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Optimum Executive Body Has 5 Members Simple Mathematical Proof

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Introduction - Intuitively we know that any executive body in any organization in order to be effective must have limited number of its members.. By means of simple mathematical procedures and ideas of the theory of information we prove that:

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Strictly as per the compliance and regulations of:

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I. Introduction

Intuitively we know that any executive body in any organization in order to be effective must have limited number of its members.. By means of simple mathematical procedures and ideas of the theory of information we prove that:

II. Optimum Number of Members of Executive Body is 5

This theorem is valid for all types of human organizations - political, economical, social etc., for any executive body with division of competences among its members and that needs be operative at its complex coordinated decision-making.

a) *Procedure of proof*

Here we understand by communication channel a surrounding serving for transmission of signals and the mode of mutual transmission of information among members of executive body that are necessary for its functioning.

The channel is then in substance verbal or written communication among 2 till n member subgroups of a executive body of n members.

Now we want to find quantum of all possible such communications. The effective use of such communication is limited by limited capacity of human being, of his brain.

Such quantum for the body, where among its members is division of work- duties and is to be maximum coordination we can ascertain combinatoricaly accordimg to size of the body.

This combinatorical task we must solve according to sort of channels. The communication connections in the executive body, necessary for proportional management of individual areas of managed activities exist:

1. In two-way information channel between two men- i.e. in two - member communication connection,
2. in consultations where are taking part 3-till n – 1 members, i.e. in group communication connections in communications among 2 member till n – 1 member subgroups , in this case it is for
3. coordination of results of the consultations different subgroups therefore it can be 2 member communication otherwise group communication on common consultation of the whole body therefore in maximum group communication connection..

Because two – member communication we consider as one channel and at the communication in n-member group does not metter on sequence of elements we can use formulas for calculation of combination 2 th class of n-different elements without repetition. Than the number of the all possible communications of two members of body we ascertain by the formula:[1] :

$$C_2(n) = \frac{n!}{(n-2)!2}$$

and the number of group communications we determine by the equation:

$$C_k(n) = \frac{n!}{(n-k)!k!}$$

where k is number of members of the subgroup, in the case n = k , i.e. at the common communication of the all members of body, naturally C (n) = 1.

I. The sum of the all combination numbers (for $k \neq 0$, $k \neq 1$) i.e.:

$$C_2(n) + C_{2+1}(n) + \ldots + C_n(n) = \sum_{k=2}^{k=n} C_k(n)$$

(that it is kown by adding of rows of Pascal' s triangle without value, where k = 0 and k = 1)

is for (n = 3) = 4, (n = 4) = 11, (n = 5) = 26, (n = 6) = 120, (n = 8) = 247.

II. The relations of different subgroups (sub 3 above) in dependance on n is at (n = 3) = 3,at (n = 4) = 1013, at (n = 5) are the relations of subgroups ,where their number is 25

$$\sum_{k=2}^{k=25} C_k(25) = \sum_{k=2}^{k=25} \frac{25!}{(25-k)!k!}$$

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[1] n ! we read n factorial where n ! = n. (n-1).(n-2) … . 1.

The number of such relations reaches with rising n quickly very great values and despite the fact that they are not practically utilized the all such combination at elaboration of management instructions in executive bodies (esp. not the combinations with greater k – but cosequence is that at common and/or group consultations some members are getting superflues information) it is demonstration of certain limit of really effective executive body.

From the quatums (I) and (II) it is possible to deduce and/or prove intiutivelly based, organizational experience that (optimum) number of member of executive body, where it is among them division of work, it is not to surpass 5 .

Theorem: In order to have effective executive body with maximum intellectual capacity and at the same time with optimum inside information processing it is to have 5 members.

Proof: From the relation (I) follows, that though 6 th member enhaces intelectual capacity of a body about 1/6 but enhances amount of basic information channels more than 1x and at the same time number of communications determined by the relation (II) reach already very high values.

These ideas have also broader cosequences for structuring ad functionning of complex and big organizational structures. It could be often useful to structure complex managed areas into maximum 5 important areas, and to ephasize substantial and quick reporting to executive mangerial bodies.

It is obvious that practice can have its specifications, e.g. in organization of the states, their governements include narmally more members than 5 because their decision- making normally need not be so urgent and therefore they need not be very operative, also the resorts managed by individual members of government have different scope and importace etc. But in the case of emergency each governments deals in framework of smaller group (only vice premiers, important ministers) in accordance with to proved limit.

We could mention and elaborate yet a row of practical examples of implemenation of presented theorem .

Lit. e. g.: Cambridge Studies in Advanced Mathematics , Vol.62, Enumerative Combinatorics, by R. Stanley, S. Fomin, ISBN 0521560691