**Communication**

A particularly important form of action is communication. Communication as it occurs in sociology is again not well defined; and those definitions which are offered are not accepted as standards by others. Moreover, studies into communication are hardly restricted to the sociological domain. An important source of confusion is the existence of a well-formed field of ‘Communication Theory’ based on the work of Shannon and Weaver ((1949) *The Mathematical Theory of Communication*, Urbana, IL: University of Illinois Press). This field tends to concentrate on models of communication that are derived from theorizing concerning information systems, thus they typically concern themselves with aspects of the process of communication that are sociologically irrelevant (or at least of much less importance) – such as the channel or the effects of noise or the varieties of encoding and decoding and so on. Such aspects need not be included in the sociological model to be proposed.

In specifically sociological contexts, the general intention behind the use of the term is widely understood to be as it is used in normal discussion. In that case we may accept as representative the statement by the literary critic I. A. Richards “Communication takes place when one mind so acts upon its environment that another mind is influenced, and in that other mind an experience occurs which is like the experience in the first mind, and is caused in part by that experience.” As the vagueness of this description suggests, in normal usage communication includes many varieties of relationship between the quality (intentions, or initial beliefs and desires) of the sender and the quality (effects, or resultant beliefs and desires) of the receiver. This can be seen in some of the models used in Communications Theory. Lasswell, for example, (‘The Structure and Function of Communication in Society’ in Bryson, (ed.) (1948) *The Communication of Ideas*, NY: Harper and Brothers) described the study of communication as concerned with ‘Who says What in Which Channel to Whom with What Effect’ and most other theorists have taken that as the primitive model to which they apply their modifications. From what was mentioned just above it is clear that an important modification to the Lasswell model that we will need to take note of is that supplied by Braddock ((1958) ‘An Extension of the Lasswell Formula’, *Journal of Communication*, **8**, pp. 88-93) who included reference to the *purpose* of the Who in Saying What etc. Such a reference, however, is rather too open; so we shall restrict this to the change that the sender intends to make to the quality of the receiver. Broader ‘purposes’ can be accounted for as being motivations for the intention to change the receiver’s quality.

***Basic Communication***

What makes communication special as a form of action, then, is that it consists in actions which have the effect of modifying some particular sets of propositional attitudes in the quality of an agent, and that quality modification is systematically related to propositional attitudes in the action originator which are causes of the action.

Begin with the definition of two essential parts of the act of communication. So:

1. *Sender*

For some proposition *p* and agents *x* and *y*, *ax*  *x* is a Procommunication of *p* from *x* to *y* iff

*Bx*[ (*~By*[ *p* ]  *p*  **B***y*  *Q*(*ax*, *qy*)) & (*By*[ *p* ]  ~*p*  **B***y*  *Q*(*ax*, *qy*)) ]

» *x believes that if y doesn’t already believe p then this action of his will lead to y believing it, and if y does already believe it then this action won’t make y believe the contrary.*

* Say *x* Procommunicates *p* by *ax* to *y,* and write *Procom*(*x, p, ax*, *y*)
* Call *p* the Content of the procommunication
* ‘Procommunication’ is not a success-term, it is intended to suggest an intention to cause a particular belief to arise in *y* or for the target belief to at least not be suppressed by the action. This action may or may not succeed, and the content intended may or may not be believed by the procommunicator. (Other less neologistic terms such as ‘persuasive’ or ‘informative’ suggest too much else that should not be suggested.)
* A procommunicative action need not have a single agent target. We might very well say that for some *Y*  *X*, *ax*  *x* is a Procommunication of *p* from *x* to *Y* iff  
  (*y*  *Y*)*Bx*[ (*~By*[ *p* ]  *p*  **B***y*  *Q*(*ax*, *qy*)) & (*By*[ *p* ]  ~*p*  **B***y*  *Q*(*ax*, *qy*)) ].

For some proposition *p* and agents *x* and *y*,**define the set of procommunications of *p* from *x* to *y* as

*x*(*p*, *y*)  *x* = {*ax**x*: *Procom*(*x, p, ax*, *y*)}

1. *Receiver*

For some agents *x* and *y*, action *ax*  *x*, and proposition *p* we say that *y* Apprehends *p* in *ax* by *x* and write *Appr*(*y*, *p, ax*, *x*) iff

*Procom*(*x, p, ax*, *y*) **B***y*  *Q*(*ax*, *qy*))

» *y believes that x believes that if y doesn’t already believe p then this action by x will lead to y believing it, and if y does already believe it then this action won’t make y believe the contrary. I.e. y believes that x has procommunicated p to him.*

