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## Interaction of Actors Theory

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### Abstract

*Gordon Pask developed not only a Conversation Theory, but also a (less well-known) Interaction of Actors Theory, partly in response to demands during the time he worked in Amsterdam. The paper aims to clarify how this Theory intended to minimise the effects of use on scientific results, while maximising the help such results to improve on actions. This would facilitate empirical study of what changes user values, as well as the preferred design of (computer supported) support systems. Results include the material and communicative support of collective and social activities. Three examples are presented.*

**Keywords:** Interaction, User Action, User Behaviour, Value, Support system, Improvement

### 1. Introduction

Gordon Pask is well-known for his many contributions, including his Conversation Theory. What is less well-known is his Interaction of Actors Theory, or IA theory—its acronym playfully opposing AI or artificial intelligence. Parts of this theory have been published or presented. There also is the manuscript of a book, but the text is patchy and partly in outline<sup>1</sup>. Some of the relevant work was done when Gordon was extraordinary professor at the University of Amsterdam.

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<sup>1</sup> The hard copy in my possession is dated June 1992. Work continued however. Files in my possession indicate continued work however, and include notes on what Gordon intended to do in co-operation with me and others. For simplicity's sake I will refer to the hard copy (they appear as single numbers in the text).

Finishing the work on IA theory did not prove easy. One obstacle was Gordon's own rather cumbersome notation (which he himself referred to as 'indigestible material', p. 47). Furthermore, while working on the theory he endured major setbacks to his health. Additionally, although the theory developed out of Gordon's Conversation Theory, it was to be something on its own, his answer to a problem for which there seemed to be little place yet in accepted scientific methodology.

The present celebration of Gordon's work presents an opportunity to sketch some of the reasons for Gordon's interest in this problem, which has baffled as well as excited many people over the last three centuries, and to expose his line of reasoning. The problem concerns the difficulty of acquiring high quality *values* on the basis of the same material one uses to acquire high quality *observations*, or in other words of deriving the 'ought' from the 'is'.

There have been many attempts to solve this problem, arguably including cybernetics, artificial intelligence and systems theory. Characteristically, each tries to encapsulate the 'ought' into a way of defining a 'part of the world chosen for investigation' (Ulrich, 1989), sometimes called the 'system', sometimes the 'scientific object'. It still proves difficult however to make the choice of such parts independent of a 'researcher', or 'actor'—unlike what is common in the natural sciences.

In this paper I aim to clarify what Gordon seems to have had in mind, partly based on the manuscript Gordon left behind. It was to be published as the first of a series under our joint editorship. I also will refer to work which appears to be in line with the ideas in his manuscript. It seems to have a wide relevance, both to the social sciences—in particular to work in organisational support—and to work in (computer supported) social support.

## 2. The problem

Gordon Pask was not a detached observer, nor a historian. He was a forward thinker. He wanted to understand (p. 7), and at the same time use that understanding. Not surprisingly therefore, he held the view 'that there is not one iota of fundamental difference between art, philosophy and science, provided they are all conducted with an appropriate degree of delicacy and integrity' (p.11).

This claim contrasts strongly with traditional demarcations which emphasise the difference between these areas, and require that science restricts itself to improving observations, that is to making them independent of 'user' interference. No such restriction pertains to art. Artists obviously like listening and responding to their public, and to playing to it. This also is the case for philosophy, especially in its Socratic form.

Gordon's contrasting view may stem from his experiences in the world of cabaret and music hall, 'where, under the stress imposed by the pressing necessity of putting on a show, if only to earn a living, my colleagues and I came to realise that it is possible to couple people together with multiple mode oscillators, responsive to and regulating music, performers, lights and motions, provided the people are participants, ... (p. 22). Producing and using here merge into the same act.

Similar experiences seem to occur almost everywhere, and thus may be worth both study and emulation—if science does not want to miss out on something important. People appear able to step out of what they are supposed to do. They can reclassify the observations they first classified for other purposes. They heed their past as well as their public—for their own good. Science tends to force all such achievements—which are not directly observational—into the same mould, that is as biases to observations.

