

Systems Analysis of Social Capital at the Firm Level

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Networking and Social Capital

- Classical approach
 - $GDP = f(C, L, T)$
- Modern approach
 - $GDP = f(C, L, T, N)$
- Where:
- C – capital L – labour T – technology
 - N - networking

Two objectives of the paper:

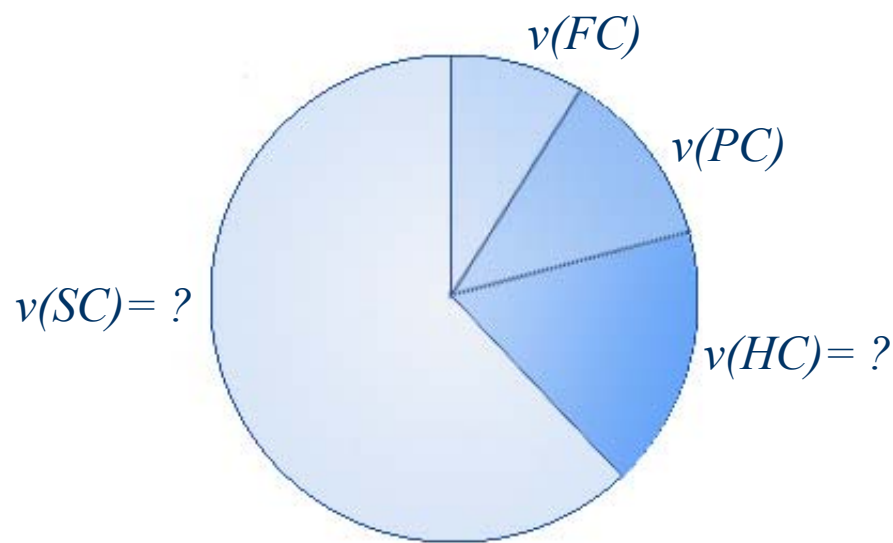
1. To assess, estimate and even measure the value of social capital of:

- Industrial/service company,
- Research institution, university, consulting firm,
- Sports club,
- Professional organization, etc.

2. To present one more way of describing social capital as a complex phenomenon in the knowledge-based economy

The entire capital (all assets) of the typical firm can be divided into the following four categories:

1. **Financial capital (*FC*)**, which comprises savings, loans, sale of stocks, sale of bonds, retained earnings etc.
2. **Physical capital (*PC*)**, which comes in the form of buildings, machines, furniture, computers and software, etc. (tangible property).
3. **Human capital (*HC*)**, which is a resource derived from competences, tacit knowledge, experiences, skills, education, training, etc. of workers considered as a discrete individuals.
4. **Social capital (*SC*)**, which is composed of formal and/or informal relationships among workers, teams, organizational units, etc. as well as its so-called organizational culture, viewed as a pool of formal/informal rules, principles, behaviour standards of people, procedures, etc.



The ideal solution

$$\text{Market value of a firm} = v(FC) + v(PC) + v(HC) + v(SC)$$

$$\underbrace{\hspace{10em}}_{v(BK)} \qquad \underbrace{\hspace{10em}}_{v(IC)}$$

Market value of the firm = $v(BK) + v(IC)$

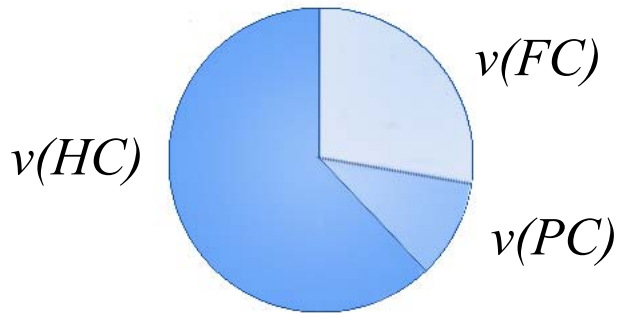
for any time t of the past, present and future of a firm

