

The potential of using psychometric tests in Polish accounting research

Potencjał zastosowania testów psychometrycznych w polskich badaniach rachunkowości

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Abstract

Purpose: To demonstrate the rationale for using psychometric tests in accounting research and show the spectrum of possibilities for such research in the context of skepticism towards them in Polish academia.

Methodology/approach: Deduction and a scoping literature review.

Findings: We confirm that personality traits and states of the human mind affect the accounting process, and psychometrics is a field with strong theoretical foundations and well-developed empirical tools. This means that the use of psychometric tests in accounting research indisputably makes sense. Thereby, the skepticism towards psychometric research in accounting in Polish academic accounting society is questioned.

Originality/value: We conducted an extensive review of the accounting research that used psychometric tests. We demonstrate the rationale for the use of psychometric testing in accounting.


Keywords: psychometrics, psychological tests, accounting, behavioral accounting.


Streszczenie

Cel: Wykazanie zasadności zastosowania testów psychometrycznych w badaniach rachunkowości, a także ukazanie spektrum możliwości w zakresie takich badań w kontekście sceptycyzmu wobec nich w polskim środowisku rachunkowości.

Metodyka/podejście badawcze: Dedukcja oraz przegląd zakresu literatury.

Wyniki: Potwierdzono, że cechy i stany psychiki ludzkiej wpływają na proces rachunkowości, a psychometria jest dziedziną o solidnych podstawach teoretycznych i wypracowanych narzędziach empirycznych. To oznacza, że stosowanie testów psychometrycznych w badaniach rachunkowości bezdyskusyjnie ma sens. Tym samym zakwestionowano sceptyczne podejście do tego typu badań w polskim naukowym środowisku rachunkowości.

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Oryginalność/wartość: Szeroki przegląd badań rachunkowości z zastosowaniem testów psychometrycznych. Oryginalna próba dedukcyjnego wykazania zasadności zastosowania badań psychometrycznych w rachunkowości w kontekście sceptycyzmu do tych badań w naukowym środowisku rachunkowości w Polsce.

Słowa kluczowe: psychometria, testy psychologiczne, rachunkowość, rachunkowość behawioralna.

Introduction

The producer and user of accounting information are still¹ largely human beings, and classical economic theories assumed that in the sphere of economic life (which includes preparing information for economic decision-making), man was fully rational. Today, there is a solid basis in economic sciences for abandoning the *homo oeconomicus* paradigm, that is, moving away from the axiom of rational man towards emotional man (Zalega, 2015, p. 8), or at least not an entirely rational one. According to Dopfer (2004, pp. 177–178), the discoveries made by sciences such as psychology, cognitive science or neuroscience, and, above all, economic research that used psychological theories or tools have undoubtedly made this possible. Suffice it to mention the economic Nobel Prize-winning research of Kahneman and Tversky (1979, pp. 263–291), which resulted in the development of the famous prospect theory, which integrates insights from psychological research into economic science. Specifically, it concerns human judgment and decision-making under uncertainty and contradicts predictions from the traditional theory of expected utility maximization. People view gains and losses differently, and prospect theory holds that people are more loss-averse than gain-seeking.

The origins of the psychological approach to economics can be traced back to antiquity (Zalega, 2015, p. 9). The psychological principles of individual behavior were clearly pointed out by Smith in his seminal work “The Theory of Moral Sentiments”. According to Smith, decisions made by an individual are influenced by emotions, approval and disapproval, altruism, and honesty (Polowczyk, 2009, p. 3). Nevertheless, behavioral economics has its detractors. Pareto, who recommended separating economics from psychology, is considered to be one of its most famous opponents, and thanks to the works of Hicks, Allen and Samuelson, the anti-psychological trend was strong in the 1930s and 1940s. A number of more-or-less valid accusations were made against behavioral economics (Zalega, 2015, pp. 9, 18–19).

Nowadays, it is widely believed that psychology cannot be completely ignored in economic sciences, as without its input, it is not possible to understand and explain how people actually make economic decisions (Zalega, 2015, pp. 9–10). This is because those decisions are neither irrational nor completely rational.

¹ Perhaps in the future, artificial intelligence will completely replace humans in both of these roles.

Behavioral economics does not replace traditional economics. Instead, it provides it with a more realistic psychological foundation (Camerer, Loewenstein, 2004). Such an increase in realism improves economics (Polowczyk, 2009, p. 4). As another great economist, Clark (1918, p. 4), expressed over a century ago, economists should take human nature into account and rely on the work of psychologists.

