Directive Correlation for Planning, Explanation and Prediction

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2022 (adapted from 14 June 1998)

Most people can readily see how the directive correlation model can be used for planning but can find it more difficult to see how it can be used for explanation and prediction. It is always more instructive to illustrate this latter with a working example than just use words. Therefore, I used the example below to help students in the Advanced OST course I ran at Concordia Uni in Montreal.

Planning

This example is from deGuerre et al, 2007, delivered to the AoM meeting which was published as DeGuerre et al, 2008, and which confirmed again that the design principles exert a powerful influence on human health both physical and mental.

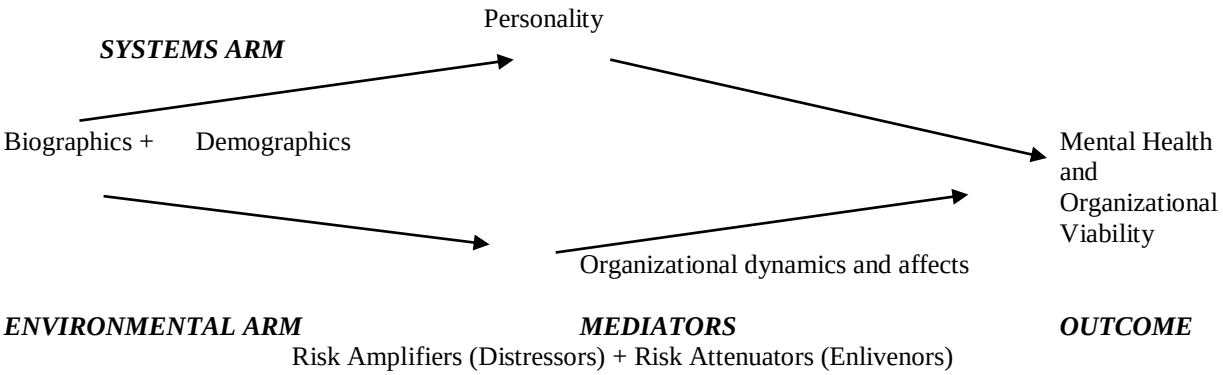


Figure 4: Conceptual Design of the Study

"In Figure 4, the starting conditions include measures of age, gender, socioeconomic class, position in the organizational hierarchy and years of service. The systems arm consists of a measure of personality conceptualized as objective behavioural preferences (Emery & Emery, 1980; Emery, M, 1999). The work environment arm of risk amplifiers/attenuators includes measures of all components of the design principles, supervision, responsibility for control and coordination, nature of team work, location of accountability, plus quality of relationships, cooperation or competition on the job, trust, mental demand, learning, creativity/innovation, sense of achievement, and the psychological requirements for productive work (intrinsic motivators) as well as hygiene factors (external motivators) such as pay and working conditions. In addition, there are measures of the mediating variables of organizational dynamics (Bion, 1952; 1961) and a wide range of affects. All factors identified in previous studies are included. The individual outcomes consist of motivation, mental health and days off sick. The organizational outcomes consist of innovation and productivity. In addition, there are measures of transfer effects to family and community life expressed as activities.

By adopting the socio-ecological perspective and acknowledging that both individuals and organizations are open systems with permeable boundaries to their various environments, the project covers all critical dimensions identified in the literature for structure, work environment and individual" (p11-12).

Explanation and Prediction

The example here is of a family's dynamics over time as both they and the environment, L22, change. The students were given relevant details of the family and asked to work out how various members of the family moved towards or away from adaptation, directive correlation, over time to the present (2000) given that there were to be no interventions such as counselling or any other disruptive event. They were to present their predictions as a DC graph over time.

The family consisted of P1, parent 1 born 1925, P2, parent 2 born 1940, K1, kid 1 born 1965 and K2, kid 2 born 1975. F stands for family and is the average at each point for P1 and P2.

The solution is based on the rate of change of the system (ROC_S) relative to the rate of change of environment (ROC_E). All systems, therefore, can be accurately compared relative to the common base of rate of change of E.

