ONLINE FIRST ARTICLE
doi.org/10.26398/IJAS.275

Statistica Applicata - Italian Journal of Applied Statistics

Received: 30.09.23/ **Accepted:** 01.03.24
Published online: 17.04.24

THE OPEN MANAGER APPROACH: MANAGEMENT STYLES AND CHARACTERISTICS

Tullio Menini
Department of Human and Social Sciences University of Naples, Italy

Abstract. *This study focuses on the manager's professional work. In particular, the main focus is to detect the possible new approach in managerial behaviour able to define this professional figure and a first idea of an 'open manager'. Kindness, empathy, and sharing of objectives are characteristics that could revolutionize the figure of the leader. A transformation that moves away from the old models in favour of a horizontal and participatory organization of power. For this reason, the successful leader can interact with the human dimension of employees and guide them towards a shared goal.*

Keywords*: Labour Market, Open Manager, Rasch Analysis*

1. INTRODUCTION

The great wave of globalization has produced a profound impact on organizations from many points of view. A change is as essential as ever in order to enable those who lead a business today to cope with the difficulties, rethinking management in entirely new ways and logics. Moreover, with the new century, one of the most interesting strategic perspectives in strategic and industrial development research has been developing, namely the phenomenon called Open Innovation (Chesbrough H., 2003). Indeed, it has been realized that it is possible to have an open way of developing innovation through connections and collaborations with research institutes, professionals and companies outside the organization, in order to create a mutually beneficial alliance.

In recent years, it is also applied to the enterprise in its complexity, to relationships with employees and to the way management interprets its role (Bruttini P., 2014). Thus, Open Organization is understood as a complex of practices that can be traced back to organizational models, systems of teamwork functioning and managerial behaviours that seek to provide a concrete response to the need for companies to quickly adapt and evolve, based on market needs (customers and tensions with competitors). It is a fragmented, multifaceted,

largely unstructured movement (Laloux et al., 2015) that identifies itself in various "buzz words" such as agility, teal and openness precisely.

The market demands that the managerial class requires new skills that until a few years ago were the prerogative of the personal relationships field. To make the most of human capital, organizations have had to adopt approaches involving concepts such as sharing, empathy, and kindness, which should pave the way for the separation between the top and bottom of the corporate pyramid. This change in mentality places human capital, especially at the executive level, as a source of attractiveness and, above all, as a creator of value for companies.

This open manager figure is not clearly defined; thus, it resembles a latent variable in statistical terms. Consequently, we analyzed data collected by a 'Confindustria' survey to outline emerging attitudes and behaviors.

As the survey is composed by a set of ordered items, we consider the most proper statistic methodology is Partial Credit Model (PCM, Wright & Masters, 1982).

The paper is structured as follows: after the introduction, a second section is dedicated to data description; the methodology applied to answer the research objectives is described in the third section, whereas a fourth section shows the results, verified by fit statistics.

2. DATA DESCRIPTION

Data was collected by ‘Fondirigenti and Confindustria’ in 2020 through a structured questionnaire distributed to a non-probabilistic sample of Italian companies and filled in by a managerial internal figure. The total number of managers who responded was 383.

The sample has been extracted from the AIDA (Integrated Automation Customs Excise) database and MISE (Ministry of Economic Development) dataset by filtering the companies presenting open manager skills.

The questionnaire was made up of two sections:

• in the first section there were questions concerning the context in which the firms operate, such as economic sector, dimension, geographical area, as well as the main social demographic characteristics of managers, such as gender, age, education level, respectively.

• in the second section there were thirty items describing the managers’ business behaviours and attitudes, useful for defining the concept of ‘openness’

characterizing the figure of the open manager. So, in the second section of the questionnaire, there are 30 different statements. Items were formulated as a 4-point Likert scale, with responses ranging from 1 to 4 where 1 stands for "totally disagree" and 4 stands for "totally agree". For more details see Appendix 1.

The main size characteristics of the companies involved are summarized in the following table.

Table 1: Turnover and employees of companies

Turnover	Employees			
	10-49	50-149	150-249	>250
2-10 mln	76	14	1	2
11-25 mln	11	53	7	5
25-50 mln	3	34	26	9
>50 mln	3	6	22	111

3. METHODOLOGY

The Rasch models can be applied wherever ordered data is obtained with the intention of measuring a latent trait.

