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    STATEMENT OF THE PROBLEM

    OBJECTIVES

    HYPOTHESES

    RESEARCH METHODOLOGY

    RESULTS & DISCUSSION

    FINDINGS

    RECOMMENDATIONS/SUGGESTIONS

    CONCLUSIONS

    SCOPE FOR FURTHER RESEARCH

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    APPENDIX/ANNEXURE

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS
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INTERPERSONAL RELATIONSHIP-AN ATTEMPT AT QUANTIFYING IT

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ABSTRACT

Interpersonal Relationship is proposed to be basically composed of two components, namely, Affinity & Kinship of which the former is the non-genetic part and the latter genetic. Affinity is analyzed and its constituent attributes identified. It is pointed out that the genetic part plays a comparatively secondary role in the intensity of a Relationship, contrary to what is generally perceived. It is proposed that the various attributes of Affinity are present in different proportions in different forms of Affinity/Relationship. These different forms are grouped into clusters based on broad similarities so that the proportions or weightages of these attributes could be reasonably generic within such clusters. A methodology is presented which enables representing Relationships numerically as a factor between 0 & 1. This facilitates comparison of the intensities of different relationships. Most importantly it enables monitoring of the need for correctional measures in familial, organizational & social relationships and also helps lay finger on which attribute needs correction and thus channelises such measures.

KEYWORDS
Affinity, kinship, interpersonal, relationship, quantifying.

INTRODUCTION
Numerous papers have appeared in journals of social psychology, behavioural sciences, management studies and the like, delving deep into the various aspects of the subject of 'Interpersonal Relationship' per se. (The snapshot appearing at the end of this paper under References gives a flavour.) They have no doubt thrown a lot of light on the complex subject in diverse scenarios and helped us gain a veritable insight into the understanding of human interactions in different settings, which is so vital for effectively handling them in various familial, social and organizational contexts. But there has been hardly any work so far, to the extent this author has been able to track, that is directed towards the possibility of quantitatively expressing/measuring interpersonal relationship, which is the quintessential tenor of a scientific approach. The present effort is to seek a way of accomplishing this goal, which this author believes is important in making it possible to compare different relationships which may be apparently not comparable, to monitor their growth/degradation over time and to modulate them in an informed way in order to accomplish contextual goals.

METHODOLOGY
The methodology adopted is to search for the basic components/constituents that contribute towards a relationship, which by its very nature is complex and hence not directly amenable to handle, and then propose a way of combining these comparatively simpler components, with suitable weightages, to generate the particular relationship under study. The presence of the constituents and their weightages are determined by empirical considerations by experts in the field. The approach also tries to give due weightage to genetical predispositions in familial relationships. The particular relationship under study is given a quantitative maximum value of '1', its components a value of '0' or '1' depending on their absence or presence respectively in contributing to the relationship, their weightages a value between '0' and '1' as empirically assessed in the specific context. Below we develop the approach.

APPROACH
We start by taking a close look at 'Relationship'. 'Relationship' between two individuals is proposed to be made up of two components which we shall term as *Affinity* and *Kinship*. *Affinity* is simply the liking for the other person, just the same as its literal meaning. *Kinship* on the other hand is the genetic/ 'genetic-derived' (explained later) component of the relationship. The attempt here is to analyze these and quantify as a number between 0 & 1, in other words to express them as a factor in relation to a possible maximum of 1. This may evoke an opinion that such essentially emotional elements are not amenable to quantification and hence to quantitative analysis. But, pause for a moment and recall how readily we respond to a doctor's request to grade our pain or well-being in the scale of 0 to 10. Hence, though it can be admitted that the quantification we are talking about may be subjective, we must realize that the emotion in question is itself essentially subjective.

Continuing with the earlier string of thought, let us call the three elements as the R-factor (R), the A-factor (A) & the K-factor (K) respectively.

Out of the two components of 'R' proposed above, 'A' must be the dominant one. Otherwise how come some friendships are stronger than blood relationships such as brother-brother, brother-sister or parent-child? We all know that the relationship between a young man and a young woman may be so intense as to thwart brother-sister or parent-child relationships which might come in the way. We can express this as follows:

R = A augmented by K   ....(1)

The nature of the qualifier 'augmented by' we shall arrive at later.

