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Key skills development at firm level and at occupation level enrichment tendency – evidence from Romania

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Abstract

The key skill specific under the paradigm changes from Industrial World to Knowledge Society is emphasized by the key skill presentation as the unit of acquiring/using/producing (new) knowledge requested from the needs of performing an occupation in a firm. This approach responds to some theory and practice demands like the qualitative outlook of the occupation structure and qualitative analysis of the employed persons activity. Our main contribution is represented the exploration model of the key skill interactions with the firm in view to estimate: a)it's the potential demand of key skill requested across the most spread/normal/inertial occupations - the economic agents list the first 5 occupations, most important in regard the number of employees occupation from firm; the aggregate potential demand is at wide economy scale level (the potential demand unit is estimated by the firm only, in the institutional legal framework), for every type of key skill; b) and also in view to estimate Key skills with high probability to be internalised into the occupation description. In other words, the idea is what is the effect of the smallest „quantity" of new represented by the „key skill unit" that could be added on an occupation until this could be an internal skill, included into the occupation description. This could be relevant at firm level in view to order/priority/timing to acquire the skills appropriated with firm strategy. The priority of selecting new skills for development is useful for the firm vocational training programs and strategies formulation and their implanting at firm level, at this stage we consider only the situation of enrichment of an occupation, without the possibility to create a new occupation and to destroy an old one.

Keywords (JEL classification): J24 - Human Capital; Skills; Occupational Choice; Labour Productivity, Occupational Licensing; M53 - Training; D83 – Search; Learning; Information and Knowledge; communication; Belief

1. Introduction

Nonaka's model of "**organizational knowledge creation**, in which he proposed that tacit knowledge, could be converted to explicit knowledge" [1] Any organization can be considered as an open social system, adaptive, with varying degrees of permeability to environmental influences. Organization of XXI st Century is a dynamic system, whose evolution and "life expectancy" is based on ability to assimilate changes into the system, but also in its relations with the environment.

One consequence of the paradigm changes from Industrial world to Knowledge Society is made by the **Job centred** approach to learning to **human centric approach**. In Industrial Age, on the cognitive stability and slowly cognitive background changes are easy to define requested, easy to transmit and to learn skills. It is very important to emphasis that in the knowledge stability situation is essential the **transfer of** existing knowledge into the minds of learners.

The human-centric approach **"enables** the development and realisation of important and useful capabilities in a changing world where innovation, knowledge creation, and communication can lead to individual and social development" [2]. On a fast cognitive background changes with a high cognitive instability, volatility and variation the skills becomes very dynamic with a short life span. Therefore it becomes difficult to define the requested skills, to predict then, to transmit and also to teach them. The skill is no more located on the job but on the **Knowledge community** as a network.

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The subject of skills is delicate. Competence should be distinguished from competency, although in general usage the terms are used interchangeably. "The concept of core competence is most closely associated with the work of Gary Hamel and C. K. Prahalad, notably in their book, *Competing for the Future* (1994). They describe core competences as bundles of skills and technologies resulting from organizational learning". [3] A competency [4] is more than just knowledge and skills, is more complex. Skills are usually acquired or learned, gained through training and experience following some definite reason, process or action.

2. Hypothesis of the model

The model background of Occupation Classification in Romania (COR) is based on the identification system, hierarchy and codification of all occupations performed in the economy, regardless of their type and place.Using the COR's codes is mandatory for all central public administration bodies and local budgetary units, economic units, regardless of ownership, employer organizations, trade unions, professional and political, foundations, associations, individuals and companies, referring to them as users. Occupations listed in the COR are the result of continuous update work, because the labour market in Romania and the European Union, is a dynamic market, constantly subject of changing. Consequently, any of the professions listed in the COR has utility for economic agents and /or public institutions. Occupation groups, the structure, in terms of professional skills, can be found at the ministry's work on the following link: http://www.mmuncii.ro/ro/cor-664-view.html.

To achieve the classification and description of occupations have had used the international standards classification of occupations works. [5] (Our reference in the model is related to occupation codification made at COR occupation codification at 5 and 6 digits level.)