The Rasch dichotomous model specifies the probability, P, that person n of ability B_n succeeds on item i of difficulty D_i. "Success" means "exhibits more of our intended latent variable. "Failure" means "exhibiting less of our intended variable".

So, we must score the observations in accordance with this intention, no matter what values are assigned to the observation during data collection. P is the probability of success, and 1- P is the probability of failure. Success or failure must always happen, as when we add their probabilities they must sum to 1. In other words, success is a score of "1", and failure is a score of "0" on an item. Then the Rasch dichotomous model specifies the probability P_{ni1}, of the person n of ability B_n scores 1 on item i of difficulty D_i while with P_{ni0} the probability of scoring 0. For ordered data "Success" means "more of what we are looking for" "Failure" means "less of what we are looking for". The difference between "Success" and "Failure" is qualitative.

The ordering of these different qualities is indicated by scoring them "1" and "0". "1" "indicates more of the latent variable". "0" "indicates less of the latent variable". In the Rasch model, the probability of a correct answer is modelled as a logistic function of the difference between the person and item parameter.

In performance assessment and attitude surveys we encounter rating scales, such as the first "none, some, plenty, and all" and the second "strongly disagree, disagree, agree, and strongly agree" (Rasch, 1993, Bond et al., 2020).

When the items are polytomous, there are several Rasch measurement models for rating scales which we will call "polytomous models". Among these we chose Rasch-Masters Partial Credit Model because we expect the partial-correctness structure to be different for different items.

The Partial Credit Model specifies that the probability, P_{nij} of person *n* of ability measure $B_n$is observed in category *j* of a rating scale specific to item *i* of the difficulty measure D_i as opposed to the probability $P_{ni(j-1)}$ of being observed in category *(j-1)* of a rating scale with categories *j=0,m*

$$log_e\left(P_{nij}/P_{ni(j-1)}\right) = B_n - D_{ij} \quad (1)$$

It is usually more straightforward to conceptualize and communicate the item difficulty separately from the rating scale structure, so we will use the $D_i - F_{ij}$ notation.

$$log_e\left(P_{nij}/P_{ni(j-1)}\right) = B_n - D_i - F_{ij} \quad (2)$$

The rating scale structure F_{ij} is specific to item *i.* We can think about the item difficulty and then impose the rating scale structure on it, $D_i - F_{ij}$, or we can think about the combination, D_{ij}. Mathematically speaking they are the same thing. The $F_{ij}$are the points of equal probability of adjacent categories (thresholds). The item difficulty D_i is the point where the top and bottom categories are equally probable.

This means that partial credit items with the same number of categories, and the same total raw "marginal" score, taken by the same people, can have different difficulties if the pattern of category usage differs between the items.

3.1 RASCH DIAGNOSTICS

In literature there are different tools to evaluate the goodness of fit of the model to observed data. Among the most used diagnostics there are Reliability statistics which report the reproducibility of the measures. The concept of reliability is defined by the ratio we now express as:

$$\text{Reliability} = \text{True Variance}/\text{Observed Variance} \quad (3)$$

Kuder-Richardson KR-20, Cronbach Alpha, etc. are all estimates of this ratio.

They are estimates because we can't know the "true" variance, as we must infer it in some way. In Rasch models, we also have an item reliability which reports how reproducible the item difficulty order is for the set of items and for the sample of units.

To evaluate the goodness of fit of each item, we apply OUTFIT (Outlier-sensitive fit statistic) and INFIT (Inlier-pattern-sensitive fit statistic, or more technically, Information-weighted fit statistic). OUTFIT is a conventional Pearson chi-square fit statistic divided by its degrees of freedom. This is more sensitive to unexpected remarks by people on items that are relatively very easy or very difficult for them. The INFIT mean-square is the information-weighted average of the squared residuals. This is more sensitive to unexpected patterns of people's observations of items that are roughly targeted at them (and vice versa).

4. RESULTS

In this paragraph we aim to measure the latent trait of openness of Italian managers through the PCM carried out by software Winstep (Linacre, J.M., 2004) and library eRm of meta-language R (https://www.R-project.org).
The results of the analysis are summarized and reported in the table 2.