This approach often appears to work well. In many situations user- or environmental contributions prove to be either reducible to irrelevance or parametrisable in a relatively simple way. The approach also can fail. Continued development often seems to strongly depend on them—for example on having a public, ‘users’, a past, or even what ‘naturally selects’. Denying these thus may ‘kill’, as both frogs and humans appear willing to testify. Neither seems able to ‘survive’ strict traditional science.

Gordon was very much aware of this danger. He considered a science which *always* aimed to defend against what is not strictly observational ‘criminal’. While he considered the scientific method itself ‘very elegant, employed with the proper type of evidence’, he also deemed that ‘the elegant is defaced, becomes nauseating and ugly, if misused in order to ape, with gestures, grunts and grimaces the respectable character of otherwise untenable findings or displays’ (p. 16).

These criticisms suggest an important albeit not a very new problem: to redesign science so it can listen and respond to the ‘voice of the user’, without losing what is elegant and useful (De Zeeuw 1996, 1997). Such a science still should be keen to improve on observations, but also must be willing to include what pertains to the user and is not observational: it should be able to improve on values, feelings and actions.

The need to do so has been bothering scientists from the time of DesCartes—who tried to evade this need by demarcating science as a strict observational endeavour. Resistance to this approach has led to many ‘isms’, for example anti-reductionism, anti-positivism, pluralism, etc. (Nagel, 1986). It has been a stimulus to the philosophy of Kant (1960), as well as to the development of cybernetics which includes the ‘voice of the user’ in its study of the controller and in its design of feedback mechanisms, or to the use of notions like stakeholders (Checkland, 1981; Checkland and Scholes, 1990).

Although Gordon did contribute to cybernetics and other areas, he still deemed the problem unsolved, at least in the important area of learning and teaching. Teachers do not simply transmit what they teach. They are participants in a conversation in which they and their students are ‘coupled’, possibly with various kinds of apparatus (p. 22). Both change in the process—as members of the play as well as of the public. Conversation Theory allows for the study of such (double) change.

Even Conversation Theory is not sufficient to cover all environmental contributions, however. The Theory only touches on the possibility of improving on values, and does not appear to support collective solutions to problems such as the pollution problem or the problem of improving on intelligent action. It was for this reason that Gordon felt the need for another Theory, stimulated through the program in Amsterdam<sup>2</sup>, which is and was (since 1985) a research program on the role of users in science.

In the next section the basics of Gordon’s Interaction of Actors Theory are summarised (not the formalism which accompanies the Theory). They lead to the formulation of a research program, some of the consequences of which are discussed in section 4. In section 5 the impact of the Interaction of Actors Theory is exemplified and evaluated. The paper ends with a conclusion (section 6).

### 3. Object definition

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<sup>2</sup> “It is quite true that I.A. is an extension of C.T. and Lp, but it is a very considerable one.”  
“The extensions accomplished are, however, of a major kind and lay emphasis upon the importance (which you have always placed) upon interaction, the matters of self and other reference, the imaging of selves, be they societal, personal or organisational; ...” (From a letter to me, dated January 1990).

Conversation Theory distinguishes between P-individuals (Psychological, Social, Pedagogical and Learning Individuals) and M-individuals (Mechanically or Biologically specified individuals). The former are 'productive and, incidentally, reproductive systems' (p. 27). M-individuals embody P-individuals: 'Any P-individual is embodied or incarnated in some (one or more) M-individual' (p. 28). M-individuals often refer to a human body and brain. However, they may be 'any dynamic fabric able to accommodate a P-individual' (p. 32), including a 'star' (p. 33).

Although this distinction appears quite simple it has considerable power, a combination of properties common to most good ideas. As will be explained below, it helped Gordon to extend what science can contribute, first through Conversation Theory, later through Interaction of Actors Theory. In both cases the aim is to include the 'user' in the process of research, with some important differences. Conversation Theory concentrates on the development of P-individuals as participants in conversations with other P-individuals.

