to transformation in someone else's interest, or by inadvertence, and their power to resist is limited. But there are also subjective problems. The sense of powerlessness may be as great an inhibitor as the actual lack of power. Peoples' lack of confidence in their ability to control their

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own lives is based on inherited history and fatalism, the observation of lack of solidarity, the experience of failure. A positive message, from Latin America at least, is that many of those who participate in community action have previously been involved in such activity, perhaps in a quite different field, which failed to reach its objectives. According to Hirschmann (1988), it is as if "social energy," once liberated, will continue to find outlets.

It is not too surprising that, on both sides of the divide between developed and less developed *countries*, those who are most disadvantaged are among the least organized. Those whose situations are so problematic that they find survival itself an overwhelming concern have neither energy nor motivation for

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collective action. Unless and until such groups achieve a level of mobilization, by whatever means, the preconditions for community OR to work directly with them are absent. In these and other cases, intermediary community development agencies are a potential alternative clientele with highly relevant problems which can benefit from the community OR approach. There are many varieties of such organizations, and governments find it very convenient (for reasons which are often quite different from those of the organizations' staff or the communities they work with) to support their existence. It can even be "virtually impossible to draw fast lines that define where grassroots organizations end and the government begins" (Annis, 1988). However, these



are lines which community operational research will need to find approximations to in practice.

Another lesson which emerges with greater clarity from the developing countries literature is of the diversity of interests which may coexist within a community group. Unity of purpose among its members cannot be assumed simply because a group is officially committed to a common aim. The formulation of issues in ways which unite rather than divide the organization may be one of the more constructive contributions which community OR can offer to its clients.

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#### **4.2 Types of Problems**

There is an almost unlimited variety of problems with which community OR/OR for development might work. There are, equally, many ways in which those problems could be categorized.

One such classification, with some basis in experience with community OR, has been suggested in this paper. This was a distinction between internal "physiological" problems (concerned with the effectiveness of the community organization's own operations), the internal resolution of divisive issues, the analysis of the group's external strategic situation, and analysis performed so as to satisfy or persuade an external agency. It was proposed that different approaches and techniques might prove appropriate for these distinct tasks.

It is possible to discover examples of three of these problem types in the examples of OR (or near OR) cited above from the third-world context. No account of internal "physiological" work was described in the paper, though in many ways this is perhaps the most straightforward category from an operational research perspective, being effectively an extrapolation of conventional OR practice to a smaller scale. The Chinese approach to optimization at the workplace comes closest to this pattern (though considering

only a very limited subset of the organization's activities). Standard quantitative ("hard") techniques were provided by experts, even though their implementation was participatory.

An example of a method for constructively defusing potential internal conflicts is provided by the self-management training programs of Peru and Chile. Both the firm's technical leaders (manager, foreman, line supervisor) and its political leaders (president, members of the governing board) are included, and the training aims to minimize conflicts between "participatory" labourers and "authoritarian" managers. In line with the analysis based on community OR experience, this is tackled by a "soft" problem structuring approach.

The work in Mexico on the systems analysis of rural exploitation clearly fits within the category of external strategic analysis. The rough-and-ready systems analysis which was employed is clearly not a member of the problem *solving* family of techniques. It was evidently used as an aid to constructive thought rather than as a substitute for it and, so, corresponds more closely to a problem *structuring* approach, as anticipated in the community OR categorization.

The fourth category, of work designed for an outside agency, is perhaps represented by the Brazilian agricultural cooperative facility location study. Even the revised, politically more progressive project, for the location of rural services stations, which was eventually formulated was solved by a sophisticated optimization technique. Indeed the technique constituted a publishable advance in the state of the art (Villela and Bornstein, 1987). The project was largely funded by a state agency. The nontechnical paper on this work (Bornstein and Villela, 1990) does not state whether the technique was developed for a report to the agency, for a report which the cooperative could use to gain external funding for the network of service stations, or for a report to enable the cooperative to select optimal locations. In either of the first two cases, the fit of approach to problem type would still hold.

### 4.3 Methods of working

The question of choice of technique for working with community groups, whether in developed or less developed countries, has been addressed in the previous section. The general lesson is to support the argument for an eclectic pragmatism, though to do so within a developing framework which can guide that choice. However, technique is only one aspect of method of working.

Along with pragmatism, a little celebrated virtue is opportunism. Dorfman (1988) records an instance of a *promotore*, deeply committed to the development of the Matacos Indians in Argentina, who was surprisingly offered the post of local administrator by the military government whose national policy he deplored. He accepted, nevertheless, and used the position to great effect.

Fainstein and Fainstein (1979), in the very different context of urban planning in the United States, urge a high level of tactical flexibility as part of a progressive policy for support of disadvantaged groups. "Strategists for the weak" they say "must be constantly opportunistic, seeking leverage by whatever means can be found."

For community OR and operational research for development, principled opportunism may take many forms. (Indeed it is in the nature of opportunism that its possible forms cannot be anticipated.) Family contacts or friends from other aspects of the analyst's life may suddenly be seen in a new light. Funds may be sought from unlikely sources, or allies found (by virtue of a common enemy) in unlikely places. Special conjunctions of circumstances must be speedily appreciated and exploited. Unloved techniques may be radically reused for a more liberatory purpose.

There are evident dangers in this strategy, among which the foremost is that the principles which it is intended to support may get mislaid. However, at least until the funding of analytic capability for disadvantaged groups is

recognized as a call on state resources, the weakness of these groups requires such strategems as the price of effectiveness.

As regards the relationship between operational research analyst and community organization, there is general recognition in the literature that it needs to be open and reciprocal. Technique must serve to clarify and empower, not to create a new substitute dependency on experts and expertise. However, the analysis has barely gone beyond this point.

Other groups and disciplines have addressed these and related issues - such as, for example, questions concerning the general validity of locally produced knowledge and of the privileging of the researcher in the production of knowledge. Discussion and practice within operational research would benefit from a critical and comparative exploration of a range of other literatures, dealing at least with community action, the Community Development Project in Britain in the 1970's, participatory research, and the several varieties of action research. There is a program of intellectual work to be conducted, if we are to be better developed to help in community development.

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