The human psyche, that is, the totality of human traits and internal processes related to emotions, intellect, predispositions and experience, is also taken into consideration by accounting researchers. This approach is often identified with the behavioral trend in accounting science, which is almost as old as behavioral economics. In a narrow sense, behavioral research in accounting is concerned with the impact of accounting information on human behavior (Becker, 1967, pp. 225–228). At its core is the assumption that information affects people. As stated by Belkaoui (2004, p. 368), accounting is action-oriented, and its purpose is to influence behavior. Accounting should, therefore, be viewed as a behavioral process, and the behavioral trend in accounting science ought to lead to understanding, explaining and predicting human behavior in response to accounting information (American Accounting Association, 1971, p. 394).

The concept of behavior in behavioral accounting research is not understood narrowly in the spirit of behaviorism. Behaviorism is a psychological trend that developed in the early 20th century, mainly through Watson, and involved studying human behavior as a form of stimulus-response associations while ignoring an individual's internal states, which were considered impossible to measure objectively (Watson, 1913, pp. 158–177). "Psychological reactions of those who consume accounting information" mentioned by Devine (1960, pp. 387–399), considered to be the postulated subject of behavioral research, are, after all, not just a reflexive and reactive behavior. They are a complex process that involves information processing linked to personality, emotions, values, motivation, knowledge, and many other factors. Thus, contrary to what was implied by classical behaviorists, insight into the "inside" of the information user is highly desirable, not to say indispensable.

Accounting researchers focus on the psychological reactions and processes not only of the users of information but also of those who create it, i.e., accountants. Additionally, in a broader sense, the creators of accounting information are all those who directly or indirectly influence this information: from the members of the boards of directors of companies who decide on their accounting policy through auditors who review financial statements to those responsible for the shape of national or international accounting standards. Whether we categorize such research as behavioral or non-behavioral is irrelevant (although we can certainly categorize it as such). For instance, Hofsted and Kindar (1970, p. 43) included not only the behavior of "non-accountants, as they are influenced by accounting functions and reports" in the field of behavioral research in accounting but also the "behavior of accountants". Belkaoui (2004, p. 368) stated that the purpose of behavioral accounting research was to explain and predict human behavior in all possible accounting contexts. It is important to assume that the information derived

from accounting is affected by the psyche of those who create (or influence) this information. Similarly, how information from accounting is (what decisions will be based on it) is influenced by the psyche of those who receive this information.²

There is no single universally accepted understanding of the term “psyche”. For the purposes of accounting research, we can adopt the Polish dictionary definition (leaving the disputes to psychologists and philosophers), according to which the psyche is the totality of human traits and internal processes related to emotions, intellect, predispositions and life experience (PWN, 2023) or (concurrently) the totality of innate and acquired intellectual, emotional and volitional dispositions (PWN, 1980, p. 613). The thus understood components of the psyche are, therefore, cognitive processes, emotions, motivational processes, and personality. This psyche, or in fact, its components, can be characterized in various ways, one of which is measurement. Psychological tests are used to measure personality traits and mental states, and the field of knowledge dealing with the theory and practice of their use is called psychometrics.

The Polish accounting academic community is skeptical about using psychological tests in accounting, as evidenced by the number of such studies: only two exist. One of them (Baszczyńska et al., 2022) concerns the occupational burnout of Polish auditors. The second one (Ciołek, 2018) refers to the professional skepticism of accounting students. Although the amount of research on psychological and social accounting aspects in Poland has grown, it is still not popular, and most studies use research methods other than psychological tests, e.g., experiments (Nowak, Maruszewska 2022). The result is a vast research gap, not only for Polish research but also for Central-European, European, and international accounting studies. Therefore, the purpose of this article is to demonstrate the rationale for using psychometric tests in accounting research and to present the spectrum of possibilities for such research in the context of the skepticism towards them in Polish academia. To this end, we used deduction and a review of the literature on accounting research that used psychometric tests.

The remainder of the paper comprises four sections. In the first section, we discuss the concept and types of psychometric tests and the conditions for their use. In the second section, we attempt to deductively demonstrate the rationale for using psychometric tests in accounting research and the directions of their application. In the third section, we present selected accounting research that used psychometric tests. The last part includes conclusions and gives recommendations and possible directions for accounting research in Poland using psychometric tests.

