

Operational Alteration Of The Labor Capacity Index Measurement Model For Qualitative Work

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ABSTRACT

The Marx term Labour capacity contains the ability to handle change, imponderables and complexity and is personal part of an employee. The Labour Capacity Index (LCI) is developed to measure the use of labour capacity at work places and from employee itself. The index helps to understand the handling and dealing of complexity and imponderables at work. For the index itself is assumed that the index itself needs small adjustment to be more valuable. A critic point of the LCI seems to be the existing scale and the used values, do to limitations on the available record set. This paper displays the results of a hopeful useful change in the operationalization of the measurement of labour capacity to increase the understanding of workers and their personal and experienced input to work. The comparison of the results is based on a survey with the working environment of IT employees. From the analysis of the results and out of the following comparison between the new and the old approach for the LCI, it can be displayed that the change in the operationalization can be done successfully. The including of new variable values also allowed a more detailed and distributes view on the labour market and the research labor capacity.

Keywords: Labour Capacity Index, Labour Analysis, Labour Science, Management Statistics

INTRODUCTION

The research work is embedded in the research project "Open IT Bachelor and Open IT Master - from IT Practitioner to Bachelor Business Informatics and Master IT Business Management" [1], which is funded by the Federal Ministry of Research and Education. The latter develops and tests credit transfer programmes for vocational IT specialists with IT-IHK initial or secondary education [2, 3]. The research project is divided into two funding phases. The first funding phase (2014 to 2018) primarily examined the framework conditions for academic continuing education for IT specialists. The focus of the second funding phase (2018 to 2020) is on the analysis of the actively used, structural work capacity of IT specialists and their ability to implement personnel knowledge in the operational environment. The research on this field is necessary to understand the informatization of the working world [e. g. 4, 5, 6] which results in the assumptions that services and production processes are decentralized continuously, virtualized as well as offered and provided internationally [7]. Information technology and informatization allowed and allows production capital a global distributed production and exercise of services [8] as well as the

realization of global and virtual project work [9]. The progress is favored by the increasing information space created by computerization, especially on the Internet [10] and the production itself, in the information space and of application and IT products, is already following standardized patterns to organize development processes [11]. It is assumed that the process of real and formal subsumption [12] is processed within the labor marked and especially resulting in the patterning of informatization work.

LABOUR CAPACITY AND LABOUR CAPACITY INDEXING

Idea of Labour Capacity

Definition of Labor Capacity:

„The qualitative and social essence of work is displayed in laboring capacity; in contrast, labour power is always already an abstraction from this process. Laboring capacity encompasses all the capabilities that are needed for the confrontation with the world – i.e. for appropriation processes in the broadest sense – and that renew, convert, and transform in its course: The comprehensive forming and application of the senses, living working knowledge with its objectified (but not yet objectified) and non-objectified shares of experiential knowledge and, finally, capabilities of the situational concretizing application of theoretically-grounded knowledge or theoretically-grounded procedures and methods.“ [13].

Labour capacity is the ability to deal with change, complexity and the unforeseen in the workplace, which means that employees know the necessary routine (or solution) within a complex overall system due to their labour capacity [14]. This can, for example, be a routine but not documented or prescribed intervention in a production process. Such activities cannot be carried out by unskilled persons and require skilled workers or similarly qualified persons who have work experience and for example, experience in dealing with uncertainty, lack of instructions, demands or changes, and who can react to these factors. Labour capacity is not the contrast between routine and non-routine, but rather the confident and flexible handling of uncertainties and challenges, based on experience and working knowledge. Detachment from routine and non-routine is necessary, since no work consists only of one or the other [14]. To a certain extent, every work activity contains a non-routine continuum that confronts the routine and, in part, makes it possible. This also applies to work with and on machines as well as pure manual work. Both work activities cannot automatically be understood as routine work to be automated, as they are only subject to theoretical automation. Nor should routine be understood as "simple repetitive action in the sense of a static body of experience" [15]. Experiences help us to cope with uncertainties and new environments and to make decisions, even in the unknown and in uncertainty. This is where intuition, gut feeling and emotion come into play, for which experience knowledge is necessary. Theoretical knowledge is reinterpreted and can help in making decisions. This leads to an intuitive-improvised action, which can be differentiated from analytical-planning action [16].

The labour capacity is important from the societal perspective and for employers and employees when considering theses that predict the exchange of workers through computer programs or automation [17]. The general assumption in the above-mentioned evaluation by Frey & Osborne was that routine work can be substituted more quickly and easily (substitution thesis), while non-routine activities (complementarity thesis) are seen as upgraded work activities and more difficult to substitute.