But all these classifications were used to determine the quantitative side of the structure of occupations, without offering, however, sufficiently qualitative-structural information regarding homogeneous activity structure of the occupied persons.

The opportunity for a new occupation classification development, including also the skill perspective, suitable for all countries including also Romania[a], is sustained by:

a) the emergence of new occupations following the spectacular results in research and development, the introduction of new technologies, materials and diversification of the scope of services;

b) the changes in economic and social structures, especially in catching up countries, imposing new groups of occupations;

c) the process of aligning the whole system of classifications and nomenclatures to international standard systems, particularly those in the European Union Countries (the need to ensure accurate and comparable to the same criteria and principles for knowledge, evaluation, comparison and communication development indicators)

In our paper the key skills are defined by **National Council for Adult Vocational Training (CNFPA)'s Decision** harmonized with international methodology and including 6 key skills and 9 other skills see table 1:

Tabel 1

Romania: National Council for Adult Vocational Training (CNFPA)'s

Key skills	a.
	b.

List of key competences, commune to some occupations was actualized through the CNFPA's decision no. 86/24.06.2008. Is important to point out that the List of key competence represents:

d. ITC compe

e numbers w

f. personel pe

Others skills

g. foreign lang

[a] the identification of the past and current status of the occupational structure of employment in Romania and the significant changes in content in the case of certain occupations on the market, main objective of the study „Evolution of occupations on Romanian Labour market in 2010 perspective (Bucharest, 2006) emphasized changes in their work content. The occupations „whose content has changed significantly" were those that recorded the highest levels of change(they disappeared), being followed by the „piercing" and „dominant" ones The development of new sectors explain the high levels of change recorded by the „piercing" occupations, new, poorly formalized occupations, out of which some are not included yet in the Romanian Occupations Classification (COR). While the dominant occupations and also suppressed/ obsolete occupation mostly in the industrial sectors, strongly affected by economic, organizational and technological restructuring. The competences mainly associated with the changes in the work content are: using the computer, problems solving, resources management and communication.

a. a dynamic dimension regarding the perspective of key skills development –is not constant in time;

b. **List of key skills**, represents in Romania and institutional list, the selection of the key skills is an outcome of the vocational and life long learning policy. (Another institutional aspect is that there is no legal request to solicit occupational standards for vocational training program authorisation)

c. In building this list is essential to cover the business inputs in a anticipative manner, especially in such a dynamic and changing environment;

In the knowledge economy the production induces changes also into the jobs, occupations, competences, training and education dimensions. In this new context, this article points the value of the skills development approach under the firm perspective. **Our attempt is focused to define the required skills by the firm that matches with the description of Key Skills List (table 1), with the perspective to estimate the potential aggregate demand of key skills (under this assumption) for short and medium term at firm level and at occupation.**

Next to "specialized skills/hard skills" – skills included in competences, occupation or job description we evaluate the Romanian firm standpoint at one moment in time regarding the interest for soft skills/learning skills/transversal/general skills development as potential firm demand, without concerning the skills structure of occupation.

Considering the key skill as the unit of acquiring/using/producing (new) knowledge requested from the new needs of performing an occupation in a firm, in both its dimensions tacit and explicit then we make **the assumptions regarding the key skills development at firm level**:

- the aggregate potential demand is at wide economy scale level (the potential demand unit is estimated by the firm only, in the institutional legal framework), for every type of key skill;
- the potential of key skill addition into the occupation after a threshold overpass expressed in terms of [a]probabilities (at this point there are many questions to ask: Q1:What is the reliable threshold level that indicate the internalisation of a skill in the occupation structure?; Q2: The level of expansion of a specific key skill, from a specific point in time could be a measure of the specific knowledge community network development?
- the start point to "create" convictions, behaviors and practices. If is studied in a dynamic manner could indicate the epidemiology of a specific knowledge spreading/ developing;
- the key skill dynamics is dependent with the technological progress. The disruptive changing into the technological progress induces also variations in the key skills "prestige";
- when aggregate the skills potential demand, considering as input disjointed key skills (very difficult to estimate "As a result, any simple cataloguing of society-wide "skill-gaps" remains inadequate. As skills are contextual and socio-technically distributed, there is no universal arithmetic that could be used to aggregate skills"; [2]
- then, for every key skill is an potential demand at firm level (as a sum for all the occupations in the firm), with the possibility to be aggregate also at national level;
- we think that we made addition but the skill's use is multiplication of results, similar situation as in the Romer affirmation: "People are reasonably good at forming estimates based on addition, but for operations such as compounding that depend on repeated multiplication, we systematically underestimate how quickly things grow"; [6]
- under the resources scarcity side becomes interesting the process of selecting the essential skill need. Even if in the normative perspective there are desirable as input at a large spectrum, could be relevant at firm **level the order/priority/timing** to acquire the skills appropriated with firm strategy. The priority of selecting new skills for development is useful for the firm vocational training programs and strategies formulation and realisation.
- Another important issue in view to choose to invest in skills development is determined by the **"place/base/fundament"** to allocate it, to addition on but using into different combinations (intensity, frequency, etc). In our paper this place is represented by the occupation;
- new resources developed as input for the economic growth. New skills input are valuable not only by the value that brings as a unit of knowledge but also as huge potential of combine them, again referring to Romer's statement that "economic growth occurs whenever people take resources and rearrange them in ways that are more valuable".[6]

2. Model building

a

Considering the key skill as the unit of acquiring/using/producing (new) knowledge then this is an external knowledge to the firm. The firm is rationale and identifies the specific key skills KSm list selected (a list with variable number of cases, with possible value 0 to 15) from the input CNFPA List (in our case with 15 cases, constant) (see Table 2).

We investigate the perspective of the most spread/normal/inertial occupations – the economic agents list the first 5 occupations, most important in regard the number of jobs (with the biggest number of employees) – for one occupation there are admitted more then 1 number of jobs /number of salaries;

Because the interaction between firm and new key skills request is analysed at occupation level then we developed the procedure to identify the specific key skills KSm list selected as requested skills, as a base for the estimation of the key skill demand at firm level/ sector/national level.

Then, for every occupation the firm makes the potential match, in short term and medium term perspective 1-3 years, following some steps:

Step 1: The firm "compare" the internal list of skills included into the Occupation description, in our specific case the internal skills list OD6 (Fig.1) with the input CNFPA List. The first key skills KSm0 selected list retains only the key skills that differ from the OD6List. In other words, here is visible the relativity of defining the new key skills. The main criteria in our model are that the key skills should be new for the firm;

Step 2: The firm "compare" the first key skills KSm0 selected list with the new needs of performing the occupation in analysis at firm level and formulates the skills requested as specific key skills KSm list selected for an occupation. Another very important criteria in our model is that the key skills should be useful for the firm;

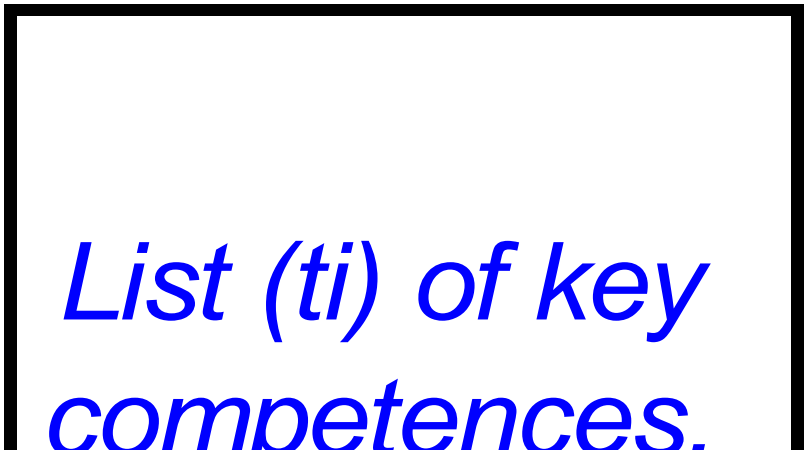

Fig.1. Occupation description according to COR [11] (at moment t_i)

Step 3 The firm response in our model is represented by the dichotomy values, 0 or 1 for every input CNFPA List (in our case with 15 cases, constant), respective for every case of key skill; (see Table 2). In our model "1" represents that the skill (i) is requested by the occupation (j) in the firm (k) and also is new for the occupation in the firm.