Assumptions:

- Greatest rate of change of L22 happens between 1965 and 1975 (cultural revolution) and then drops off
- Every individual learns and adapts to the L22
- Length of time spent in Type III environment will affect rate of adaptation to Type IV
- Maturity of Type IV will also affect rate of adaptation (and therefore, K2 adapts faster than K1)
- First few years of K1 and K2's lives follow family (i.e. graphs coincide)
- P2 as bridge between Type III and IV makes bigger moves towards adaptation after kids are born

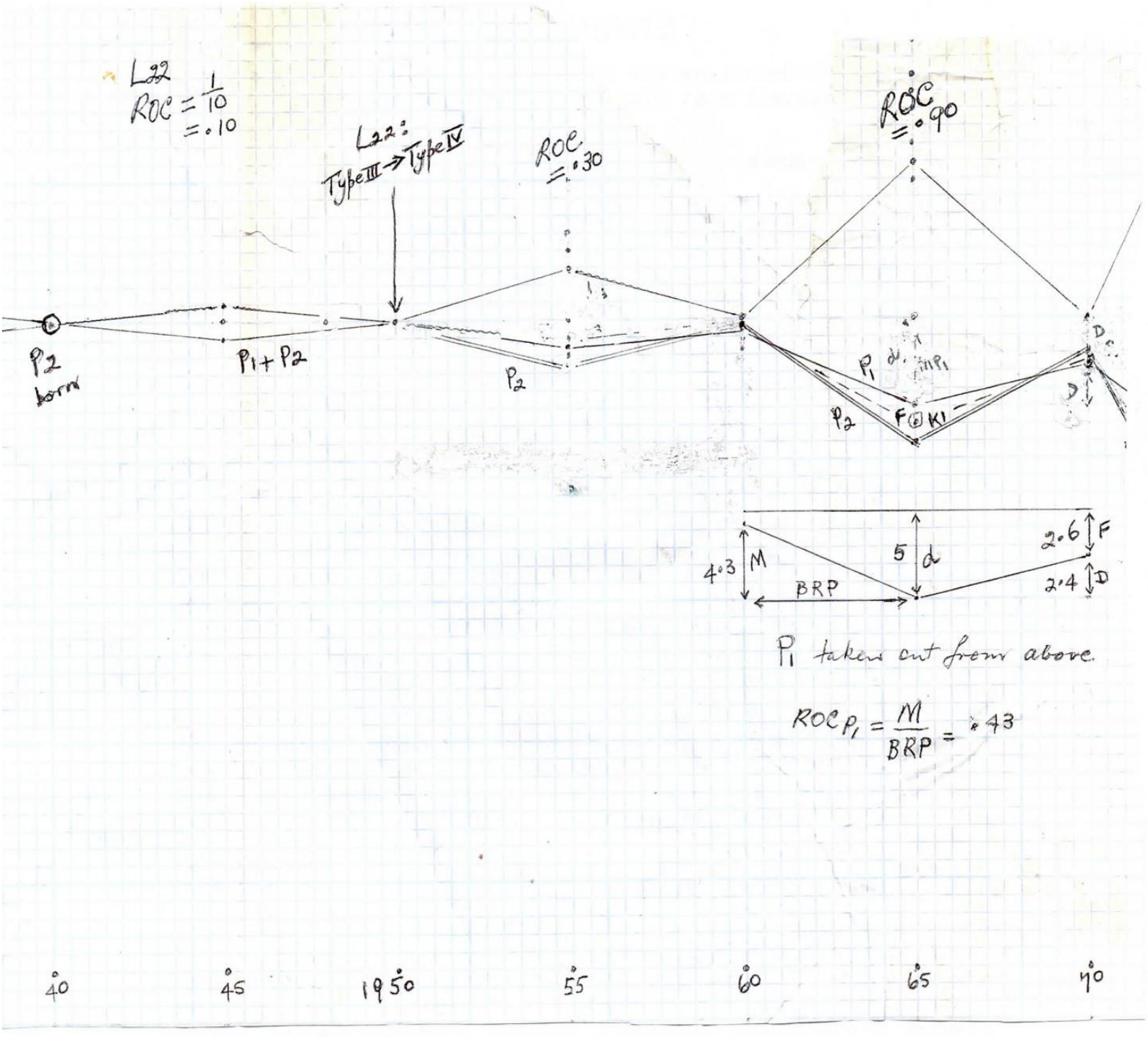
Results

Please see graph below. Unfortunately, the original was damaged and the patch up job is not entirely satisfactory but you will get the idea.