Table 2: Summary statistics

SUMMARY OF 383 MEASURED PERSONS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	99.4	30	1.46	0.3	1.03	0.1	0.99	-0.1
S.D.	7.2	0	0.62	0.04	0.37	1.3	0.35	1.2
MAX.	117	30	3.88	0.6	2.68	4.4	2.93	4.6
MIN.	73	30	-0.3	0.23	0.32	-3.6	0.31	-3.6

CRONBACH ALPHA (KR-20) PERSON RAW SCORE RELIABILITY = 0.76

SUMMARY OF 30 MEASURED ITEMS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	1269	383	0	0.08	1	0.1	0.99	0
S.D.	119.3	0	0.59	0.01	0.12	1.6	0.15	1.9
MAX.	1457	383	1.42	0.12	1.33	4.6	1.33	4.6
MIN.	958	383	-0.99	0.06	0.88	-1.6	0.81	-2.2

ITEM RELIABILITY= 0.98

Infit and outfit statistics make it possible to evaluate the goodness of fit of the items and the response patterns of managers to the model. Considering the average of non-standardized infits and outfits, 1 and 0.99 for item fit and 1.03 and 0.99 for person fit, these statistics do not show values outside the range proposed by Linacre [0.6; 1.4], consequently the data shows a good fit. On the other hand, as far as the reliability index is concerned, the closer the index is to 1, the more reproducible the test used, i.e. it produces the same results in repeated tests, the analysis has an item reliability of 0.9. As far as the person reliability of 0.76 is concerned, it must be considered that 0.8 is the threshold for strong decision, testifying to the good reproducibility characteristics of the instrument.

The parameters of the model characterize the competence of the interviewees and the difficulty of the items as collocations on a continuous latent variable.

The proposed representation of the results allows us to have at the same time the measure of the behaviours considered prevalent in the definition of open manager, and of the adherence of the managers interviewed to these behaviours. In the variable map (Fig.1), the lower box shows the 30 items, marked with labels ranging from "1" to "30", arranged in ascending order according to their position on the latent dimension; The solid dots indicate the difficulty of each item, while the circles indicate the positions of the thresholds. The top panel (Person Parameter Distribution), on the other hand, shows the distribution of managers' skill from the least skilled (from the left) to the most skilled (right). From the graph you can immediately see how on average the skill of the subjects is greater than the difficulty of the items; therefore, the attitude of the managers interviewed to adopt open attitudes in their professional activity is very high. However, there are items that are difficult even for highly skilled managers, and if you look closer, you can see that these are reverse items.

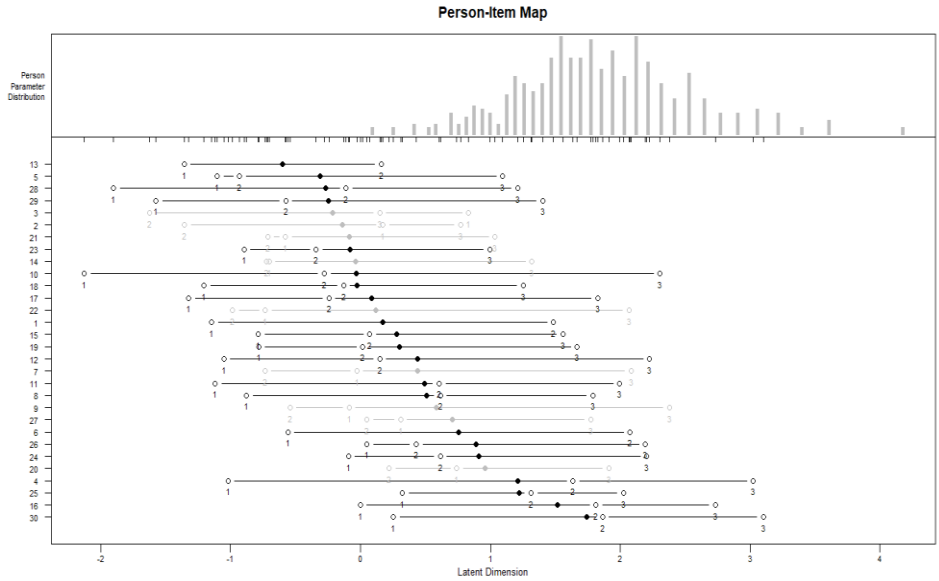

Figure 1: Person and item parameters (items 1-30)

Still referring to the person-item map, it is easy to see how some items (3, 2, 21, 14, 22, 7, 9, 27, 20) have been assigned the colour grey; this is to emphasize that these are items with unordered thresholds, i.e. with one or more redundant categories. There are several diagnostics for the analysis of the individual items.