A P-individual consists of 'productive operators which *may* be applied to entities belonging to a domain, or substrate, and which, if so applied, yield products. Amongst these products ... are products that are the productive operators, themselves. Although *may* does not imply *must*, there is a principle ... such that at some stage, *all* productive operators must be applied to the substrate and, further, that at *any* stage *some* productive operator *must* be applied to the substrate' (p. 27).

As an example one may think of a P-individual as the set of rules and concepts that was used to re-distribute land after the yearly flood in early Egypt. Or alternatively as what is now called Euclidean geometry, that is a mathematical theory one of the applications of which is to re-distribute land. Thirdly a P-individual may be a set of rules developed by someone who has been engaged for some time in re-distributing land after having been trained in Euclidean geometry.

P-individuals develop in conversations, for example a conversation between (M-individuals called) a teacher and student. It may happen after some time that neither provides (counter-) examples anymore (Lakatos, 1977). This situation is taken as a criterion (observable to all observers) to decide that a coherent P-individual has formed, 'organisationally closed, informationally open' (p. xxx)—usually as an adaptation to some (teacher-) preferred P-individual, for example Euclidean geometry.

Notice that P-individuals which develop while conversing with the same teacher need not be the same, that is include the same set of concepts or 'language' (p. 24). Students eventually can differ in terms of what they learn and even in terms of having different conversational styles or styles of learning. The teacher also may come to embody a number of P-individuals, each developed separately in conversation with students.

The distinction between P- and M-individuals helps to partly solve the problem mentioned in section 2, as it allows for two things. Firstly, to identify whether a process of learning has stopped or not. Secondly, to develop a set of concepts or a language which allows some M-individual (including non-human embodiments) to behave as a (new) purposive entity, one willing to maintain preferred norms and values, for example those of an expert.

Interestingly, at about the same time Conversation Theory developed another effort was made with somewhat similar aims, leading to the notion of autopoiesis (Maturana, 1988; Varela, 1979; Maturana and Varela, 1988). The two differ considerably although both owe to the work of Heinz von Foerster, as Gordon was to eager to recognise (p. xxx). The distinction between P- and M-individuals was meant to facilitate the study of 'education, complex decision making, creativity, design and the like' (p. 28), where the (re-)productive

operators are conceptual, while the notion of autopoiesis seems mainly meant to improve observations in the study of living beings.

The above serves to introduce the Interaction of Actors Theory which aims to make explicit how science can help to improve values on a more general level than was possible through Conversation Theory<sup>3</sup>. It restricts embodiments of P-individuals to those *who are capable of action* (p. 43). This allows new P-individuals to develop which co-ordinate the activities of various M-individuals and also replaces the need in Conversation Theory to assume a preferred P-individual (the choice of what is to be taught) to which others—students—have to adapt.

Interaction of Actors Theory can be exemplified by assuming two M-individuals, each embodying a P-individual the values of which are realised in action, while the two actions interact. This implies a process in which the P-individuals can change, but not *disengage* as in the case of Conversation Theory. They become part of a collective P-individual, which co-ordinates the actions of the M-individuals and is determined in conversation. This P-individual may become sufficiently stable as implemented in a group of M-individuals to be observable to science.

If this happens the consequences are, firstly, that the M-individuals become able to realise a collective action, that is implement a (new) collective value. Secondly, co-ordination of the activities of the M-individuals implies a change in the values or perspectives of the original P-individuals. Thirdly, each value is maintained in and through the new collective. It is characterised therefore by the form its co-ordination takes, as well by the properties it makes visible.

In an alternative formulation one may say that if science succeeds in developing the intended collective, it supports three types of actions: a) actions by those not participating in the collective, who use its observable properties as resources to their actions; b) actions which the collective itself is able to implement; c) actions which are performed by the members of the collective to maintain the collective.

The first type of action usually is considered 'rational' in general; it implies the possibility of separating out the means to predictably realise some value in an optimal way. The second type of action emphasises communication and co-ordination—both of which allow for non-predictable behaviour of the collective. The third type of action has two forms. Firstly, it requires that participants do not defect from the collective. Secondly, it includes 'local' action: one may or may not react predictably to what one sees one's 'neighbour' (in the collective) doing<sup>4</sup>.