² In general, we believe that the terms “behavioral research” or “behavioral trend” used in accounting are not accurate, especially when referring to research whose subject is not so much or not only human behavior but features of the human psyche or mental states. It would be better to speak of “psychological” (or even more broadly “psychosocial”) research, since many of the studies included in the behavioral trend in accounting are *de facto* concerned with social aspects, e.g., the study of the relationship between national cultural traits and accounting). We are not isolated in this opinion (cf. Cieciora, 2015, p. 360).

1. Psychometric tests – the concept, types, properties and principles of application

The emergence of psychometrics is associated with Wolff, who was active in the first half of the 18th century and who distinguished empirical psychology as a scientific discipline. He recognized that psychology was similar to the natural sciences in terms of its purpose, and therefore, mathematical tools can be applied to it. He called this approach psychometrics (Richards, 1980, pp. 227–228). The first psychometric test in the modern sense of the word is attributed to Galton, a cousin of Charles Darwin, who created an intelligence measurement test in the 1880s (e.g., Buchanan, Finch, 2005, pp. 2–3; Malani, 2021). Galton is widely associated with the early development of the psychometric paradigm (Michell, 2022). Psychometrics, as an independent scientific discipline, dates back over 80 years (see Groenen, van der Ark, 2006). While originally closely associated with psychology, contemporary psychometrics is a diverse and multifaceted discipline (Wijsen, Borsboom, 2021, p. 327).

As mentioned in the Introduction, psychometrics measures personality traits or mental states by means of psychological tests. According to the American Psychological Association (APA; 2023), a psychological test (psychometric test) is “any standardized instrument, including scales and self-report inventories, used to measure behavior or mental attributes, such as attitudes, emotional functioning, intelligence and cognitive abilities (reasoning, comprehension, abstraction, etc.)”. With the results of the tests, it is possible to understand and predict the behavior of people in various life situations (Witkowska, 2009, p. 12). The diagnosis obtained from a psychological test makes it possible to determine, for instance, whether someone will be able to cope in a certain profession, whether this individual will be a good supervisor or whether he or she will be able to work in a team. The variables that are measured by psychological tests are constructs developed in advance on the basis of specific theories to explain human behavior. They are primarily broadly defined personality traits (e.g., intelligence), attitudes (e.g., authoritarianism), and emotional states (e.g., anxiety).

There are various types of psychological tests, which can be categorized based on their testing procedures and the nature of the tasks assigned to test subjects. These categorizations include individual tests and group tests. Additionally, tests are further distinguished as either tests of maximal performance or self-report tests. The former requires the subjects to perform certain tasks to the best of their ability, and in each task, only one answer is correct. The latter requires the subjects to determine their own feelings, beliefs, opinions or emotional states, and there are no right or wrong answers. We can also distinguish between standardized tests (which have standardization samples based on a large group of people, which is a frame of reference for interpreting individual stories) and non-standardized ones. Tests can also be classified by the age group for which they are intended (e.g., tests for children, adolescents or adults).

In the context of accounting research, it is particularly interesting to divide tests by what they are measuring, i.e., the trait (aspect). There are many classifications of tests based on the object of measurement (the dimension being measured), and they differ significantly in the number of categories. There are classifications that distinguish only two types of tests, e.g., Fronczyk (2009) distinguished between tests of intellect (intelligence and ability) and tests of personality and temperament. At the opposite extreme is the classification from the *Seventeenth Mental Measurements Yearbook* (Geisinger et al., 2007). It includes nineteen categories of tests: achievement, behavior assessment, developmental, education, native language, fine arts, foreign languages, intelligence, mathematics, miscellaneous, multi-aptitude batteries, neuropsychological, personality, reading, science, sensor and motor, social studies, speech and hearing, and vocations. The tests available at the Laboratory of Psychological Tests of the Polish Psychological Association³ are divided into five areas of diagnosis: intelligence and cognitive processes, family, personality and interests, clinical methods, HR, as well as health promotion and psychology.

There are many different tests in each category. Let us look at personality tests, for instance. It is estimated that there are more than 2,500 tests in the United States alone (Personality Tests in Psychology, 2022). Not all of them have strong scientific foundations or are equally frequently used. But even if we consider only the most commonly used and most respected by scientists and psychologists, there is still a great number. For instance, in the *Handbook of Personality Assessment*, Weiner and Greene (2008) presented nine of the most widely applied and frequently studied personality inventories: five self-reported inventories and four performance-based measures.⁴ A similar variety of tests is encountered in other dimensions (aspects) of the human psyche. This is often because different theories are behind each construct (for example, there are many very different theories of personality – see, e.g., Hall et al., 1997).