AFFINITY
Affinity for a person presumably derives from 10 major attributes proposed below. Obviously they cannot have equal contribution in determining affinity. So an appropriate weightage is to be assigned to each one of them. The attributes are listed below along with the symbols we shall be using for representing them and for their weightages of contribution.

TABLE-1

Attributes	Symbol for Attribute	Symbol for Weightage
Dependability in distress	Ad	Wd
Commonality of interests	Ai	Wi
Temperamental compatibility	At	Wt
Character compatibiliy	Ach	Wch
Cultural compatibility	Ac	Wc
Sexual/aesthetic attraction	Asa	Wsa
Usefulness in realizing one's goals	Ag	Wg
Ability to arouse one's protective instinct	Ap	Wp
Admirable accomplishments	Aacc	Wacc
Admirable achievements	Aach	Wach

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A-factor can now be expressed as follows:

A = Wd x Ad + Wi x Ai + Wt x At + Wch x Ach + Wc x Ac + Wsa x Asa + Wg x Ag + Wp x Ap + Wacc x Aacc + Wach x Aach …(2)

Here 'x' is multiplication sign and it has precedence over '+' as is customary in any algebraic expression. The weightages Wd….Wach and the attributes Ad….Aach will all have values between 0 & 1 so that A is also within the same range consistent with what we postulated in the beginning. 'Ach' refers broadly to one's major personality traits such as belief systems, integrity etc. 'Ac' refers broadly to social background. A-factor between individuals C & D may generally differ in either direction. That is to say, the affinity of C-to-D may differ from that of D-to-C.

Note that the emphasis here is on relative attributes as perceived by the initiator of the relationship, which fact is expressed by terms like 'compatibility', 'attraction', 'being useful' or 'being admirable', and not on the absolute attribute per se. This facilitates the applicability of the expression to all categories of people, regardless of their class or virtues, be it a person of noble descent or a heinous criminal.

The weightages 'W' can not be uniform for all kinds of relationships. For example 'Ws,a' will generally be high in affinity between youth of opposite sex compared with that between senior citizens and youth. Or 'Wp' will generally be prominent in an adult-child affinity as compared to adult-adult affinity. Hence they have to be chosen appropriately for different affinity groups. The first thing to do in this context is to identify the distinct affinity groups. The following is a proposed list.

TABLE-2

Affinity Groups	Symbol
Age/Gender-based Groups:	
-Child group (Upto 10 years)	C→C
-Youth same-sex group (11 to 50 years)	Yss→Yss
-Youth male-female group & its inverse (11 to 50 years)	Ym→Yf
	Yf→Ym
-Senior group (51 years and above)	S→S
-Senior/Youth-Child group & its inverse	S/Y→C
	C→S/Y
-Senior/Youth & its inverse	S→Y
	Y→S
Workplace-based Group:	
-Employer-Employee & its inverse	Er→Ee
	Ee→Er

Employer-Employee affinity will of course be influenced by the Age/Gender-based affinity also. For simplicity we deliberately ignore it here, but shall talk about it when we analyze the relationship.

Now let us choose the weightages as realistically as possible for each of these groups. The weightages so selected will make possible to have a generic base-line expression over which one can assign the specific ratings of the attributes in any particular case in order to yield the measure of the corresponding affinity targeted.

TABLE-3

Values for various Affinity Groups

Weightages	C→C	Yss →Yss	Ym →Yf	Yf →Ym	S→S	S→C Y→C	C→S C→Y	S→Y	Y→S	Er →Ee	Ee →Er
Wd	0.1	0.2	0.05	0.2	0.2	0	0.3	0.2	0.1	0.05	0.1
Wi	0.3	0.1	0.05	0.05	0.2	0	0	0.1	0.1	0.1	0.1
Wt	0.2	0.1	0.2	0.2	0.1	0.2	0.3	0.2	0.2	0.1	0.1
Wch	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Wc	0.2	0.05	0.05	0.05	0.1	0.1	0.1	0.05	0.05	0.05	0.05
Ws,a	0	0.05	0.3	0.2	0.05	0.2	0	0.1	0.05	0.05	0.05
Wg	0	0.2	0.05	0.05	0.05	0	0.2	0.1	0.1	0.2	0.2
Wp	0.1	0.05	0.05	0	0.05	0.3	0	0	0.1	0.05	0
Wacc	0	0.1	0.1	0.1	0.1	0.1	0	0.1	0.15	0.15	0.15
Wach	0	0.05	0.05	0.05	0.05	0	0	0.05	0.15	0.15	0.2

It is of course to be admitted that there is some degree of arbitrariness in the choice of the above values for the weightages.
We shall come back to the topic for specific relationships a bit later, after taking a look at Knship.