By way of example, the measures of the thresholds between categories and curves are calculated. The graphs of the characteristic curves of the items (CCIs) represents, on the axis of measurement of the latent dimension, the probability curves of the categories and the locations of the thresholds that are located at the points of intersection of the curves. By reporting the characteristic curves of the items with unordered thresholds (Figure 2) it is possible to deduce that for these items, Category 1 is not used like the other categories, since it is never the most likely. In this case it is said that that category does not emerge; Therefore, it should be grouped into one of the two adjacent categories.

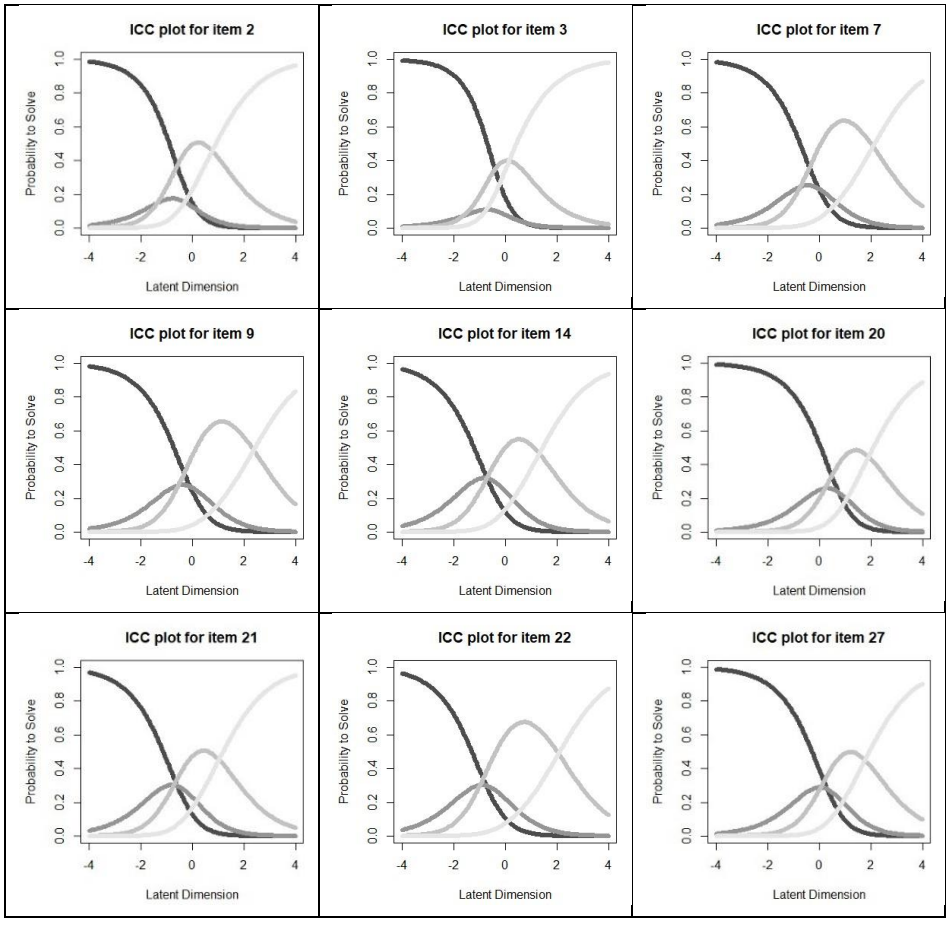

Figure 2: Category probabilities - item 2, 3, 7, 9, 14, 20, 21, 22 e 27.

The graphs of the characteristic curves of the items (CCIs), in which the probability curves of the categories and the locations of the thresholds that are located at the points of intersection of the curves are represented on the axis of measurement of the latent dimension. By reporting the characteristic curves of the items with unordered thresholds (Figure 2) it is possible to deduce that for these items, the answer "Partially disagree" is not used like the other categories, since it is never the most likely. In this case, the category "Partially disagree" is said not to emerge; Therefore, it should be grouped into one of the two adjacent categories.