Table 2

The firm response for every input CNFPA List (in our case with 15 cases, constant), respective for every case of key skill

Key skills	PR7 proiect - Key skills number of persons in th a. comunication

Where: the selection for a key skill was made into the dummy variables (15 variables pr7 for every Occupation j) Generic codification:

pr7oiKSj = **1** **Yes,** the skill is requested by the occupation j in the firm
0 **No,** the skill is not requested by the occupation j in the firm
, NA

KSj-key skill indice *15 variables, codified From „a" to „o"*
Occupation indice: j *1 la 5, for the first 5 occupation most important;*
maxim prtoKSi = 5
min=0

In our model we describe the firm as a pattern build from occupation combination. One person is employed on a job and is entering into an occupation. The occupation is constant as long the person performs the same type of duties. In the moment when the person gets out of the occupation that person exits from the occupation group. At this point, there is another important assumption, in our model (as medium term perspective 1 to 3 years horizon) we consider there is no variation in terms of occupation firm structure and dimension. That means there is no variation regarding the number of the occupation at firm level and the occupation turnover is different from the personnel turnover. In our model we describe the personnel turnover of the firm as a function of personnel turnover at occupation level. Then there is a surjectiv relation between the number of employees and number of occupations. (for every employee there is only one occupation but for one occupation could be more then 1 employees). As an algebric relation we express as:
a. Flux of people/employees across the occupations/jobs at firm level

$$\sum Ns = \sum_{i=1}^{5} Noc \qquad (1),$$

Another generic relation is that the variation of the number of employs during (t1-t0) period of time is:

$$N_{t0} - N_{out}\, t_1 + N_{in}\, t_1 = N\, t_1 \qquad (2)$$

Where, for r occupations, at the firm (i) the flux of personnel into the firm during (t1-t0) period of time is equal with the sum of all flux of personnel into every occupation position :

$$N^i_{t_1} = (N^i_{t_0} + N^i_{in_{t1}} - N^i_{out_{t1}})_{occupation\_1} + (N^i_{t_0} + N^i_{in_{t1}} - N^i_{out_{t1}})_{occupation\_2} + (N^i_{t_0} + N^i_{in_{t1}} - N^i_{out_{t1}})_{occupation\_3} + \ldots\ldots\ldots + (N^i_{t_0} + N^i_{in_{t1}} - N^i_{out_{t1}})_{occupation\_r} \qquad (3)$$

Step 4. In perspective to be developed: the **simulation of the firm decision procedure** regarding the way to respond to the key skill acquires (investing in vocational training programmes or fire/hire a new employee). In this stage is need to develop also an analyse cost/return;

Step 5. There is no variation of the internal skills (skills that respond to demand for occupation practicing, included into the occupation description, OD6 position in Figure 1), according to COR definition. Based on this hypothesis we consider the Occupation as a black box ignoring the possibility to lose some skill in the occupational practice. **The only possibility admitted into our model is represented by the situation** of the enrichment of an occupation in the case pi>p0 (4)

p *probability at moment t2 to add the Key Skill$_{(p/t1)}$ [p=1 to n] on the every Occupation explored;*

$$p_i = \frac{\sum D_{i_J}}{f_J} \qquad (4)$$

Where: J occupation indices in Index of COR,
i key skill indices,
f frequency

p0 *the minim threshold of probability (proposed 60%) that confirm the transition of an external skill for an occupation as an internal (new) skill into the old occupation. If the old occupation is still with the same name the difference from the skills structure differ and in this context we could consider that the occupation is enriched. There is a new discussion regarding the "quantity of new" absorbed in terms of status of the new occupation. Is possible that the new occupation to change its name, to become a related occupation with the old one.*
Our research is cover only the first 5, most important occupation from the firm, using the Key Skills list