Accounting model for analysis of social capital

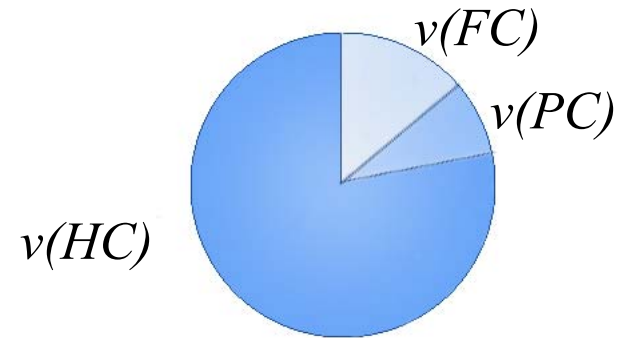
Observation 1. In one-man company $v(SC) = 0$, i.e. there is no social capital

Example 1

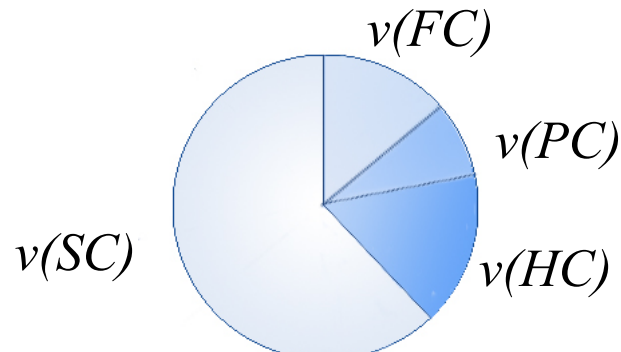
One-man TAX Company



One-man LAW Company



Two-men LAW&TAX Company



Multi-staff organization as a set of one-man companies:

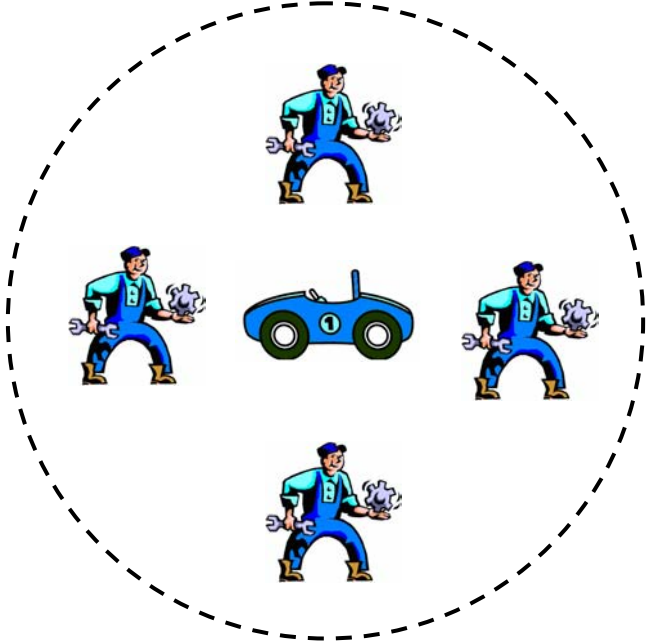
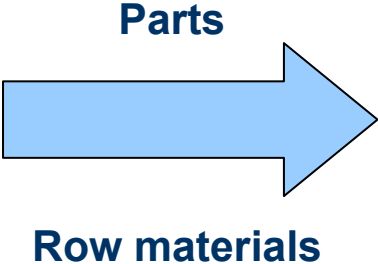
- Academic market as a part of general market

Example 2

Manchester United *FC* as a set of one-man companies
(top players):

- $v(HC)$ measured during transfer period
- a training vs a match
- HC vs SC
- Current $v(SC)$ vs „global” in time $v(SC)$
- Local $v(SC)$ vs „global” in space $v(SC)$