Let us return to the types of tests. There are tests that measure some aspect of the human psyche as a whole, and there are those that measure some part of it. Again, personality is a good example here. In addition to inventories that diagnose the entire structure of personality, some measure a specific dimension, such as irritability, aggression, emotional sensitivity, locus of control, hostility, depression, or anxiety. There are often different tests developed by various authors to measure the same dimension. Take as an example the locus of control – a construct of great interest from an accounting perspective. To measure it, the scale developed by Rotter (1966) is mainly used, but before and especially after his work, many researchers developed their own questionnaires (see Furnham, Steele, 1993).

Diagnosing intellect is similar to measuring personality. In addition to tests of general intelligence, there are tests that measure its specific dimensions, such as

³ <https://www.practest.com.pl/sklep/testy> (accessed 11.02.2023).

⁴ Their names will not be provided due to the limited volume of the article.

cognitive, mathematical, verbal, spatial, abstract-logical abilities, etc. Even if a given test diagnoses an aspect of the psyche as a whole, there is often an internal variation of this aspect. This is manifested in the structure of the test in the form of scales (dimensions). For instance, Costa and McCrae's (2003) popular contemporary personality inventories based on the five-factor theory of personality consider the following: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Each of these five main factors comprises six more specific elements. Together, therefore, there are 30 sub-factors.

To summarize this brief typology of psychometric tests, it can be said that they are almost limitless. New tests are constantly being developed (they can be divided into three groups: tests that measure completely new constructs, tests that measure known constructs in a different way, and domestic adaptations of foreign tests). Some are developed over many years by teams of experienced researchers, while others are created quickly for a single study or as part of a master's thesis.

Many tests are somewhat exaggeratedly referred to as psychological. However, they do not meet the basic standards of psychometrics, i.e., validity and reliability. According to the Standards for Educational and Psychological Testing of the American Educational Research Association (AERA), the APA and the National Council on Measurement in Education (NCME), the most fundamental consideration in developing tests is validity. It "refers to the degree to which evidence and theory support the interpretations of test scores for proposed uses of tests" (AERA/APA/NCME, 2014, p. 11). Validity has several aspects. Guion (2005) lists the following Holy Trinity: criterion-oriented validity (concurrent and predictive), content validity, and construct validity. Construct validity is considered the most important type (Brzezinski, 2019, p. 367). Cronbach and Meehl (1955) listed five ways to estimate construct validity, which indicates the complexity of evaluating this property.

Reliability, in turn, "refers to the consistency of scores across replications of a testing procedure" (AERA/APA/NCME, 2014, p. 33). It is a measure of the accuracy of the measurement made by the test. As Urbina wrote (2004, p. 212): "reliability is a characteristic of test scores, rather than of tests themselves". The theory of reliability of psychological tests is extensive. As with measures of validity, a number of methods of estimation of reliability coefficients have been developed in the course of the evolution of psychometrics (see Leong et al., 2014, Chapter 28).

Related to the quality of the study conducted using a psychological test is the issue of adapting the questionnaire, as the vast majority of psychometric tools used around the world come from abroad. According to Drwal (1995, p. 11), adapting a personality questionnaire "is not a simple transfer of the tool from one country to another, but a complex process of overcoming cultural barriers" (this certainly applies not only to personality inventories but also to other types of psychological tests). It is already a very difficult task to create a native language version of a foreign tool (see Drwal, 1995, pp. 12–26). Subsequently, this native version should then be evaluated for validity and reliability.

When conducting a psychological test, certain rules must be followed. Good psychological tests have manuals describing the recommended procedure for conducting the test. Familiarizing oneself with such a manual should be the first step for the researcher (Witkowska, 2009, pp. 13–14). Correctly interpreting test results is vital, which is why test norms based on results obtained in the reference group are used. Evaluating the raw score without a reference point is subjective and difficult; moreover, according to some specialists, such a raw score is even impossible to interpret and completely useless⁵ (Witkowska, 2009, p. 16). The specified requirements also apply to the person conducting the psychometric test.⁶ According to Brzeziński (2019, pp. 338–339), only a psychologist, after completing a five-year master's degree, “is fully prepared substantively to handle all varieties of psychological testing”. According to others,⁷ in order to use some tests, it is enough to be a certified specialist with knowledge of general psychometrics or of a particular test or type of test. Ethical principles must be respected throughout the psychometric testing stage, especially the rights of the test subjects (see AERA/APA/NCME, 2014, pp. 131–137).