An example of a well-developed collective is traffic<sup>5</sup>. People who want to travel (M-individuals able to act) can become participants, and also may stop doing so. This does not

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<sup>3</sup> "This clearly entails extending the existing theory into an I.A. theory which not only adumbrates some of the principles underlying the conversion of mentative conceptualisation into its orthogonal manifestation as thought and also, in this case, of directed action and interaction, linguistic or not." (Letter dated January, 1990).

<sup>4</sup> Notice the interest in what is called complexity or complexification (Bak and Chen, 1991; Coveney and Highfield, 1995; Depew and Weber, 1996; Kaufmann, 1995; Rosen, 1993). These terms usually refer to collectives which are not built up out of M-individuals who can act. In this case the interest mainly focuses on the difference between the rationality of using the collective, and what makes such usage possible (collectives may be on the 'edge of chaos', for example, that is they may be sensitive to the disturbances implicit in usage (Lewin, 1992); in the case of M-individuals who can act members may search for forms of communication which are less sensitive).

<sup>5</sup> Traffic has not been developed by science, of course: it developed out of a need, and its rules usually are determined in the political process. There is an increasing interest in contributions from science, however.

imply that their actions have an end or a beginning (Gordon sometimes calls them 'immortal'). They are determined by the existence of the collective which implies the availability of a set of communicative rules (participants may develop additional, mutually acceptable, hand-signals of course).

The collective depends on whether participants are willing to adhere to the rules (fourth type of action). It then determines the way participants 'flow' in time and space (third type of action). They have to adapt, c.q. improve their values to be able to achieve the collective good (second type of action), that is (maximally) uninterrupted travel—which it itself may support other actions such as distributing food, collecting taxes (first type of action)<sup>6</sup>.

#### 4. Interpretation

The Interaction of Actors Theory is not a theory, in the same way that Conversation Theory is not a theory. Both imply definitions of how to identify what observations belong together to a sufficient degree to be compared, and to make the class of such observations visible. In the case of Conversation Theory it is the conversation which provides this visibility, in the case of Interaction of Actors Theory the collective of activities of M-individuals.

Given that a collective has been observed to develop, one may study its characteristics, such as the language used to maintain it, the properties that become visible to an external observer, the change in values participation in the collective induces (Jackson, 1991). Together these would constitute what traditionally is called a theory. Interaction of Actors Theory differs from this theory. It makes it possible to search for such a theory.

The history of science provides many examples of situations where at first it seemed impossible to observe the class of certain observations, and where eventually one was found anyway. The best-known example is Darwin's theory of evolution which allowed him to collect, and observe as a class, observations on the variety in life forms, and to derive this variety from long-term developments. Before Darwin more limited sets of observations had been considered, the selection of which was ascribed to some outside (for example spiritual) force.

A similar reversal seems to have been achieved through the notion of acting M-individuals, although this may not be a revolution on the Darwinian scale. The original Cartesian solution had been to 'silence' the user. This implied that the results of science could be used as a resource by single actors, independent of their intentions, values or viewpoints. Science could not consider such intentions, and had to abstain from all efforts to improve on them, as it could not provide a criterion, for example the class of 'good' intentions or values.

The Interaction of Actors Theory proposes such a criterion. It suggests that one develops a collective P-individual embodied in a group of M-individuals who can act. The variety this collective allows for, or 'contains', defines the class of preferred intentions. This class depends on the form of co-ordination used, and hence on the language implemented (Baecker, 1997). One may explore such languages therefore in terms of the improvements on values or viewpoints they allow participants to achieve (Eco, 1995; Elias, 1978).

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<sup>6</sup> An other interesting example is science itself. Scientists may organise themselves into collectives (Kuhn, 1962), be on the 'edge of chaos' (when anomalies become visible), and search for new forms of communication such as local rules to determine quality (De Groot, 1971, 1981; Rittel and Webber, 1973).