For the analysis of labour capacity, Pfeiffer and Suphan [14] have developed the labour capacity index (LCI) approach, which aims to make the use of labour capacity of employees more tangible. This approach does not examine the dichotomy between routine and non-routine, does not include expert opinions or assessments of automation, and does not assume that work can be robustly explained purely by comparing routine and non-routine. Moreover, routine should not be understood as a simple repetitive action in the sense of a static set of experiences. For the first analysis of the LCI, the results of the employee survey conducted by the German Federal Institute for Vocational Training [18] were used. From this survey, 18 quantitative items were selected to form the LCI. The questions were assigned to the respective fields of handling complexity, situational imponderables and the structural increase in complexity.

The fields of IT core occupations, engineering occupations and technicians showed the highest values in the LCI. This leads to the assumption that the occupational activities that are carried out in this area are characterized by an extremely high non-routine share and that employees have to draw on their experience here. Pfeiffer and Suphan define this even more precisely for the IT sector and state that 91% of labour activities in the IT services sector can only be carried out by accessing the employee's labour capacity. In addition, Pfeiffer [19] states that there is a link between rising skill levels and rising labour capacity. The above-mentioned labour activities usually take place within the framework of knowledge or project management work. The labour there includes distinct expert work, which can also be carried out largely independent of location and visualized. In addition, decisions often have to be made even if relevant information or necessary action competences are not available. The complete planning of work steps is immanently impossible in such situations, so that experience and its previous interpretation must be drawn upon. The existing complexity must be (correctly) interpreted.

Measurement of Labour Capacity

The measurement of the in 2.1 mentioned labour capacity index contains three sections:

- Situational handling of complexity (sitCOM): Frequency of situational problem solving and decision-making within the professional activity.
- Situational handling of imponderables (sitIP): Subjective labor action involves working under time pressure, with emerging imponderables and with anticipatory problem prevention, as well as situations where an action is necessary to prevent major consequential problems.
- Section C: Handling of structural complexity increase (strCOM): The extent of changes in work equipment, work object and work organization in the last two years, as well as their influence on the work environment and increase in stress during work.

The questions of the sections and their changes will be displayed in 3.1 in this paper.

New Measurement Approach

Changes within the standardized Labour Capacity Questionnaire

The original LCI contained 18 items. For the in this paper reviewed online survey, this number of items was reduced to 13 items based on previous research results by Sabine Pfeiffer [20].

The number of items is not reduced for Situational Handling of Complexity (sitCOM), for the area of Situational imponderables (sitIP) the number of items is reduced by 2 and for the area of Structural increase of Complexity (strCOM) by 3. The detail reduction, and the detailed questions, are displayed in table 1 below.

Out of the reduction of questions, and with this, a reduction of variables, also the formula to calculate the LCI must be renewed. The new formula is displayed in figure 1.

Table 1. Comparison questionair for the OLD and NEW LCI.

Section	No.	Question	Old LCI	New LCI
sitCom	A1	How often do you have to react to problems?	X	X
	A2	How often do you have to make independent, difficult decisions?	X	X
	A3	How often do you have to communicate with other people on a professional basis?	X	X
sitIP	B1	How often do you have to work under strong deadline or performance pressure in your job?	X	X
	B2	How often do you find yourself disturbed or interrupted during your work?	X	X
	B3	How often do you have to do things that you have not learned or that you do not know how to do?	X	X
	B4	How often do you have to keep an eye on different types of work or processes at the same time?	X	X
	B5	How often does it happen that even a small mistake or a minor inattention can result in major financial losses?	X	-
	B6	How often does it happen that you have to work very quickly?	X	X
	B7	How often does it happen that you do not receive all the necessary information to carry out your work properly?	X	-
strcom	C1	Have new technologies been introduced in the last two years?	X	X
	C2	Have new computer programs (not new versions) been introduced in the last two years?	X	-
	C3	Have any new machines or systems been introduced in the last two years that you look after?	X	-
	C4	Have new or significantly changed products or materials been used in the last two years?	X	X
	C5	Have new or significantly changed services been provided in the last two years?	X	X
	C6	Has there been any significant restructuring or reorganization in the last two years?	X	X
	C7	How have stress and work pressure changed?	X	-

$$LC = \left(\frac{\overline{sitCOM} + \overline{sitIP} + \overline{strCOM}}{3} \right) * Rel = [0; 1]$$

Figure 1. Formula of the abridged Labour Capacity Index

The variable Rel in the formula is an additional question to the survey participants. It asks only if the job require a dedicated training period. In general, those variables can be assume as 1 for all kind of jobs above a European Qualification Framework (EQF) level of 3 or at least at a level 4. Normally only jobs with an EQF level of 1–3 are assumed suitable for people, which do not need a dedicated training period. In this context, it must be understand, that those requirements are more to be defined on a meta-level. On an individual level, the answer for such a question can be different. Like when a person, who is trained on a higher EQF level, takes care of a lower EQF level, it might be not necessary for him to receive a training. In this paper, we will not go deeper or more in detail on this variable.