KINSHIP

Kinship is genetic/'genetic-derived' as stated before. Let us derive the K-factor for the more prominent kinships. To begin this process, we need to take note of the chromosomal combinations that result in gender difference. These are, as is well-known, the following:

M = Xmo + Yfa   ….(3)
W = Xfa + Xmo   ….(4)

These are of course not algebraic equations but genetic strings with the '+' representing the string symbol.

Here 'M' stands for man, 'W' for woman, 'X' stands for X-chromosome, 'Y' stands for Y- chromosome, suffix 'fa' for father, 'mo' for mother.

In man, considering the commonality of his gender with his father Yfa can be assumed to be dominant. Similarly for woman. Emphasizing this fact, the above-mentioned combinations can be more effectively represented with visual emphasis as follows with bold Yfa for man and bold Xmo for woman:

M = Xmo + **Yfa**   ….(3')
W = Xfa + **Xmo**   ….(4')

The major kinships represented by 'K' can be reasonably hypothesized to be quantifiable as given below:

Father-Son (F-S)	Kfs = 0.52 due to dominant Yfa	
Father-Daughter (F-D)	Kfd = 0.48 due to non-dominant Xfa	
Similarly		
Mother-Son (M-S)	Kms = 0.48	
Mother-Daughter (M-D)	Kmd = 0.52	

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Brother-Brother (B-B)	Kbb = 0.9
Brother-Sister (B-S)	Kbs = 0.8
Similarly	
Sister-Sister (S-S)	Kss = 0.9

Axiom-1: *K-factors are multiplicative when deduced for a chain of kinships*.

Thus

Paternal Uncle-Nephew	Kpune = Kbb x Kfs = 0.9 x 0.52 = 0.47
Paternal Uncle-Niece	Kpuni = Kbb x Kfd = 0.9 x 0.48 = 0.43

Similarly for parallel mother-routed kinships.

It may appear somewhat distorted to find that Kms & Kpune are nearly equal. But remember that we are talking about *kinship* only at this stage and not about *relationship*. We shall resolve it later.

'Genetic-derived' kinship is that between parents as illustrated below:

Unrelated Husband-Wife	Khw = 0

With 1 progeny 'genetic derivation' of K-factor starts.

Thus   Khw = Kfs x Kms = Kfd x Kmd = 0.52 x 0.48 = 0.25

Axiom-2: *K-factor contributed by each progeny in H-W relationship is additive*.

So, for 4 progenies   Khw = 0.25 + 0.25 + 0.25 + 0.25 = 1 , the possible maximal value.

Note that this does not mean that the 2-children norm is detracting from a fuller husband-wife relationship, as we are presently talking about *kinship* only like earlier and not *relationship*.

RELATIONSHIP

Now we come back to the formula (1) viz.

R = A augmented by K

What is the nature of this 'augmentation'?

When we have already postulated, based on general observation, that Affinity is the over-riding element in a Relationship, it is logical to propose that this augmentation should be in proportion to the extent to which A-factor falls short of attaining the maximal value of R-factor viz. 1. This is taken care of as follows:

R = A + (1 - A)K   ....(1')

Here '+' and '-'are the familiar arithmetic operational symbols

Now let us start deriving R for some major relationships.

First we must select the attribute values that make up A-factors.

FATHER-SON VS. FATHER_DAUGHTER

These relationships need to be analyzed recognizing the possibility of different age-groups the two individuals may belong to. Thus, in the light of our discussion of different affinity-groups above, we need to consider the following cases:

Father-Son (F-S):	S/Y→C
	Yss→Yss
	S→Y
	S→S
Similarly	
Father-Daughter (F-D):	S/Y→C
	Ym→Yf
	S→Y
	S→S

Let us assign the attribute values in each case in the tabular form like we did earlier which has the advantage of facilitating a comparison among the different groups. Values of attributes selected are for typical relationships.