* Call *p* the Content of the Apprehension
* Given some very reasonable assumptions about the structure of intentions, the apprehension of *p* according to this definition makes *p* cognitively ‘available’ to the agent without committing him to taking any particular attitude towards it. Something like this is necessary if apprehension is going to be used in a definition of communication which needs to acknowledge the fact that in normal usage talk of communication includes many varieties of relationship between the content (as defined here) at the sender’s end and the content at the receiver’s end.
* *Y*  *X*, *p, ax*  *x*. We can say that *Y* apprehends *p* in *ax* when

(*y*  *Y*) *Appr*(*y*, *p, ax*, *x*)

For some proposition *p* and agents *x* and *y*,**define the set of Signals of *p* from *x* to *y* as

*x*(*p*, *y*)  *x* = {*ax**x*: *Appr*(*y*, *p, ax*, *x*)}

*Process*

Given this we can now offer a simple definition of communication as follows:

For *p* a proposition, *x* and *y* agents, we say *x* Communicates *p* to *y*, *Comm*(*x, p*, *y*), iff

1. *Dx*[ *By*[ *p* ] ] &

» *x wants y to believe p and*

1. *ax**x*(*p*, *y*))[*Ax*(*qx,0*, *cx,0*) = *ax* &

» *x procommunicates p to y by the action it takes and*

1. *Procom*(*x, p, ax*, *y*)  **B***y,1*  *Q*(*ax*, *qy,0*) ]

» *y apprehends p in the action*

* Process indices are attached to the intentional operators
* Call *p* the Content of the communication
* *ax* in condition (ii) is a Communication of *p* from *x* to *y*, write *M*(*x, p, ax, y*)
* It is not required that *x* believe *p,* or that *y* not believe *p* at index *0*
* In the case that *Bx,0*[ *p* ], this is a Sincere communication
* In the case that ~*By,0*[ *p* ] & *By,1*[ *p* ], this is a Persuasive communication
* Note that condition (iii) here is a limited success condition. Every target of a communication apprehends some claim made (procommunicated) by the source; but this does not mean that there have been any changes in attitude to the communication content itself. It is unlikely that more can be said for communication in general.
* If *PP* is a set of propositions and *x* communicates *p* to *y* for all *p*  *PP*, then *x* communicates *PP* to *y – Comm*(*x, PP*, *y*)
* There are various possible alternatives here but note especially that if condition (iii) does not apply, *ax* is a Failed Communication, whatever else the quality effect of *ax* may produce in the quality of *y*.
* If *Procom*(*x, p1, ax*, *y*) and *Appr*(*y*, *p2*, *ax*, *x*) ] for *p1*  *p2* then *ax* is a Miscommunication and *Procom*(*x, p2, ax*, *y*)  **B***y,1*  *Q*(*ax*, *qy,0*) is a Misapprehension.

For some proposition *p* and agents *x* and *y*,**define the set of communications of *p* from *x* to *y* as

*x*(*p*, *y*)  *x* = {*ax**x*: *M*(*x, p, ax*, *y*)}

Communication theorists approve of diagrams. This model is very simply diagrammed.

*c*{x*,y*},*0*

*x y*

*ax*

*qx,0* *qy,0*

***Conversations***

As communication is a sub-type of action so conversation is a sub-type of interaction. The fundamental assumption here is that a communication has an act effect by quality on the receiver. The change in receiver’s quality that the apprehension represents will change the probability of actions that will be produced by the receiver. The rules for conversation can be given quickly, merely noting the special vocabulary and some modifications to the more general rules for interactions.

Let *S*  *X.*

Let *JJS* = (*a1*, …, *an*) be a sequence of actions involving the members of *S.*

We call *JJS* a Conversation in *S* if:

1. [Relevance] (*ai**JJS*)(*x**S*)[ *ai* *x* *y**x*  *S*)*p*)[ *M*(*x, p, ax, y*)]].

» *Every action by an agent in the sequence is a communication with some other agent in S*

1. [Participation] (*x*  *S*)*ai*  *JJS*)[ *ai* *x*]

» *Every agent in S performs some action in the sequence*

1. [Completeness] (*x*  *S*)(*y**x*  *S*)(*i*)(*p*)[*ai*  *y* & *ai*  *y*(*p*, *x*) ]

» *Every agent in S is the target of a communication by some other agent in S*

* Other conditions may be added for whatever reason: the point is to include everything that is typically thought of as a conversation, without including too many that are not thought of as conversations.
* Note that condition (iii) here is a limited success condition. Every participant in a conversation finishes by apprehending some claim made (procommunicated) by another conversant; but this does not mean that there have been any changes in attitude to the communication content itself. It is unlikely that more can be said for conversations in general.
* The various possibilities for failure in communication result in various possibilities for failure in conversation. In that sense, ‘conversation’ as it is represented here appears to be a normative concept. It would be possible if desired, to allow those various failures to still count as conversations. We shall not pursue this here.