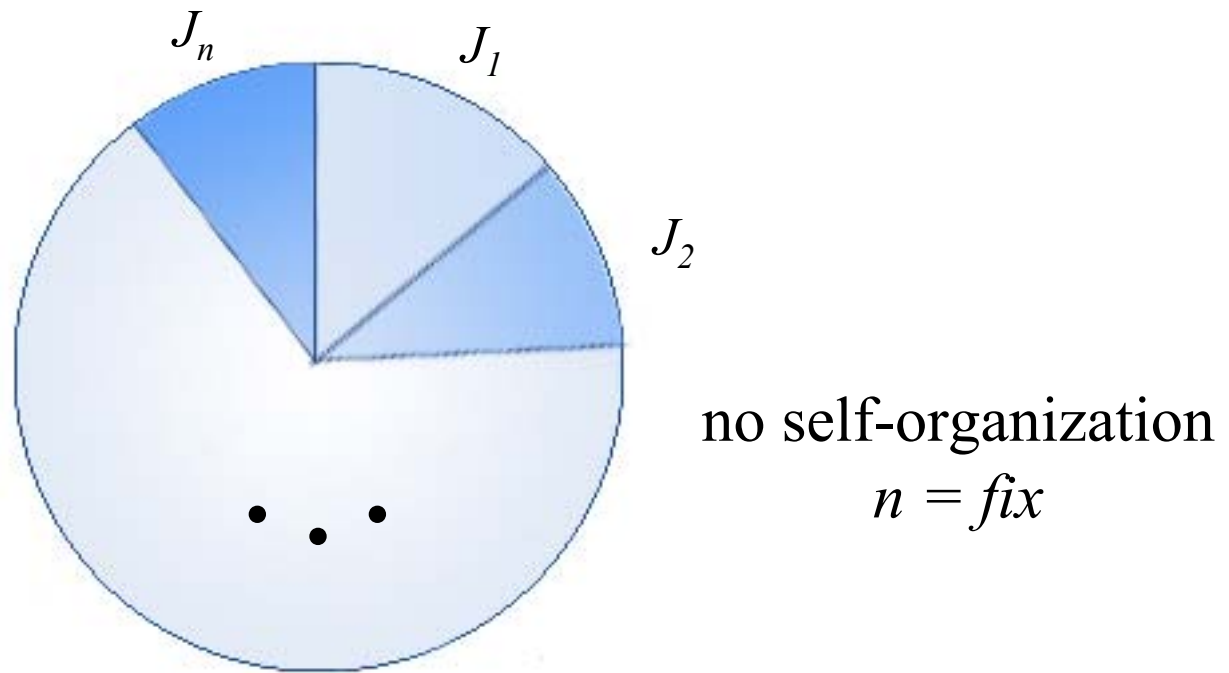
Production circle



Classical Production/service Line (CPL)