The results obtained from the Rasch analysis were used to test some hypotheses about the characteristics of managers already identified in Bruttini et al. (2022).

The Rasch Analysis results developed the ones of the analysis by Bruttini et al. (2022) on the same dataset. The authors defined six different groups of managers by applying a different methodological approach. In fact, Data analysis carried out by Bruttini et al. (2022) applied the agglomerative hierarchical cluster procedure with Ward's method allowing to define six different groups of managers, according to their openness level; instead, our analysis measures the openness level of each manager. Moreover, we tried to identify the different areas of competencies where it is possible to improve the open attitude for every group of managers identified by Bruttini et al. (2022) starting from the measure of item difficulty weighted with scores in the groups (Figure 3).

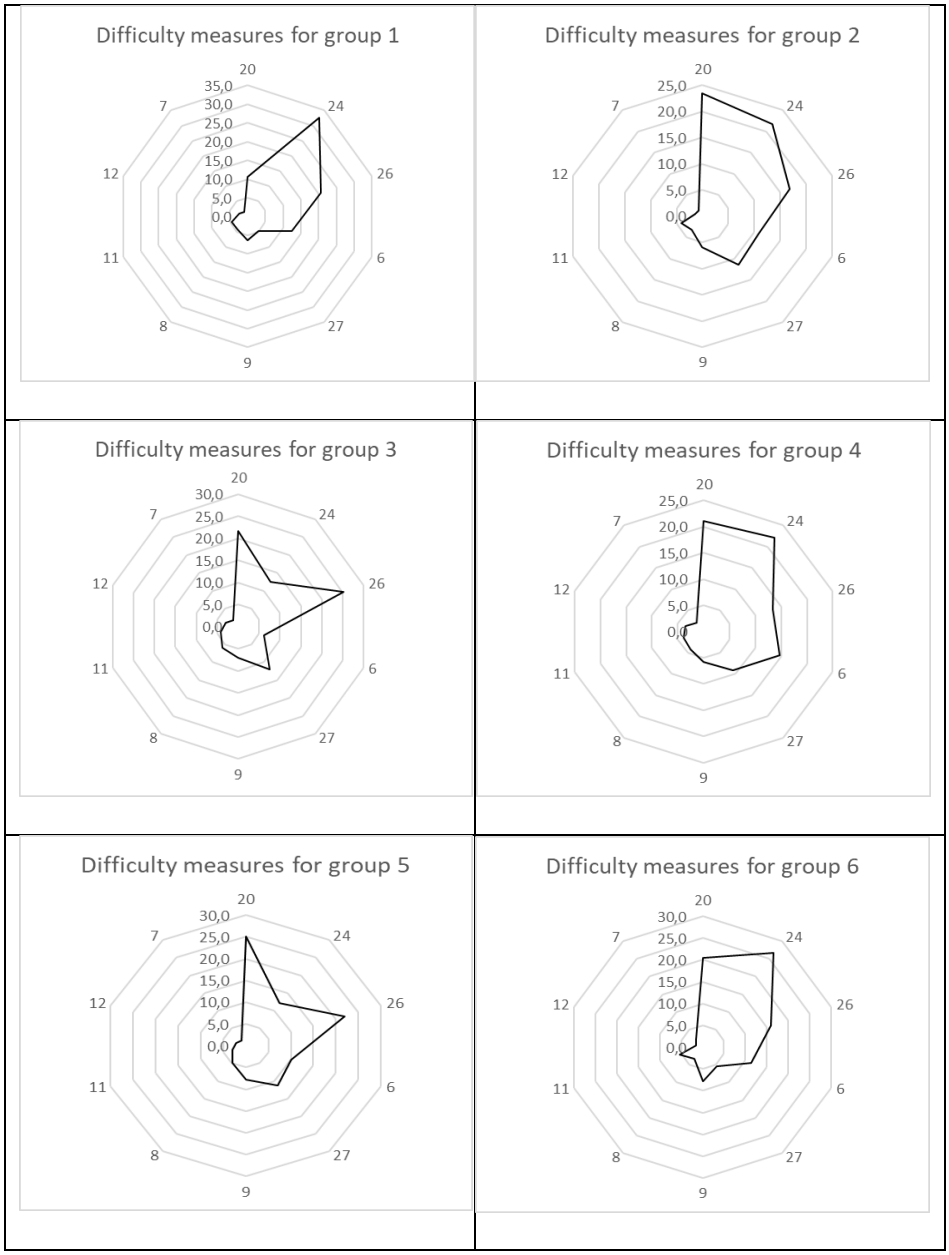

Figure 3: Difficulty measures for groups

5. CONCLUSIONS AND FURTHER EXTENSIONS

The results of the analysis can be used to predict the likelihood of the manager to be open in his activities, based on the pattern of responses to the questionnaire. The guidelines for the managerial staff in the selection phase are useful for a fruitful collaboration or calibrating training interventions on certain aspects of possible improvement of the company management. Using the data collected in the first part of the questionnaire, it is possible to compare groups of subjects with different personal characteristics using Differential item functioning (Camminatiello I. et al., 2014).

The study lends itself to further analysis and application in management and training. For example, once the measurement tool has been also validated by reviewing some critical aspects of the questionnaire, it could be useful to anchor the parameters of the items, to compare personal measures with subsequent surveys and to evaluate the effectiveness of training interventions.

Finally, diagnostic tools of consolidated statistical methods show that the adopted questionnaire is an effective tool for evaluating manager openness. The questionnaire can be improved by changing the number of categories of items.

Appendix 1- Items of the questionnaire

1	I can accept continuous changes in the business world
2	It's important to admit your mistakes with collaborators
3	I seize all the opportunities that come my way to learn new things
4	I prefer collaborators who can assert themselves over others
5	It's always appropriate to give visibility opportunities to collaborators
6	In a professional context, I act very quickly
7	In decision-making, I question my own opinions
8	Business today requires the utmost consistency
9	In the face of any critical task, I always know someone who can help me