Without intervention, the dynamics indicate that P1 finds no relationship with K2 in 1990 (ratios). In 2000, P1 finds no relationship with both K1 and K2 and is pretty isolated also from P2. In linear terms, P1 is significantly more isolated from rest of family than has been previously.

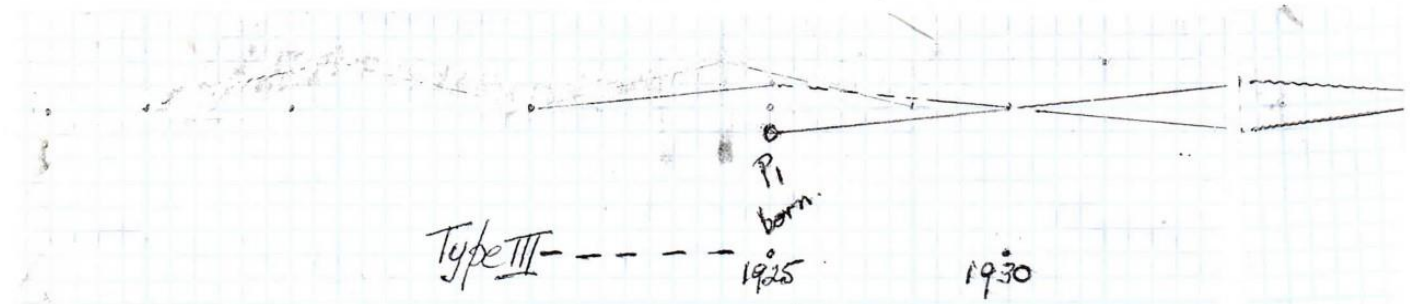
This picture is not perfect as for example, it could seriously underestimate P1's ability to adapt. Real data here, from various sources such as interviews, survey with reasonably accurate scales, would have improved it.

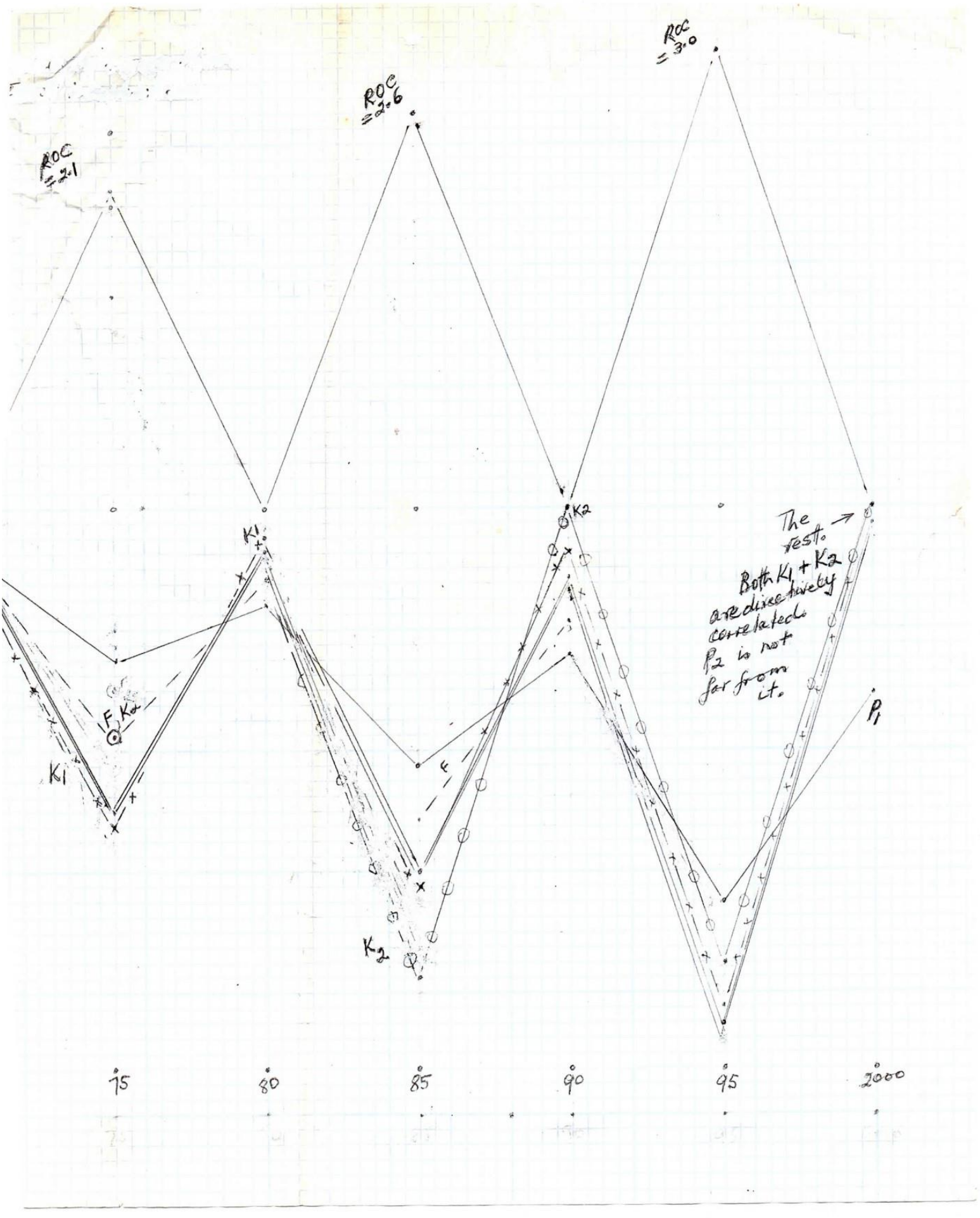
Trends re Direction Correlation over time, expected without intervention.