With the changes within the formula for the new Labour Capacity Index, also the calculation from the sub variables have changes. Thereby applies:

$$\overline{sitCOM} = \frac{1}{3} \sum_{i=1}^3 x_i = [0; 1]$$

$$\overline{sitIP} = \frac{1}{5} \sum_{i=1}^5 x_i = [0; 1]$$

$$\overline{strCOM} = \frac{1}{4} \sum_{i=1}^4 x_i = [0; 1]$$

Figure 2. Sub formulas of the abridged Labour Capacity Index

Beside the calculation of the LCI, also the variable values behind the answers for the questions are changed.

Changes within the value calculation of the Labour Capacity Index

The LCI was calculated in the past based on secondary data and contained a more limited range of answers, which is displayed in table 2. The answers were in addition reduced for the old LCI approach with a certain party of uncertainty as displayed later in table 3. The reduction happened also due to the available data set. Here comes the research question up how the LCI would work outside of such a limitation. The answering onto this question started with the question for a possible scale. At the beginning to use of two different kinds of new scale were conducted:

- 5-Likert-Scale (0; 0.25; 0.5; 0.75; 1.0)
- 6-Likert-Scale (0; 0.2; 0.4; 0.6; 0.8; 1.0)

Due to the more common used and the ability to receive a real medium, the 5-Likert-Scale was selected.

In the case of the LCI, the operationalization of the questions and the scaling of the answer options associated with the questions were revised for the survey. This adjustment was carried out because test runs showed that the participants had difficulties with the previous classification. The aim was also that each question could be answered with a 5-Likert scale and that a comparable scale could be stored for all questions. For sitCOM and sitIP the answer possibilities of section 1 apply, for strCOM the answer possibilities of section 2 apply, which is shown in table 1. In order to develop the answer possibilities, interviews were conducted with colleagues and possible test persons to find out how they would define the previously answer possibilities. The answers are display in table 2.

For later evaluation, the individual Likert-values are assigned a real numerical value. This was also done in an attempt to achieve theoretical downward compatibility with the previous calculation. This should be possible as shown in table 2. In the later result representation, only the LCI approach is used again. To prove the new scale with the old Labour capacity index, the calculation contains also an approach to calculate with the new scale the old as also the new index. The different values for the answers are displayed in table 3.

With this approach, the survey was provided to several stakeholders within the IT labour market. The target of the survey was a sample of the labour capacity from different IT workers within the German IT market. The contribution in the market was handle with the target to receive a sample, which covers the different IT services for and in different branches as also for different kinds of work difficulty.

Table 2. Modification of the reply options for the LCI

	Answers LCI	Answers LCI new
sitCOM Section 1	Never	Never
		Rare
	Sometimes	Several times a week
	Frequently	Daily
		Several times a day
sitIP Section 1	Never	Never
	Rare	Rare
	Sometimes	Several times a week
	Frequently	Daily
		Several times a day
strCOM Section 2	No	No
	Yes	Yes, 1 times
		Yes, 2 times
		Yes, 3 times
		Yes, more as 3 times

Table 3. Operational value changes for the calculation of the Labour Capacity Index

	Calculation LCI old		Calculation LCI new	
	Answer	Value	Answer	Value
Section 1	Never	0	Never	0
	Rare	0	Rare	0.25
	Several times a week	0	Several times a week	0.5
	Daily	1	Daily	0.75
	Several times a day	1	Several times a day	1
Section 2	No	0	No	0
	Yes, 1 times	0	Yes, 1 times	0.25
	Yes, 2 times	1	Yes, 2 times	0.5
	Yes, 3 times	1	Yes, 3 times	0.75
	Yes, more as 3 times	1	Yes, more as 3 times	1

Comparison of the Old and New Measurement Approach

The correlation between the results for the old and the new LCI, displayed in figure 3, shows the correlation of 0.91 with a significant of $<2.2e-16$. Both measurements receive similar results.

Table 4. Information Sample data

Variable	Value	Variable	Value
t	23.622	p-value	$< 2.2e-16$
df	121	95 percent confidence interval	0.8689500 0.9337147