We can conveniently diagram a conversation on a Conversation Table in much the same way that we did for interactions in general. In this case however, because our interest is restricted to the procommunication and apprehension of content, we must add markers to indicate those features of the interaction and ignore the quality and context markers. For example:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *i* = 0 | *x1* | *x2* | *x3* | *x4* |
| 1 | ***a****, p1* |  | *p1* | *p1* |
| 2 |  | *p2* | ***a****, p2* |  |
| 3 | *p3* | ***a****, p3* | *p3* |  |
| 4 | *p5* |  | ***a****, p4* | *p4* |
| 5 | ***a****, p6* | *p7* | *p7* | *p7* |
| 6 | *p7* |  | *p7* | ***a****, p7* |

The columns we call Conversant Histories and the rows we call Conversational Event Levels. Cell contents are Conversational Events. From the conditions for a conversation described above we make the following observations

1. Every conversational event level contains a procommunication
2. Every conversant history contains a procommunication and
3. Every conversant history contains an apprehension and
4. The final apprehension of each conversant can be found by combining the apprehensions in its history.

If *JJS* = (*a1*, …, *an*) is a conversation and (*j*, *m*]  [1, *n*])(*S1*  *S*)[*JJ1,S1* = (*aj*, …, *am*) is a conversation on *S1*] then *JJ1,S1* is a Subsidiary Conversation of *JJS*

*Normative Effects*

Most interactions seem to involve norm-modified behaviour, and this is especially true for conversations. (All of language is, in fact, a convention.) The example given of friends greeting and introductions being made in the example of general interactions is a case in point, and the tools provided to deal with norms in interactions are also adequate to account for the effect of norms in conversations – with the obvious modifications.

We can include the governing norms conveniently on a conversation table in just the same way that we do on an action table.

***Communication Networks***

Communication as a special type of action produces a special subset of action networks that need to be considered in their own right. The development here is modelled in the obvious way on the development for action networks in general given above, and the motivation is similarly to more or less precisely define the conditions under which the communicative relations may be said to exist or to be relevant.

*Communication Dyads*

Define «*x*, *y*» as a binary relation indicating the possibility of communication from *x* to *y*;ie. «*x*, *y*» iff

(*p*)(*ax*  *x*) *ax*  *x*(*p*, *y*).

* Read this as *x* Communicates With *y*
* We also have *x* » *y* as an alternative notation – again referring to the sort of notation that is popular in graph theory or in network theory in sociology. The action element definition allows us to have a full understanding of what is implied by the connecting ‘arrow’ in terms of the agent model sketched above.
* If «*x*, *y*» and «*y*, *x*» then *x* «» *y*, but we don’t need to develop this notation further.

Write «*x*, *y*»*N* iff

(*cx,0*  *x*) [*g*(*N*, *cx,0*) & (*p*) (*ax*  *x*) [(*N,cx,0*(*ax*)  *N,cx,0*(*ax*)) & *ax*  *x*(*p*, *y*)]]

* i.e. There is a context governed by the norm formation *N*, and there is a communication of some *p* by *x* to *y* commanded or permitted by *N* in that context.
* Read this as *x* Communicates With *y* Under *N*
* *N*: *x* » *y*, or, if the action element is part of a graphical representation of a collection of actions all governed by the same norm formation, then let *N* be a label for that representation.
* «*x*, *y*»*N*«*x*, *y*»

Let *p*«*x*, *y*» indicate that there is an objective probability *r* that *x* communicates with *y*, thus: *r**x*, *y* iff

«*x*, *y*» and *Prob*((*p*)[*Ax*(*qx,0*, *cx*,*0*)*x*(*p*, *y*)]) = *r*.

* Read this as *x* Communicates With *y* With Probability *p*
* *x* *p*» *y*

*r*«*x*, *y*»*N* iff

«*x*, *y*»*N* and *Prob*(*g*(*N*, *cx,0*)& *Ax*(*qx,0*, *cx*,*0*)=*ax*((*p*)(*ax**x*(*p*, *y*))&(*N,cx,0*(*ax*)*N,cx,0*(*ax*))))=*r*

* Read this as *x* Communicates With *y* Under *N* With Probability *p*
* *N*: *x* *r*» *y*

*Dyadic Communication Diagrams*

Let *X* be a set of agents, *t*  [0, 1], *A*(x*, y*) = {*ax*  *x*): *ax*  *x*(*p*, *y*)}as before.