TABLE-4

Weightages &Attributes	Values for different Affinity Groups							
	F-S: S/Y→C	Yss→Yss	S→Y	S→S	F-D: S/Y→C	Ym→Yf	S→Y	S→S
Wd	0	0.2	0.2	0.2	0	0.05	0.2	0.2
Ad	0	0.9	0.9	0.9	0	0.8	0.9	0.9
Wi	0	0.1	0.1	0.2	0	0.05	0.1	0.2
Ai	0	0.7	0.7	0.7	0	0.7	0.7	0.7
Wt	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
At	0.9	0.8	0.6	0.5	0.9	0.8	0.6	0.5
Wch	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Ach	0.9	0.7	0.7	0.7	0.9	0.8	0.7	0.7
Wc	0.1	0.05	0.05	0.1	0.1	0.05	0,05	0.1
Ac	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0
Wsa	0.2	0.05	0.1	0.05	0.2	0.3	0.1	0.05
Asa	0.8	0.8	0.6	0.4	0.9	0.9	0.6	0.4
Wg	0	0.2	0.1	0.05	0	0.05	0.1	0.05
Ag	0	0.8	0.8	0.6	0	0.6	0.8	0.6
Wp	0.3	0.05	0	0.05	0.3	0.05	0	0.05
Ap	0.8	0.5	0.4	0.3	0.9	0.5	0.4	0.3
Wacc	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aacc	0.8	0.9	0.9	0.9	0.8	0.9	0.9	0.9
Wach	0	0.05	0.05	0.05	0	0.05	0.05	0.05
Aach	0	0.8	0.9	0.9	0	0.7	0.9	0.9
A-factor	0.85	0.77	0.77	0.76	0.89	0.79	0.77	0.76
R-factor	0.93	0.89	0.89	0.88	0.94	0.89	0.89	0.88

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Compare the first two columns of F-S and F-D. Observe that even though the R-factors are nearly identical the A-factors lean towards the daughters in their childhood and youth. That explains, in general, why fathers' darlings are daughters despite lower kinship.

Similar will be the result for mother-son relationship.

PATERNAL UNCLE-NEPHEW VS. MOTHER SON RELATIONSHIP

***Axiom*-3:** *While deriving a chain of relationships the A-factor to be taken into account will be that between the terminally linked individuals only.*

In PU-Ne relationship the chain of relationships involved is B-B followed by F-S. According to the above axiom we won't consider A-factors for B-B and for F-S. We shall only consider A-factor between PU and Ne.

So,   Rpune = Apune + (1-Apune) Kpune

                Kpune = Kbb x Kfs = 0.9 x 0.52 = 0.47

Treating it exhaustively will need us to consider the different age-groups. It should suffice here to consider a single age-group, say, S/Y→C.

TABLE 5

Weightages & Attributes	Values for	
	PU→Ne	M→S
Wd	0	0
Ad	0	0
Wi	0	0
Ai	0	0
Wt	0.2	0.2
At	0.7	0.9
Wch	0.1	0.1
Ach	0.7	0.9
Wc	0.1	0.1
Ac	0.9	0.9
Wsa	0.2	0.2
As,a	0.7	0.9
Wg	0	0
Ag	0	0
Wp	0.3	0.3
Ap	0.7	1
Wacc	0.1	0.1
Aacc	0.7	0.7
Wach	0	0
Aach	0	0
A-factor	0.72	0.91
R-factor	0.85	0.95

Thus the R-factor is convincingly leaning towards the mother-son relationship unlike the K-factor.

HUSBAND-WIFE RELATIONSHIP

Ahw can be assumed to be at least 0.5. A lesser value obviously doesn't justify marriage.