Step 6. In view to develop the Step 4, we express the demand in Conventional Unities of Key Skills [CUKS] (next we shall allocate cost values based on the history of vocational training programmes), at a key
a .key skill demand by every type at the firm level

$$KS_{D_i}{}^{f} = \sum^{j} KS_{D_{i_{Ocj}}} * N_{e_{Ocj}} \qquad \text{[CUKS] (5)}$$

a1. key skill demand by every type at the firm level

$$KS_{D_i} = \sum^{f} KS_{D_i}{}^{f} = \sum^{f}\left(\sum^{j} KS_{D_{iOcj}} * N_{e_{Ocj}}\right) \quad \text{[CUKS] (6)}$$

b. key skills demand at firm level

$$KS_{D}{}^{f} = \sum^{i} KS_{D_i}{}^{f} = \sum^{i}\left(\sum^{j} KS_{D_{iOcj}} * N_{e_{Ocj}}\right) \quad \text{[CUKS] (7)}$$

c. key skills demand at national level

$$KS_{D} = \sum^{f} KS_{D}{}^{f} = \sum^{f}\left(\sum^{i} KS_{D_i}{}^{f}\right) = \sum^{f}\left[\sum^{i}\left(\sum^{j} KS_{D_{iOcj}} * N_{e_{Ocj}}\right)\right] \quad \text{[CUKS] (8)}$$

Where: f firm indices,
j occupation indices in firm,
i key skill indices,
Ne number of employees (from the Ocj))

4. Data and methods

We use data obtained by a national survey in Romania (2008) at firm level. The main result are: the potential demand estimation for key skills development at medium term (3 years) at firm, sector, national level aggregation and the probability to an occupation to absorb an key skill. These results are useful especially for the firm in view to identify the priority to invest in key skills development into the training programmes projection and also to estimate in terms of CUKS the key skill demand as presented in (5) to (8) issues.

4.1 .Building the Sample Survey:

- Multistadial and multilayered, following the next procedure:
  Firm sample dimension (number of units): 506 firms
- Stratified sample for 8 economic regions, 3 types of size classes of firms (small, medium and large) and **CANE Rev.1 (activity of national economy –7 sections covered)**;
- Selection of companies was made randomly for each layer, the online database www.listafirme.ro; companies in Romania (about 740,000 - database made by Borg Design SRL).
- 125 municipalities (urban and rural), of which 6 represent sectors of Bucharest, widespread in all 42 counties (județe);
- Average number of interviews conducted in each locality: 4
- The maximum sampling error: ±4.36%

4.2 Correspondently to the firm sample there are the occupation samples:

- COR represents the main nomenclature, we list of occupation sum 3078 occupations presented into the INDEX COR [12] (January 2010, MMSSF).
- There are investigating the potential demand for key competences (defined by the list presented into the table 1) only the first / the most important 5 occupations into the firm.
- Main Objective of research/survey:Identifying the needs for training in companies in Romania applying a questionnaire towards the selected companies, the respondents were human resource managers;

5. Results regarding Key skills development at firm level:

In our model, at this stage of development there are some partial results, of 2 category with the tables in brackets, both calculated into the closed[a] and open[b] system situation:

5.1 **Potential demand for the key skills requested** by the firm expressed as Mean of the Conventional Unities of Key Skills development on short and medium term (1 to 3 years) by different characteristics. (These results uses 5 to 8 relationships); we choose to present the results only by firm size class as characteristic;

5.2 **Occupation level enrichment tendency:** We consider only the situation of enrichment of an occupation, without the possibility to create a new occupation and to destroy an old occupation. In other words, the ideea is what is effect of the smallest "quantity" of new represented by the "key skill unit" as "external skill" that could be added on an occupation until this could become an internal skill, included into the occupation description. The skills that with the highest probability to be internalised into the occupation description, on short and medium term perspective. The level of **p0** the minim threshold of probability (proposed 60%) that

[a] Closed is a part of the initial sample, where the number of occupations is equal to the number of employees.
[b] Open system is the initial sample of the survey, where the number of employees are bigger then the number of occupations

confirm the transition of an external skill for an occupation as an internal (new) skill into the old occupation represent another subject of discussion (the level o f minimum is very important).