Define *YY*(*X*2) = {(*x*, *y*): *x, y*  *X*, and «*x*, *y*»}

*ZZ*(*X*2) = &(*x*,*y*)*YY*(*X*2) «*x*, *y*» is the Communication Diagram for *X*

Define *YY*(*X*2, *t*) = {(*x*, *y*): *x, y*  *X*,«*x*, *y*», and *Prob*((*p*)[*Ax*(*qx,0*, *cx*,*0*)*x*(*p*, *y*)])  *t*}; then

*ZZ*(*X*2, *t*) = &(*x*,*y*)*YY*(*X*2,*t*) «*x*, *y*» is the Communication Diagram for *X* With Probability  *t*

* *t* is the Diagram Threshold Probability whose significance is only to distinguish a level of probable action below which the communications are not considered sociologically significant.

Define *YYN*(*X*2) = {(*x*, *y*): *x, y*  *X*, and«*x*, *y*»*N*}; then

*ZZN*(*X*2) = &(*x*,*y*)*YYN*(*X*2) «*x*, *y*»*N* is the Communication Diagram for *X* Under *N*

Define *YYN*(*X*2, *t*) = {(*x*, *y*): *x, y*  *X*,«*x*, *y*»*N*, and

*Prob*(*g*(*N*, *cx,0*) & *Ax*(*qx,0*, *cx*,*0*)=*ax*  (*p*)(*ax**x*(*p*, *y*)) & (*N,cx,0*(*ax*)  *N,cx,0*(*ax*))))  *t*}; then

*ZZN*(*X*2, *t*) = &(*x*,*y*)*YYN* (*X*2,*t*) «*x*, *y*»*N*, for *N* a norm formation, is the Communication Diagram for *X* Under *N* With Probability  *t*

*Dyadic Communication Relations*

Let *r* be a relation defined on *X*2

When (*x,y*)[*r*(*x*, *y*) «*x*, *y*»] then *x* Communicates With *y* in *r*

* Allow *r*: *x* » *y* as an alternative notation for *r*(*x* *y*)
* *YYr*(*X*2) = {(*x*, *y*): *r*(*x*, *y*) and (*x*, *y*)  *YY*(*X*2)}
* *ZZr*(*X*2) = &(*x*,*y*)*YYr*(*X2*) *r*(*x*, *y*) is the Communication Diagram for *r* In *X*

When (*x,y*)[*r*(*x*, *y*) «*x*, *y*»*N*] then *x* Communicates With *y* In *r* Under *N*

* (*x*,*y*)[*r*(*x*, *y*)*N*«*x*, *y*»*N*]](*x,y*)[*r*(*x*, *y*)«*x*, *y*»]  *R*(*r*)
* *r*: *N*: *x* » *y*
* *YYN,r*(*X*2) = {(*x*, *y*): *r*(*x*, *y*), (*x*, *y*)  «*x*, *y*»*N*}
* *ZZN,r*(*X*2) = &(*x*,*y*)*YYN,r*(*X2*) *r*(*x*, *y*) is the Communication Diagram for *r* In *X* Under *N*

When (*x,y*)[*r*(*x*, *y*)*p*«*x*, *y*»] then *x* Communicates With *y* In *r* With Probability *p*

* (*x*,*y*)[*r*(*x*, *y*)*p*«*x*, *y*»](*x,y*)[*r*(*x*, *y*)«*x*, *y*»]  *R*(*r*)
* *r*: *x*  *p*» *y*
* *YYr*(*X*2, *t*) = {(*x*, *y*): *r*(*x*, *y*) and (*x*, *y*)  *YY*(*X*2, *t*)}
* *ZZr*(*X*2, *t*) = &(*x*,*y*)*YYr*(*X*2,*t*) «*x*, *y*» is the Communication Diagram for *r* In *X* With Probability  *t*

When (*x,y*)[*r*(*x*, *y*)*p*«*x*, *y*»*N*] then *x* Communicates With *y* In *r* Under *N* With Probability *p*

* (*x*,*y*)[*r*(*x*, *y*)*p*«*x*, *y*»*N*](*x,y*)[*r*(*x*, *y*)«*x*, *y*»]  *R*(*r*)
* *r*: *N*: *x*  *p*» *y*
* *YYN,r*(*X*2, *t*) = {(*x*, *y*): *r*(*x*, *y*) and (*x*, *y*)  *YYN*(*X*2, *t*)}
* *ZZN,r*(*X*2, *t*) = &(*x*,*y*)*YYN,r*(*X*2,*t*) «*x*, *y*»*N*, for *N* a norm formation, is the Communication Diagram for *X* Under *N* With Probability  *t*