Finally, there are some who completely deny the point of psychometrics. They believe that psychometric tests greatly simplify and even completely distort the picture of a person's mental abilities and emotions. Some have gone even further in their criticism, for example, Gould, an American paleontologist, evolutionary biologist, and historian of science. In his book with the telling title “The Mismeasure of Man”, he included not only a criticism of the scientific foundations of psychometrics (especially the measurement of intelligence) but even accused it of discriminating against certain groups of people by showing through tests that they are inferior to others in terms of some abilities.⁸ Such extreme opinions against the measurement of personality traits are rather indefensible. Gould's attack on psychometrics was immediately met with a strong and pointed counterattack by other researchers, including Blinkhorn (1982), Humphreys (1983), Korb (1994) and Carrol (1995), who called Gould's views “science fiction” and a “masterpiece of propaganda”.

Based on a review of the psychological literature, of which only a small part is presented in this section, a picture emerges of psychometrics as a very rigorous discipline with strong theoretical foundations and well-developed empirical tools.⁹ The use of psychological tests, therefore, makes sense, provided that we use good tests in the right way. We must also interpret their results meaningfully, with an awareness of the immanent limitations of measuring such an extremely complex creation as the human psyche.

⁵ With regard to some tests, this is probably too strong a conclusion.

⁶ We are not referring to the person who distributes and collects the test sheets to the respondents but to the individual who is substantively responsible for conducting the study.

⁷ See the requirements of the Laboratory of Psychological Tests of the Polish Psychological Association at: <https://www.practest.com.pl/sklep/testy> (accessed 14.02.2023).

⁸ https://en.wikipedia.org/wiki/The_Mismeasure_of_Man (accessed 12.02.2023).

⁹ Quizzes and psychological games like “What Disney Princess you are” give psychological tests a bad name (Epstein, 2023). However, they have nothing to do with real psychometrics.

2. The rationale and directions for the use of psychometric tests in accounting research

Our considerations carried out to demonstrate the rationale for using psychometric tests in accounting research are as follows:

Personality traits and mental states, at least to some extent, affect how people behave in the economic sphere (as evidenced by behavioral economics research). Therefore, it is necessary to consider people's traits and mental states for a more complete understanding and better prediction of their behavior in the economic sphere. Additionally, as preparing and communicating information about economic transactions and events, i.e., accounting, is an element of the economic sphere, understanding people's characters and mental states will also help understand their accounting behavior. Psychometric tests are a scientific method of studying the traits and states of the human psyche to understand and predict behavior that has strong theoretical foundations and well-developed empirical tools. This is undoubtedly evident from the literature on psychological testing presented in Section 1. Therefore, we can reasonably conclude that the use of psychometric tests in accounting research is justified.

The scope of psychometric testing in accounting can be very broad, and the available test types are very diverse. Let us start with who can be the subject of such tests. The most suitable people are accountants and auditors, as well as accounting students as future accountants and auditors. However, it is also possible and worthwhile to study those who decide on the accounting policies of companies (i.e., the members of boards of directors and supervisory boards), create accounting regulations (e.g., the members of national accounting standards committees) or educate on accounting (accounting lecturers at universities and courses¹⁰). Users of accounting information can also be the subject of research. In any case, when we mention accounting, we mean both financial accounting and management accounting.

The focus of our study is any aspect of the human psyche that can be reasonably hypothesized to be related to an important aspect of accounting. The aspects of accounting can be various, e.g., the level of accounting conservatism, transparency of disclosure, audit quality, the level of accounting numbers manipulation, and the approach to budgeting. In the absence of a rational basis for such a hypothesis, the results of a psychometric study of accountants or others involved in accounting will be merely a curiosity.¹¹ The best basis for a hypothesis about the

¹⁰ As that they can shape accounting students' views on certain issues, such as the degree of conservatism.

¹¹ It may be of great interest to psychometrically examine accountants in terms of parental attitudes, attachment styles, death anxiety, food preferences, or health behavior or sexual behavior. However, the relationship of such aspects to accounting is weak. They could be connected with other psychological traits that are already more closely related to accounting, but then it is better to study these other traits for explanatory and predictive purposes.

relationship between a psychological variable and an aspect of accounting is to extrapolate a sound psychological theory about that variable to accounting. For instance, a hypothesis about locus of control might be that accountants with an external locus of control have difficulty applying the International Financial Reporting Standards based on professional judgments.