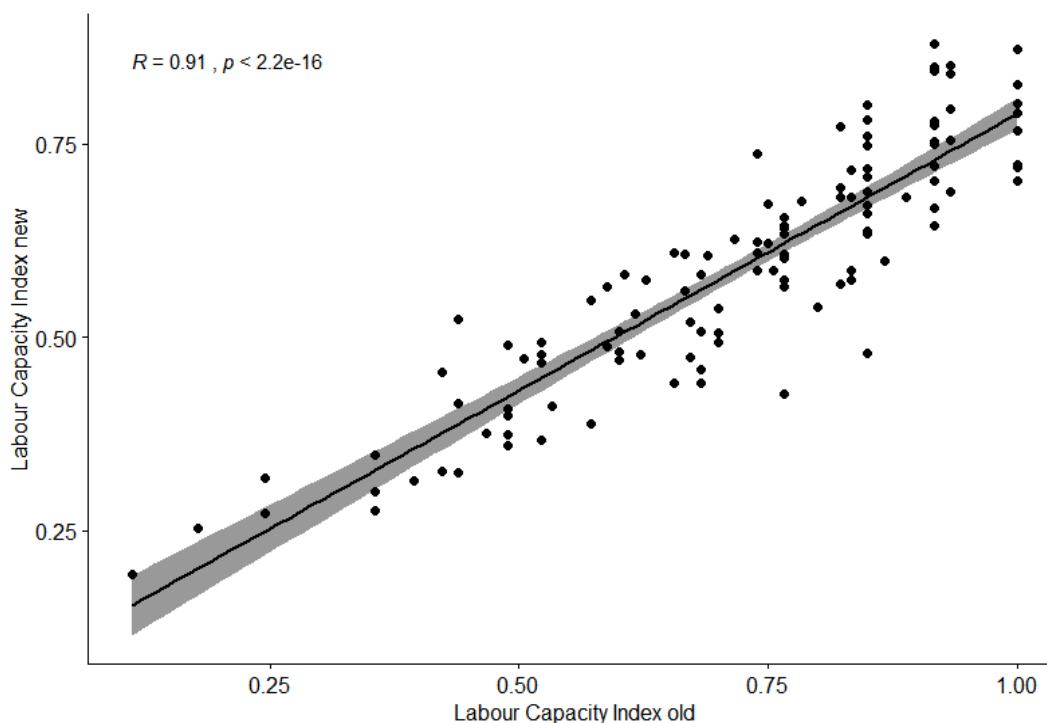


Figure 3. Correlation visualization between the results of the old and the new Labour Capacity Index

The additional data information (table 4) displays the reliability and the significant level of the sample.

Beside the similarity, the quality of the sample is also to review. The review follows the assumption that, from the understanding of work a maximum or minimum cannot be reached frequently. Also a more average oriented approach should be targeted to display more differences in the high qualified sector of IT work, which is based on the old approach on a high level. In the new LCI approach, those highfliers received lower values and the sample itself receives a medium oriented mean with a closer deviation (table 5).

Table 5. Comparison of descriptive statistics results from the new and old Labor Capacity Index

Section	sitCOM		sitIP		strCOM		LCI	
LCI type	Old	New	Old	New	Old	New	Old	New
Min	0.33	0.33	0.00	0.25	0.00	0.00	0.11	0.19
Max	1.00	1.00	1.00	0.95	1.00	1.00	1.00	0.88
Mean	1.00	0.75	0.80	0.60	0.75	0.50	0.77	0.61
Average	0.86	0.71	0.75	0.59	0.56	0.47	0.72	0.59
Mode	1.00	0.83	0.80	0.60	0.75	0.50	0.85	0.59
Variance	0.04	0.02	0.05	0.02	0.12	0.08	0.04	0.02
Standard deviation	0.19	0.15	0.21	0.15	0.34	0.28	0.19	0.15

The changes in the ranking of the research item itself are measurable but capable. From a quantile point of view, 31.4% of the items changed their quantile, but only in a small range. An addition the results of the LCI reacts more on qualitative determined variables like the flexibility of the researched business section or management approach. Also in this term, the new LCI is useful as the old LCI.

CONCLUSION

With the tested approach, it can be confirmed, that a similar scale used labour capacity index, works out for the calculation of the labour capacity index, by taking into consideration, that it different(s) were only tested for the German IT labour market. Overall reviewed the results in general seems to be similar between the old and the new calculation, which allows to work on with the labour capacity and labour market theories the approach fundamentals on.

With the new approach, a different detail level within the labour capacity index can be received and, especially also with adjustments, changed and enhanced. The new approach different more clearly between IT jobs, because it levels the general working section more in average and to allow to identify extremes more in detail. For a detailed labour research a qualitative view and response too additional, especially socio demographic variables and business management variables, is recommended to receive a more detailed understandings of extreme results. The LCI in general is valuable to allow a different view on labour personas and including qualitative explanations for the identification of trends, technology usage, process and project management and management development. Like onto the increasing of LCI especially in the field of startups, where higher flexibility needs to be trained. In general, the detailed results can be for sure challenged in the future. The new scale for the LCI is in general possible and allows the receiving of a more distributed LCI for a more socio-economical view with additional variables to explain certain parts of a sample. The

medium-scaled approach might be also an indicator for the future, when lower working levels became in exchanged, virtually or locally, by robotic process automation or similar interfaces or devices.

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