These results are represented in the table 3 and 4 for the indicator: potential demand for the key skills requested and in the table 5 and 6 for the indicator: occupation level enrichment tendency.

Table 3

Open System: **Potential demand for the key skills requested by the firm expressed** ***as Mean of the Conventional Unities of Key Skills development on short and medium term (1 to 3 years) by CANE Rev.1 (activity of national economy –7 sections covered) and by firm size class, according to employees number***

CANE Re (activity nationa econom sections	Size class, a employees
	Small (10-49
	Medium (5 employe
Manufact	Large (250 and M employees)
Total	M

Table 4

Closed System: **Potential demand for the key skills requested by the firm expressed** ***as Mean of the Conventional Unities of Key Skills development on short and medium term (1 to 3 years) by CANE Rev.1 (activity of national economy –6 sections covered) and by firm size class***

- Conventional Unities of Key Skills-

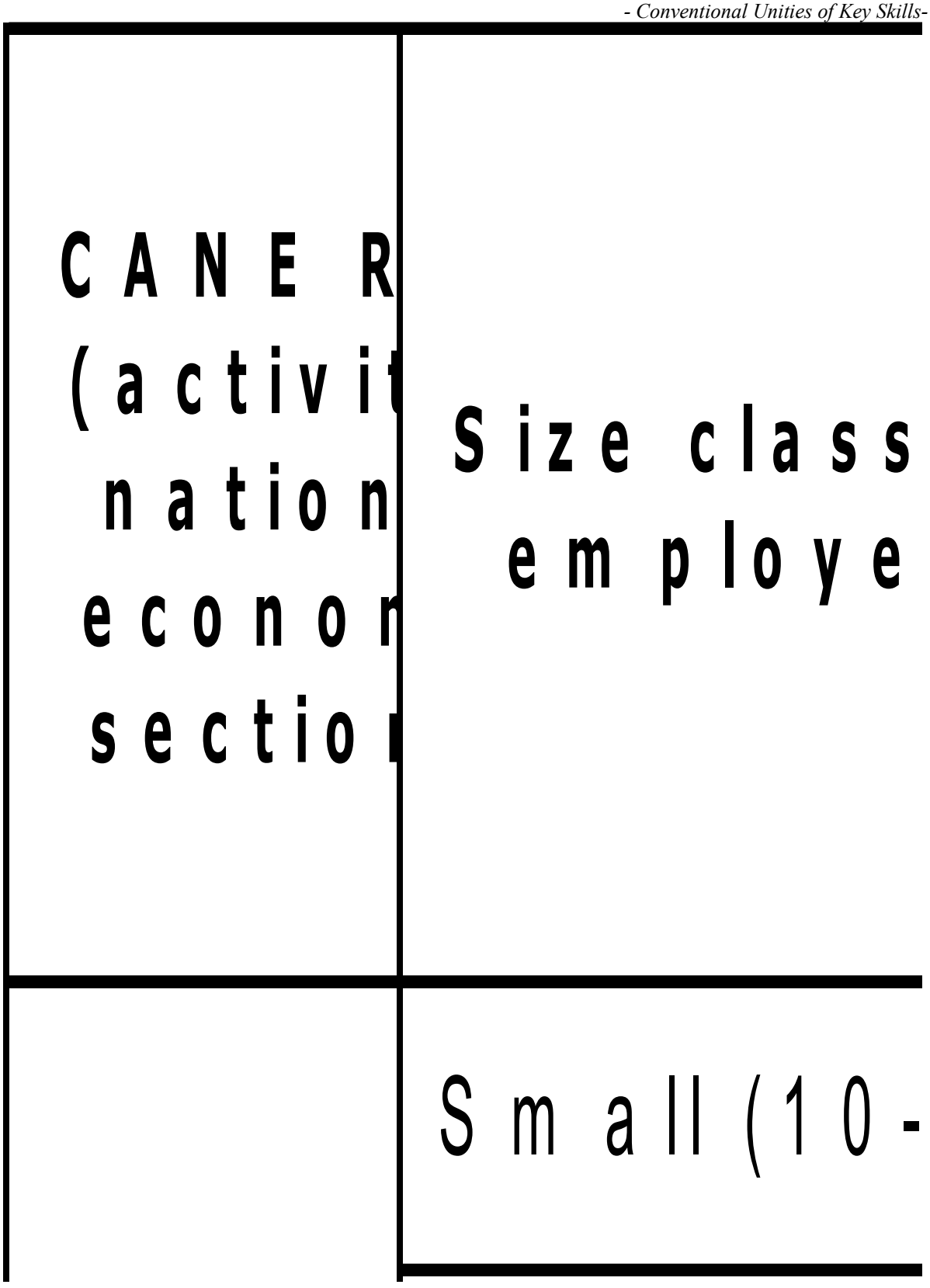

Table 5

Open system: Occupation level enrichment tendency

Sum

N (frequency)	occupations, with the of employees (occu among the first 5th in firm)…(following th occupati COR,http://www.mmu 664-view.h
122	sofer / conducat
100	muncitor necalifi
80	inginer
61	electricieni
54	lacatusi
51	sudor
49	vanzatori

Table 6

Closed system: Occupation level enrichment tendency

Case Summaries

occupations, with the bigg
of employees (occupatio

6. Discussion

The key skill specific under the paradigm changes from industrial world to Knowledge Society is emphasized by the key skill presentation as the unit of acquiring/using/producing (new) knowledge requested from the new needs of performing an occupation in a firm. This approach responds to some theory and practice demands like the qualitative outlook of the occupation structure and qualitative analysis of the employed persons activity. Our main contribution is represented by the exploration model of the key skill interactions with the firm in view to estimate:

a. it's the potential demand of key skill requested across the most spread / normal /inertial occupations (with the highest cognitive distance)– the economic agents list the first 5 occupations, most important in regard the number of employees occupation from the firm; the aggregate potential demand is at wide economy scale level (the potential demand unit is estimated by the firm only, in the institutional legal framework), for every type of key skill;