Ideally, the test should verify this kind of hypothesis in some way, for example, by analyzing the content of accounting documents or through observations, interviews, surveys, or experiments. A psychometric test is then only one element of the study of the relationship between the characteristics of the objects (psychological traits and accounting traits). However, it is also possible and worthwhile to study a personality trait alone, without simultaneously studying its relationship to some aspect of accounting. Such a study may also examine how this trait's strength relates to how people who work in accounting function. However, the inference of this relationship will be indirect, e.g., it will be an extrapolation of the results of other studies.

The traits and states studied by psychometric tests in accounting research do not have to be an independent variable. They can also be studied as the dependent variable. A particular trait or mental state will then be a hypothetical effect of accounting (or a particular aspect) in the research model, such as how the monotony of working in a low and narrowly specialized accounting position affects an individual's emotional state or how introducing bottom-up budgeting and responsibility accounting affect employee independence. This second example shows that when it comes to those who work in accounting, the possibilities for research in which traits and mental states are accounting-dependent variables are even greater. For instance, non-accountant employees do not necessarily affect a company's accounting system, although it may affect them (e.g., standard cost accounting may operate "over the heads" of production employees but be a source of increased motivation or increased stress for them). Another example would be high school students or students in a non-economic field taking accounting classes. They are unlikely to be involved in accounting, so their traits and mental states will not affect accounting in any way, but the accounting lessons they took part in may shape their personalities in some way.

Psychometric research in accounting can comprise multiple tests, when one dimension of psychology is measured more than once in a given population at certain intervals, or single tests. The first type of research can be aimed not only at studying the relationship of a given psychic trait with some aspect of accounting but also at determining how it changes over time in the population being studied.

Accounting research can use not only existing validated psychometric questionnaires but also tools developed specifically for that study. This makes sense when there are no validated tools suitable for measuring the variable you want to study. However, it is important to remember that creating your own questionnaire is a long, difficult, and rigorous process (e.g., Fenn et al., 2020; Obrycka, Lorens, 2017).

Thus, there are many reasonable opportunities to apply psychometric tests in accounting research. In the next part of the paper, we will examine selected international studies that have been conducted so far.

3. A scoping literature review on psychometric testing in accounting

The literature review plays a special role in our paper. First of all, it provides additional evidence to support the rationale for using psychometric tests in accounting research. We want to demonstrate that such research is not incidental and that it addresses important issues in accounting. Another purpose of the review is to show that the spectrum of this research is broad, which we hope will inspire further studies. Given this defined role, our review of the literature does not simply present all psychometric studies in accounting that have been published to date in available sources. Nor does it classify them precisely. If an aspect has been studied repeatedly, we present only a selection of studies concerning this aspect (the most important or interesting, in our opinion). The review will also not draw a detailed picture of the knowledge provided by the results of those studies¹² – we only make a general conclusion at the end of the paper.

In order to investigate the nature of the already published studies, we performed a scoping review, as this type of literature review highlights possible new research directions. The choice of the papers included in our review was aimed at depicting the scope and differentiation among the existing research.

We sought relevant articles in many different ways. We searched databases available in the EBSCO (Elton B. Stephens CO) database and used ordinary Internet search engines. As keywords, we used general terms, such as psychometric test, psychological test, or psychometrics, as well as words and phrases that describe particular dimensions, traits or states of the psyche, such as personality, intelligence, mental ability, burnout, resilience, locus of control, conscientiousness, and many others, including the names of psychometric tests. In addition to words relating to the psyche and its measurement, keywords included related words, such as accounting, accountant, auditor, and controller. In many cases, we were guided to the next paper by the bibliography of a previous article. We analyzed the main body of each article, not just the abstract, unless it was clear that no psychometric test had been used. We only considered papers written in English.

We felt that the best way to organize the papers here would be in terms of the traits of the psyche that were measured. Some of the most numerous were personality type studies, most of which focused on accounting education. The Myers-Briggs Type Indicator (MBTI) was used most often to measure personality. Ott et al. (1990) used it to determine whether students with certain personality traits perform better when instructed in either of two different methods of instruction.

¹² Anyway, with the limited volume of the paper, it would be impossible anyway.