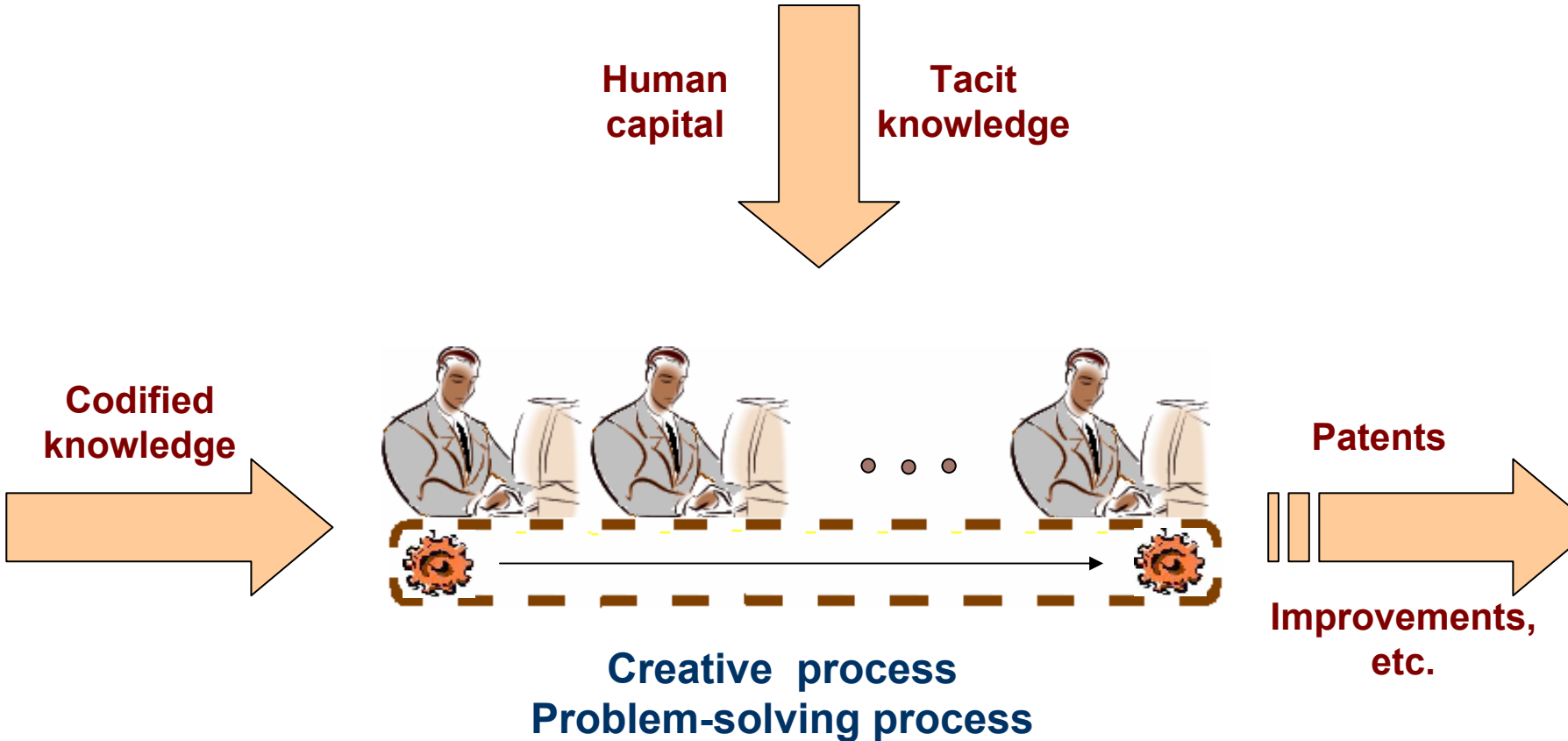
Definition 1. Classical production line (CPL) is a division of a well defined and sufficiently described complex production/service process into a fixed number of simple operations (jobs) described to the smallest detail. Such a division is fixed for a time and does not allow of any self-organization.



Main assumption.

Application of knowledge by teams of scientist, experts, specialists, etc. is always connected with solving a problem. It may not be well-defined or described in a fuzzy way, but always has a creative, problem-solving nature.