b. and also in view to estimate Key skills with high probability to be internalised into the occupation description. the skill's use is multiplication of results. In other words, the idea is what is effect of the smallest "quantity" of new represented by the "key skill unit" as "external skill" that could be added on an occupation until this could become an internal skill, included into the occupation description. This could be relevant at firm level the order/priority/timing to acquire the skills appropriated with firm strategy. The priority of selecting new skills for development is useful for the firm vocational training programs and strategies formulation and their implanting at firm level and also for the training providers and for the specific policies actors. Our model for the key skill request at firm level, at this stage we consider only the situation of enrichment of an occupation, without the possibility to create a new occupation, to destroy an old occupation.

At this point is possible to outline a broad research agenda:

- the potential of key skill addition into the occupation after a threshold overpass expressed in terms of probabilities (at this point there are many questions to ask: Q1:What is the reliable threshold level that indicate the internalisation of a skill in the occupation structure?; Q2: The level of expansion of a specific key skill, from a specific point in time could be a measure of the specific knowledge community network development?
- the skills that with the highest probability to be internalised into the occupation description, on short and medium term perspective;
- the skills with highest probability to generate a kin occupation/new occupation with the old one (on long term perspective – here is another discussion possible: how long it takes to generate a new occupation);
- represent the cause of the structural changes. If there is a strong substitution effect, then could be determined the skills with highest probability to generate a kin occupation/new occupation with the old

one (on long term perspective – here is another discussion possible: how long it takes to generate a new occupation);

- all these are arguments for justify the need to implement a new system not only a procedure for up-dating the occupations framework. It's a need for a dynamic and flexible system which can offer for different horizons of anticipations credible informations, which can support a training decision and be part of a strategical management at micro and macrolevel in our society. The model proposed can be used as part of a system optimizing the knowledge management, human resource development and of course a training decision. It is also the start point for a dynamic database which can process quantitative and qualitative analysis regarding occupations for economic activity purchasing valid information for anticipating the future skills at national scale;
- the need to reconsider the skill and key skill relationships and approaches in a coordinated and internationally comparable manner (considering that the dynamic of the skills is fast and more difficult to predict).

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