The relationship between the performance and accounting students' MBTI personality type was also studied by Nourayi and Cherry (1993). Wolk and Nikolai (1997) used the MBTI in their research of personality types of American accounting students and accounting faculty members to consider the impact of revealed personality types on accounting education. Kovar et al. (2003) also examined the personality type of US accounting students using the MBTI, but in the context of accounting college admissions. For Abdolmohammadi et al. (2009), the indicator was used to assess cognitive styles in relation to ethical reasoning assessed by the Defining Issues Test (DIT). For more than a decade, Swain and Olsen (2012) examined the pattern of personality types of students using the MBTI in relation to career decisions. Schloemer (2015) showed that students with a sensing preference, as measured using the MBTI, have higher performance.

The studies listed above were conducted in the US, which dominates in terms of the number of studies.¹³ However, studies of the relationship between personality and accounting have also been conducted in many other countries. For example, in Australia, Briggs et al. (2007) observed the personality type of accounting students over a five-year period and determined a need for a better mix of personality in the 21st century. Also in Australia, and again using the MBTI, Andon et al. (2010) investigated the relative personality preferences of accounting and non-accounting graduates seeking to enter the accounting profession. Meanwhile, in the UK, Oswick and Barber (1998) examined the relationships between MBTI personality traits and accounting performance. In Germany, Meier et al. (2019) measured the MBTI personality traits of students at a local university to ascertain if they met contemporary business requirements.

The MBTI has been used to study not only accounting students but also accounting professionals. Vaassen et al. (1993) used it and the MacDonald AT-20 Tolerance for Ambiguity instrument (AT-20) to investigate the cognitive styles of practicing auditors in the Netherlands. In a similar study, Abdolmohammadi et al. (2003) discovered disproportionately higher levels of the Sensing/Thinking (ST) cognitive style among new auditors in the Big-Five accounting firms in the US.

We have presented here only a selection of studies that used the MBTI. There are many more. As early as 2001, Wheeler (2001) identified 16 articles that used the MBTI in accounting research. Wheeler has perhaps drawn the most attention to the role of personality in human behavior in the context of accounting, also indicating research opportunities using the personality type theory and the MBTI (Wheeler et al., 2004).

To study the personality of accounting students or accounting professionals, various models are employed, not limited to just the MBTI. The most noteworthy include the Big Five Inventory, commonly used in psychology and human resources research. Research using this tool has been conducted among accounting students in Germany (Bravidor et al., 2019) and Turkey (Demirci et al., 2015). As with the MBTI, research using the Big Five Inventory is also conducted among

¹³ This applies not only to psychometric research in accounting.

accounting professionals. Levy and Richardson (2011) used it to investigate personality traits in relation to the career satisfaction of accountants. Saadullah and Bailey (2014) investigated the effects of the Big Five personality traits on the ethical decision-making of US accountants at various levels. Doublin (2015) used it to investigate the personality traits of accounting professionals in different practice areas. In Portugal, Samagaio and Felicio (2022) analyzed how the Big Five auditor personality traits impact audit quality, while Asare et al. (2023) demonstrated the homogeneity of personality traits within the American auditing profession. Burton and Daugherty (2016) had used the MBTI a few years earlier for a similar purpose. Taggar and Parkinson's (2007) review article pointed out that the Big Five and MBTI are the two most common personality typologies used in accounting.

Other personality tests found in accounting research include the following, e.g., Cattell's 16 Personality Factors Test (Davidson, Etherington, 1995), Holland's test of occupational personality (Ponemon, 1992; Cewinska et al., 2017), and the Keirsey Temperament Sorter (KTS) (Bealing et al., 2006). The importance of personality research in relation to accounting was perhaps best summarized by Briggs et al. (2007), who stated that: "personality theories and their application to the accounting profession could assist in helping to understand why corporate collapses and current trends are occurring, by understanding the internal processes of the individual in the profession".

In psychometric accounting research, the object of measurement is not only personality as a whole, but also specific traits. One of the most frequently studied traits in relation to accounting, and specifically to auditors, is professional skepticism. Hruttt (2010) developed a scale to measure professional skepticism (the Hruttt Professional Skepticism Scale – HPSS). Ying and Patel (2016) used the scale in a comparative study between Chinese accounting students in Australia and China. Ciołek (2018) used the HPSS to examine whether accounting programs at a Polish economic university shape the "search for knowledge" trait more effectively than other economic programs. Chen et al. (2023) studied the effects of professional skepticism (also using the HPSS) and personality traits (using the Big Five) on audit quality in Taiwan. Sampaio et al. (2020) used the HPSS to link auditors' skepticism to the Dark Triad personality traits (narcissism, Machiavellianism and psychopathy) in Brazil.