Some of the work in non-zero sum games tends to go in the same direction, in particular the work by Axelrod (1984) on the Prisoners' Dilemma. It assumes two P-individuals (each having two alternatives to achieve a 'gain'), embodied by two M-individuals. If both try to maximise their gain as if they were single actors, the result will be less than if they try to maximise collectively. The Dilemma follows from the fact that neither player knows the 'value' on which the other player intends to maximise—the 'value' as an individual actor or as a collective actor.

This difficulty obviously is removed when the Dilemma is extended to a negotiation before the game—but this changes the Dilemma fundamentally<sup>7</sup>. This suggests a search for a minimal extension<sup>8</sup> of the Dilemma (see also Howard, 1971). Axelrod proposed iterations (indefinite ones, without knowledge of the 'last' iteration). This allows players to pattern the choice of their moves and thereby 'converse' and inform the other player of the 'value' they wish to be implemented.

One such pattern is switching to an individual 'value' when the other player does, and switching to the collective 'value' when the other does (in other words: don't hesitate to punish—by switching to a choice which will be less advantageous to the other player—but do not bear a grudge). This pattern could be shown to be highly informative in that it seemed to 'tell' players quite effectively not to switch to an individual, single actor 'value'<sup>9</sup>.

Axelrod uses the term 'transparent' to label the class of such patterns: there should be no ambiguity in what the patterns are meant to transmit to the other player. One also may say that such patterns have a higher informative 'speed'. 'Punishment' for example proved to be more effective in changing individual 'values' to collective ones when it was immediate, that is not postponed over a number of iterations.

These results appear to exemplify what Gordon meant to introduce, as formulated in his Interaction of Actors Theory. It suggests two conditions. Firstly, to improve on values one needs some form of exchange between M-individuals who can act. Secondly, informative forms should develop within the process of exchange and not be imposed or imported from outside this process. Both conditions seem necessary to bring the improvement of values into the domain of science.

The point being made here is of course that doing so does not change the emphasis in science on the improvement of observation, it only extends science. What the Interaction of Actors Theory aims to do is to translate values into observations and vice versa. What is worth looking for is the mechanism of this translation: what language to use in a group of M-individuals who can act such that values can be improved to contribute to a collective value<sup>10</sup>.

Such a language should show high 'speed', and not lead to defection (to single actor values). It also should be transferable: it should allow users to 'address' new groups of M-individuals such that they tend to act with improved values, that is as participants. When a collective develops on the basis of such a language it should be able to defend itself

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<sup>7</sup> This also is the case of course when outsiders such as politicians redefine what the players can do.

<sup>8</sup> Such an extension will not imply a redefinition of the Dilemma, and will make any form of negotiation which is added in the extension as much as possible like the Dilemma.

<sup>9</sup> Gordon was interested in what he called a protolanguage,  $L_p$ , the definition of which was to be minimal in the same sense as described in the text.

<sup>10</sup> Interest in what supports interaction appears to be confused sometimes with an interest in participation. Many participative methods do not appear to have been developed with due consideration of what participation means (Guba, 1990; Reason, 1994).

against disturbances due to the users of the observations on the collective: it should defend its identity through its own process of implementation.

It is not claimed here that the search for this kind of result is easy or immediate. It is also not claimed that all collective P-individuals necessarily prevent harm to non-participants. It can be claimed however that the more a language satisfies the above criteria, the less likely such harm will be. Due to the fact that participants can be any M-individual who can act, users may include those who also are participants to the collective—who surely will not wish to harm themselves.

## 5. Examples

As argued above, Gordon's is to be interpreted as a theory *for* research, a way to extend science rather than a theory *of* something<sup>11</sup>. It helps to get 'sharp observations' on the constraints on exchanges between participants—at the cost of not bothering about their nature. That is to say, participants are assumed to need some (in principle unobservable) 'space' to change and re-change their exchanges if they are not to defect from being observable to outside observers.