Before producing a progeny   R-factor = Ahw + (1-Ahw) x Khw = 0.5 + (1-0.5) x 0 = 0.5

| After 1 progeny | Khw = 0.25 as shown earlier. |
| Corresponding | Rhw = 0.5 + (1-0.5) x 0.25 = 0.63 |

| After 2 progeny | Khw = 0.25 + 0.25 = 0.5 |
| Corresponding | Rhw = 0.5 + (1-0.5) x 0.5 = 0.75 |

| After 3 progeny | Khw = 0.25+ 0.25 + 0.25 = 0.75 |
| Corresponding | Rhw = 0.5 + (1-0.5) x 0.75 = 0.88 |

| After 4 progeny | Khw = 0.25+0.25+ 0.25 + 0.25 = 1 |
| Corresponding | Rhw = 0.5 + (1-0.5) x 1 = 1 |

However, Rhw can be 1 right at the time of marriage in an intensely romantic man-woman relationship where Ahw could equal 1.

EMPLOYER EMPLOYEE & INVERSE RELATIONSHIP

Typical attribute values for a good affinity are being considered below:

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TABLE 6

Weitages & Attributes	Values	
	Er→Ee	Ee→Er
Wd	0.05	0.1
Ad	0.3	0.8
Wi	0.1	0.1
Ai	0.8	0.8
Wt	0.1	0.1
At	0.8	0.8
Wch	0.1	0.1
Ach	0.7	0.7
Ws,a	0.05	0.05
As,a	0.5	0.5
Wg	0.2	0.2
Ag	0.9	0.8
Wp	0.05	0
Ap	0.8	0
Wacc	0.15	0.15
Aacc	0.8	0.8
Wach	0.15	0.15
Aach	0.6	0.8
A-factor	0.7	0.62
R-factor	0.7	0.62

We haven't considered here the influence of age/gender-based affinities which is quite a possibility in real-life Employer-Employee and the inverse relations as long as the people involved are normal human beings. In order to derive such a realistic measure we need to augment this result with the affinity that derives from those aspects also. The group affinities that operate here are S→Y, Y→S, Ym→Yf, Yf→Ym whichever is applicable in the specific instance. The weightages to be assigned for the two may reasonably be assumed as indicated below, for an uncorrupt relationship.

A-factor = 0.7x A-factor of pure Er-Ee/Ee-Er affinity + 0.3x A-factor of age/gender- based group applicable   ....(5)

APPLICATIONS

The above discussion may appear to be at best a theoretical exposition of the subject albeit from an unconventional point of view. However, if one takes a serious look one will realize that the analysis attempted affords a better comprehension of the essentially instinctive process of developing a relationship and helps place one's finger on what aspect of the relationship needs to be improved for higher satisfaction. In an organization a confidential feedback form for eliciting the various attributes will help the Human Resources personnel to improve the Employer-Employee/inverse relationships. In the same way, in a family environment a counselor will be able to get valuable clues as to the shortcomings in internal family relationships from these parameters obtained through a feedback that would enable him to enhance such relationships. Of course to facilitate action in this direction a definition of what is the norm and what is the lower bound is needed with regard to such affinities/relationships. We have already accepted a prescription in the above discussion for husband-wife relationship viz. 0.5 for affinity to justify marriage. Let us look at this issue more comprehensively:

TABLE 7

Relationship	A-factor Lower Bound	A-factor Norm
H-W & inverse	0.5	0.7
F-S, F-D, M-S, M-D B-B, B-S & invers	0.7	0.8
Grand Parent-Grand Child & inverse	0.6	0.7
Uncle/Aunt-Nephew/Niece & inverse	0.5	0.6
Cousins	0.6	0.7
Employer-Employee & inverse	0.5	0.7

CONCLUSION

What has been attempted above is to broadly spell out a modality of approach if we wish to analyze human relationship with the intention of expressing it quantitatively which is of course a radical departure from the usual qualitative approach. Along the way, we have identified not only two fundamental constituents of relationship but have gone much deeper in search of the attributes of the affinity that two individuals might feel for each other. Ten such attributes have been proposed. Their impacts will be in different proportions. With that realization their weightages were proposed in order to evolve a mathematical expression for affinity. The values of these weightages will differ in different affinities/relationships. Several such affinity groups were identified based on age, gender & workplace and different sets of weightages were assigned to characterize them. The kinship factors for fundamental kinships were also assigned values. Certainly there is some degree of subjectivity in the enumeration of such affinity groups. It is also the case with the values of weightages, of kinship factors for basic kinships, of lower bounds & norms of affinities and of age-group bounds. Professionals from Social Psychology & Behavioural Sciences are definitely better-placed to come out with more realistic notions and estimates on these issues.

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