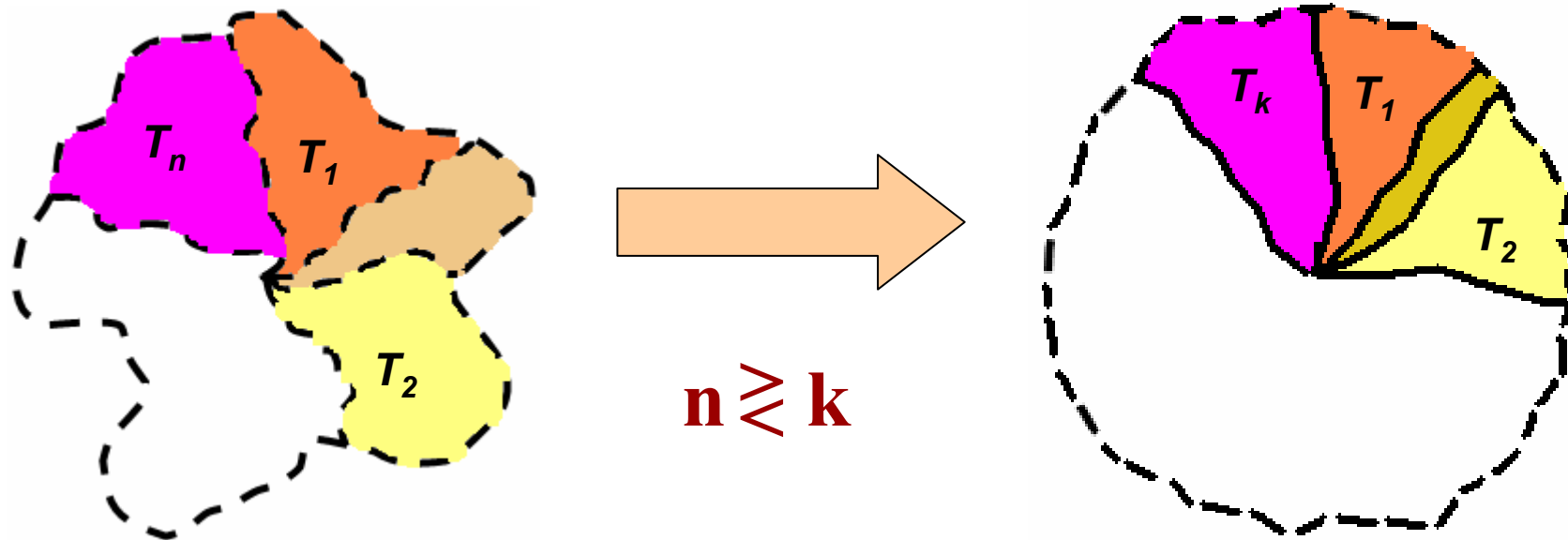
Virtual production line (VPL)



Managerial model for analysis of social capital

Definition 2. The **virtual production line (VPL)** is a division into more or less precisely described tasks (jobs) of a complex, perhaps not so well-defined problem-solving process (creative process), combined with modern ICT. The division of labour into tasks as well as the number of tasks may be changed during the creative process by experts (team of experts) involved in the process. Such a modification is called **self-organization of virtual production line**. Obviously, self-organization may recur over the creative process.

After self-organization



Conclusion 1. (The Past). Without modern ICT, the value of social capital of the firm is negligible.

Conclusion 2. (The Future). The history of improvement/development of CPL delineates directions for research on VPL. In fact, VPL is a natural development (phase) of CPL.

Knowledge -based economy

- Big companies – many CPLs and VPLs
- SMEs- clusters and VPLs

Econometric model for analysis of social capital

Three dimensions of social capital

Let E_1, E_2, \dots, E_n – experts (teams of experts, organizational units, etc in a firm).

- 1. The structural dimension x_{ij}** which reflects the existence of cooperation, contacts, connections, etc, between E_i and E_j .
- 2. The relational (qualitative) dimension q_{ij}** which describes the quality of relationships between E_i and E_j , e.g. trust, intimacy, openness, liking and so forth.
- 3. The cognitive (creative) dimension c_{ij}** which identifies the extent to which E_i and E_j are ready to participate in problem solving in a firm (creative process), to what extent they share common perspectives and understanding, how much they intend to contribute to $v(SC)$.

Clearly, x_{ij} can be treated as a binary variable

$$x_{ij} = \begin{cases} 1, & \text{if } E_i \text{ cooperates with } E_j \\ 0, & \text{otherwise} \end{cases} \quad i, j = 1, 2, \dots, n.$$

So we have a binary matrix $X = [x_{ij}]$, $i, j = 1, 2, \dots, n$.

Without loss of generality we may assume that q_{ij} and c_{ij} are real figures obtained e.g. by means of questionnaires designed for a given case. Therefore, we have two $n \times n$ matrices.

$$Q = [q_{ij}] \quad \text{and} \quad C = [c_{ij}], \quad i, j = 1, 2, \dots, n.$$

If we define \times -multiplication as

$$XQ = [x_{ij}q_{ij}] \quad \text{and} \quad XC = [x_{ij}c_{ij}] \quad \text{for } i, j = 1, 2, \dots, n,$$

then we can formulate

Observation 2. $v(SC) = f(X, Q, C) = f(XQ, XC)$.