'Sharp observations' in mainstream research are considered *resources*, or knowledge, to be used by any user. When identified through the Interaction of Actors Theory they appear to function as *support systems*. These provide a medium through which P- and M-individuals instruct each other, or an interface to use the term Gordon seems to prefer (p. 78). They do not constitute knowledge in the usual sense. They are meant to stimulate and maintain exchanges between actor/participants<sup>12</sup>.

In this section I provide three examples of what appear to be studies of support systems. This seems useful, although the main aim of this paper has been only to identify what problem Gordon tried to solve. Gordon did not provide research designs—being still busy on the formalisms needed. The examples may be considered somewhat mundane in that they refer to attempts to deal with practical problems. I feel sure that at least Gordon would not mind.

Fischhoff (1992) wants to support women in preventing or evading rape. Following the principles of mainstream research he assumed women to be instances of some 'hypothetical individual', in particular a decision maker. This implies the need to increase their resources as decision makers, that is to improve observation of what might be the decision makers' alternatives, their probabilities, their utilities or values on the basis of which to choose.

He then collected material from the literature as well as from diverse groups of people: (female) 'students at the University of Oregon; alumnae of the University (all over 40 years of age); and mothers belonging to a parenting program, largely from low-income homes.' There also were 'samples from male students, paralleling the female ones, and samples of sexual assault experts, drawn nationally from private consultants, criminal justice personnel, counsellors, and researchers' (p. 579).

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<sup>11</sup> He did not develop a theory about phenomena, for example some 'ideal' theory of participation and conversation, in the sense of Habermas and others.

<sup>12</sup> P-individuals may be embedded in one M-individual who can act of course: "My hunch is simply this, to make a "character" (which is perpetuated by other authors and in other media), is similar to and not so distinct from how one makes a "society" and, in particular to our own interests, how one makes a social support system with comparably durable properties." (Letter January 1990).

The resulting set of 'options for reducing the chance of being raped' totalled more than 1,100. It was attempted to reduce this set in terms of 'good' decision making, by re-writing each option as advice to 'Doing action X in order to achieve intended effect Y'. Unfortunately it proved impossible to perform a 'comprehensive analysis' of this kind, and even 'infeasible' to find one advice or strategy (or a small set) which could be 'believed to reduce the risk of rape', and little or nothing else.

This outcome was especially striking as Fischhoff was careful to follow proper research procedures. This led Fischhoff to reverse his interpretation. Each woman herself would have to '[c]onsider where [she] might fit in' the material collected, and not accept classification by the researcher as an instance of an 'hypothetical' decision maker. That is to say, women no longer instantiated the *object* of study. They became *addressees*, partners in possible collectives. The options found became an 'aid in coping with (a stressful topic)', and served as injunctions to 'keep thinking'.

The change is quite remarkable. The author appears to abandon decision theory as dealing with *single* actors, and to start using it as a method to create *collectives* in which rapists and women (each able to act) have to develop P-individuals which would no longer include rape. Fischhoff no longer was looking for resources therefore, but rather for support systems to help women anticipate and prepare such changes.

This change in interpretation clearly exemplifies the problem Gordon Pask faced. Another study—Van den Berghe e.a. (1980)—appears to even attempt an explicit solution (although *ex ante*). The authors wanted to provide support to homosexual men who run a high risk of being beaten by 'gay bashers'. The cost of traditional alternatives—like becoming experts in karate—seemed too high, as would be the cost of recommendations like 'reduc[ing] men's propensity to rape', and of 'creat[ing] full employment', which Fischhoff mentions.

Van den Berghe e.a. (1980) assume that the hunter-like behaviour of 'gay bashers' qualifies homosexuals as 'victims'. This suggested to the authors to change the 'values' involved in the exchange between the 'gay bashers' and their victims, or in other words to modify their process of 'qualifying' (a term Gordon Pask also uses; p. 56). As it turned out, the authors found various *anecdotes* about such changes. These were collected, as many as possible, rewritten and tested on 'ease of understanding', 'grippingness', etc.