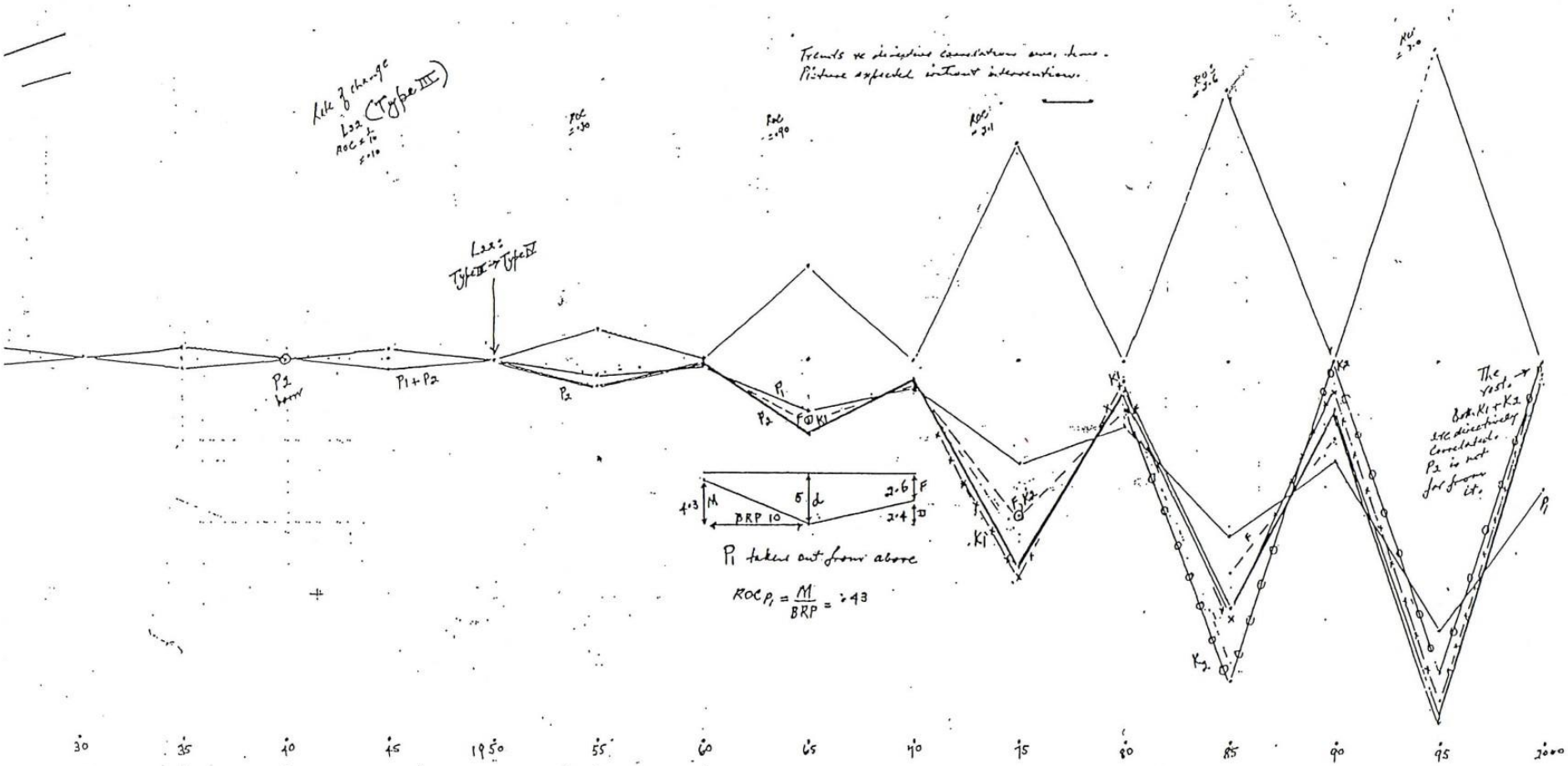


P_1 taken out from above.

$$ROC\ P_1 = \frac{M}{BRP} = .43$$




ROC = 2.1
ROC = 2.6
ROC = 3.0
K1
K2
F K2
K1
K2
The rest.
Both K1 + K2 are directively correlated.
P2 is not far from it.
P1
75
80
85
90
95
2000



Trends re directive correlation over time.
Picture expected without intervention.
Rate of change
L22 (Type III)
ROC = 1/10
= .10
ROC = .30
ROC = .90
ROC = 2.1
ROC = 2.6
ROC = 3.0
L22: Type III → Type IV
P2 horiz
P1 + P2
P2
P1
P2
F
K1
K1
K2
K2
K1
K2
P1
The rest. → Both K1 + K2 are directively correlated. P2 is not far from it.
4.3 M
5 d
2.6 F
2.4 D
BRP 10
P1 taken out from above
ROC P1 = M/BRP = .43
30
35
40
45
1950
55
60
65
70
75
80
85
90
95
2000

Workings

Formula is given by F=d-D where: d= distance to DC and

$$D = \frac{(ROC_S)}{(ROC_E)} \times d$$

Where: $ROC_S = \frac{M_S}{BRP \text{ (back reference period)}}$

Where: M= distance moved over previous BRP.

Therefore: $F = d - \frac{M_S}{BRP...} \times d$

$$\frac{M_E}{BRP}$$

Table of calculations