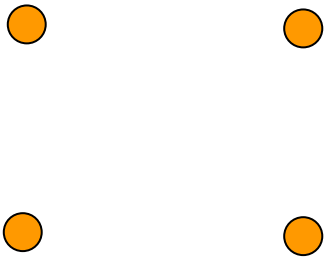
Application of graph theory

Structural graph $G = \langle V, L \rangle$, where V is a set of its vertices

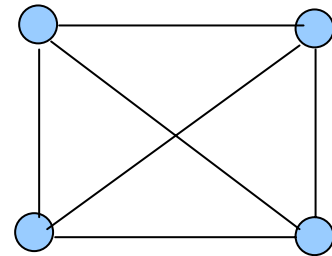
$V = \{ E_1, E_2, \dots, E_n \}$ and L is a set of its links (edges).

The link between E_i and E_j exist if and only if $x_{ij} = 1$.

Specific subgraphs of G

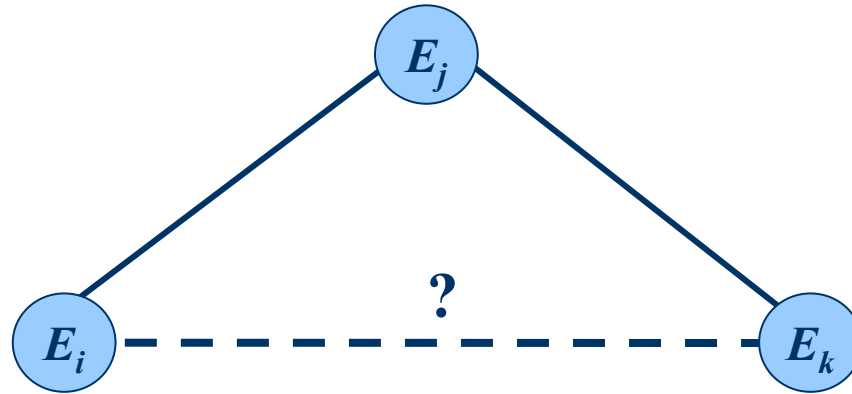


4-hole

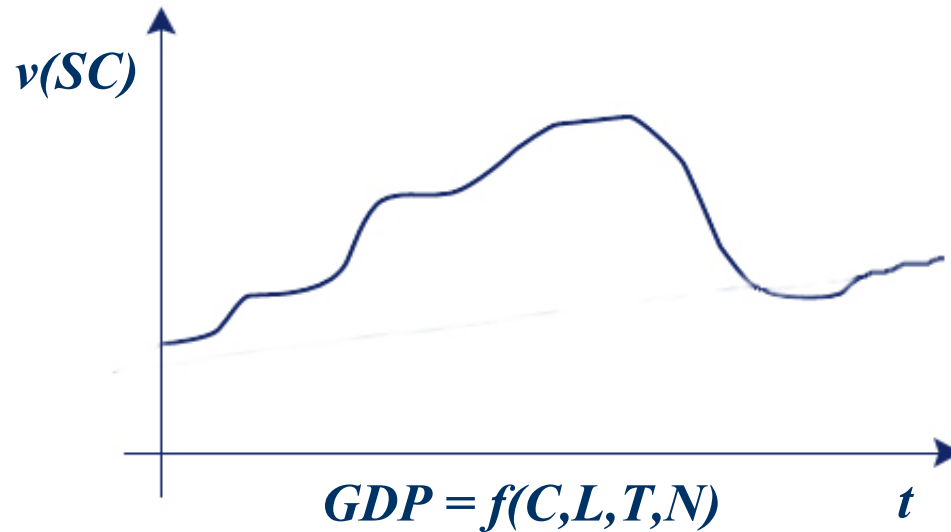


4-clique

Analysis of elementary paths



Similarities between GDP



Conclusions