10	I always manage to develop relationships with interlocutors who can impact the business
11	I encourage collaborators to adopt indicators so they can self-monitor
12	I expect my collaborators to be able to change autonomously
13	For the team to function, it's always necessary to clarify priorities
14	I'm always careful to identify potential areas of business growth

15	I dedicate regular meetings to review the situation, analyse experiences and learn from mistakes made
16	It's not always appropriate to prioritise the career development of your collaborators
17	In the face of people's resistance, I act to overcome it
18	In every context I go to, I immediately try to create relationships
19	I feel affectionate towards my colleagues in this company
20	Sometimes I personally take care of writing the procedures that regulate activities
21	You have to trust collaborators so they can manage critical situations in the way they find most effective
22	I can create a climate that pushes every team member to innovate
23	I never lose confidence and the idea of being able to do it
24	I often imagine doing things that others consider impossible
25	In decision-making, it's not always necessary to evaluate the impact on others
26	In my work, I know I have to convince even my enemies
27	I feel completely identified with my company
28	To do my job, I need to gain a deep understanding of technologies and organisational processes
29	It's important to create work contexts where people can self-manage
30	It's not always appropriate for subordinates to contribute to important decision-making

REFERENCES

Bond, T., Yan, Z., and Heene, M. (2020). *Applying the Rasch model: Fundamental measurement in the human sciences*, Routledge, New York.

Bruttini, P. (2014) *Città dei capi*, IPSOA, Milano.

Bruttini P., Mariani P., Marletta A., Masserini L. and Zenga M. (2022). *A new definition of the professional figure Open Manager*. In R. Lombardo, I. Camminatiello and V. Simonacci, editors, Book of Short papers 10th International Conference IES 2022, Milan, PKE: 412-416.

Camminatiello I., Menini T., Gallo M. (2014). *Objective measurements of student satisfaction by comparing the effects of different factors*, Procedia Economics and Finance 17: 71-78

Chesbrough, H. (2003). *The Logic of Open Innovation: Managing Intellectual Property*. California Management Review, vol.45, no.3: 33-58.

Laloux, F., Poireaux, G. N., & Blanchard, P.; (2015). *Reinventing Organizations-Vers des communautés de travail inspirées*. Diateino.

Linacre, J.M., (2004). *Facets Rasch measurement computer program*. Winsteps.com, Chicago

R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org

Rasch, G., (1960). *Probabilistic models for some intelligence and attainment tests*. Danish Institute for Educational Research, Copenhagen

Wright, B. D., Masters, G. N., (1982). *Rating Scale Analysis*. Chicago, IL: MESA Press