Table of changes for each member of family												
	P1			P2			K1			K2		
	R.ROCxd*	D	F	R.ROCxd	D	F	R.ROCxd	D	F	R.ROCxd	D	F
1960	.15 x 1.5 30	0.8	0.7	.25 x 2.5 .30	2.1	0.4						
1970	.43 x 5 .90	2.4	2.6	.66 x 7 .90	5.1	1.9						
1980	.76 x 10 2.1	3.6	6.4	1.8 x 20 2.1	17.1	2.9	1.9 x 21 2.1	19	2			
1990	1.1 x 17 2.6	7.2	9.8	2.1 x 24 2.6	19.4	4.6	2.3 x 25 2.6	22.1	2.9	2.6 x 31 2.6	30	0
2000	1.6 x 26 3.0	13.9	12.1	2.9 x 34 3.0	33	1	3.0 x 33 3.0	33	0	3.0 x 30 3.0	30	0

* R.ROCxd means relative rate of change x d or D

Therefore, in 1990, P1/P2=2.1; P1/K1=3.4; P1/K2=infinity

In 2000, P1/P2 = 12.1; P1/K1=infinity; P1/K2=infinity

OR, in terms of distance from each other in linear terms:

In 1990, P1-P2=5.2;	P1-K1=6.9;	P1-K2=9.8
In 2000, P1-P2=11.1;	P1-K1=12.1;	P1-K2=12.1

Reference

deGuerre, D.W., Emery, M, Aughton, P, Trull, A.S. (2008). Structure Underlies Other Organizational Determinants of Mental Health: Recent Results Confirm Early Sociotechnical Systems Research. *Systemic Practice and Action Research*. 21. 359-379.