One anecdote tells about someone walking alone in a park. When he notices that a group of 'gay bashers' is getting interested, he starts to dance, flap his arms and yell 'Peewee, I am a bird'. His assailants walk away in disgust. They react to a change in 'value': from 'homosexual victim' to 'mad person'—who is uninteresting to 'gay bashers'. This kind of change requires little training, but can lead to large (and desirable) effects. A selection of anecdotes that seemed most insightful was published. It sold more than 1500 copies in Amsterdam.

Interviews with some of the buyers indicated that reading the anecdotes had had the intended effect. They were not interpreted as (repeatable) solutions to a problem. Rather, they introduced a 'way of thinking'. This was facilitated by the form of the anecdotes: a situation was described, then a danger, then a change in the interpretation of the situation, then the (surprising) consequences of the change. Anecdotes are, of course, quite similar to the 'moral tales' that help people 'extract lessons' (Fischhoff, 1992). Most cultures cherish them<sup>13</sup>.

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<sup>13</sup> In this and the other two examples something seems to be emphasised which usually does not turn up in empirical studies: a raising of *consciousness*, that is an increase in the ability to act opportunistically as well as effectively, and continuously consider some unpredictable usage of available resources.

A third example is a study which aimed to help a service organisation strengthen its identity and improve its functioning (Vahl, 1994, 1997). The author decided to look at the way members interacted in terms of the linguistic structure: 'if observation(s) X, then do action(s) A'. She first modelled the organisation in terms of this structure (asking questions such as: 'if you observe X, what do you do?'), then translated the model into statements which members could use to negotiate.

That is to say, it was pointed out that one may change the X, the A, or both in a statement. For example, actions A can be attached to wider or smaller sets of indicators X; observations X may be attached to wider sets of actions A. The set of 'if ... do ...'s had to remain a co-ordinated whole however. Changes in one statement had to reverberate to changes in others, if necessary. Systematic widening or narrowing X's and A's provided the 'space' needed to create and maintain a new collective P-individual. A stable, effective and self-reliant service was established.

It is to be noted that the 'if ... do ...' form which the author used did not develop in the process of organisational interaction, that is as part of the study. One may prefer to interpret the study as a test on transfer therefore, in this case of a linguistic form which was identified using Axelrod's (1984) work (the patterns in his work with high informative 'speed' seem to instantiate a class of 'if ... do ...' forms, that a form basic to maintainable collectives).

The reason for the service organisation to call for help seems to have been that the linguistic forms which members had used to establish themselves had become 'theories of' each other. They thus had lost the 'space' necessary to maintain a collective P-individual<sup>14</sup>. Such a 'space' appears characteristic of support systems, as Luhmann (1986) notes, and others de-emphasise (Jantsch, 1980).

## 6. Conclusion

Gordon Pask's Interaction of Actors Theory appears to be relatively unknown in Academe. This is understandable as he started serious work on it only relatively late. This lack of familiarity may be one of the reasons that even when the Theory is known, it is interpreted as a theory *of* interaction, rather than as a theory *for* the study of interactions, to improve on values.

In this paper I have tried to expose why Gordon tried to develop such a theory. He had noticed the difficulty of scientifically improving on values, like many others—and developed his Interacton of Actors Theory as a tool to deal with this difficulty. He used it to identify forms of interaction which satisfy criteria of 'outward' (rather than 'inward') stability.

Work on this problem continues to be of great interest, for example in the Center for Innovation and Cooperative Technology at the University of Amsterdam (CICT)—although it has become somewhat virtual in that its members substantially contribute to, for example, the Amsterdam Virtual Reality Institute and Laboratory (AVRIL) and the Nijenrode Centre for Corporate and Community Renewal (CORE).

This type of work focuses on what minimises the effects of use on scientific results, and maximises the help such results to improve on actions. This interest in user support directly generalises to two types of study: studies of what helps to change user values, and studies into what supports collective and social activities, including the development of (computer supported) support systems.

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<sup>14</sup> Gordon frequently emphasised that individuals should have the 'right to interact' (e.g. letter January 1990).

Gordon's contributions also continue through our memories of his way of working. To many of us he still presents an example of the true scientist: always willing to discuss projects, always on the alert to develop his own and other's ideas, to solve problems and to support colleagues.

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