The Dark Triad has attracted significant attention from accounting researchers. Hobson et al. (2020) experimentally studied the impact of Dark Triad personality traits on the conduct of US auditors and found that auditors with higher Dark Triad scores "are relatively more resistant to lapses in professional skepticism due to the effects of social interaction". There are also studies on only two or one of the traits from the Dark Triad. For instance, Bailey (2019) examined the joint effects of narcissism and psychopathy on accounting students' attitudes towards unethical professional practices. Earlier, Bailey (2017) examined only the influence of psychopathy. Brown et al. (2013) assessed the level of narcissism in accounting students at universities in the American Midwest in comparison to other business students.

Another trait that can significantly translate into the effects of studying or working in accounting, and which is studied in this context, is conscientiousness. It is one of the five personality traits of the Big Five personality theory. Emerson and Yang (2012) examined the relationship between conscientiousness and the auditor's ability to detect fraud. Meanwhile, Perlow and Kopp (2009) studied the impact of conscientiousness on accounting students' performance.

In the context of accounting education, learning style has long been a subject of great interest. Baker et al. (1986) assessed the learning style preferences of accounting students, while Geiger (1992) studied the learning styles of introductory accounting students in relation to course performance and satisfaction. McKee et al. (1992) compared the learning style preferences of Norwegian and American accounting students. Eide et al. (2001) noted that most of those studies were conducted using Kolb's Learning Style Inventor, so they used the Canfield Learning Style Inventory for the first time. Duff (2001a), on the other hand, examined the learning styles of British students using the Learning Styles Questionnaire (while checking its psychometric properties).

In subsequent years, learning styles research also used other measurement tools, e.g., Fedler's learning styles (McChlery, Visser, 2009), Flemming's VARK (visual, aural, read/write, kinesthetic) Questionnaire (Stefani et al., 2023) or the Honey and Mumford Learning Styles Inventory (Polat et al., 2015). Still, Kolb's inventory continued to be used (e.g., Novin et al., 2003; Sugahara, Boland, 2010; Cekiso et al., 2017). It is interesting to note that those studies were conducted in very different parts of the world, including the UK, Australia, Japan, Turkey, Indonesia, and South Africa. Based on a study conducted on a large group of students, Cameron et al. (2015) determined that student learning styles should be assessed before designing appropriate teaching methodologies to maximize the educational benefit for the accounting profession. As explained by Poon Teng Fatt (1995), research on learning style "can enable educators to structure their accountancy curricula and teaching methods to maximize learning". Learning style has been studied in both students and professional accountants (e.g., Collins, Milliron, 1987). This is important because accounting professionals also learn (for some professions, continuing education is mandatory).

Locus of control has long been measured in various contexts in accounting research. Brownell (1981) examined it as a moderator of the relationship between budgetary participants and managerial performance. Similarly, Mia (1987) included it as a factor that influences participation in budgetary decision-making. Mareta et al. (2021) examined its moderating role in relation to the impact of abusive supervision on budgetary slack. Chong and Eggleton (2023) examined the interaction between task uncertainty, locus of control, and management accounting systems. Locus of control has also been studied as a determinant of auditors' behavior and performance (e.g., Tsui, Gul, 1996; Bernardi, 1997; Hyatt, Prawitt, 2000; Donnelly et al., 2003a and 2003b; Srimindarti et al., 2015; Anugerah et al., 2016; Siregar et al. 2018). Sahla and Iryanie (2018) examined the influence of locus of control, Machiavellianism, and ethical reasoning on auditor behavior in

conflict situations. It is one of many examples of accounting studies in which very different psychological variables were measured simultaneously.

Locus of control is also measured in accounting students. Radianto et al. (2021) studied how it influences the financial attitudes, financial self-efficacy, and, ultimately, financial behavior of Indonesian students. Hermawan et al. (2021) measured intellectual intelligence, emotional intelligence, and spiritual intelligence and examined their effect on the understanding of financial accounting with an internal locus of control as a moderating variable.

Manifestations and types of intelligence are frequently measured in accounting studies. Shute (1979) measured American accounting students' abstract reasoning, which is the highest form of thinking, and tested the relationship between their cognitive development and academic performance. Ferrater-Gimena et al. (2015) studied abstract reasoning and arithmetic ability as determinants of accounting students' academic performance in the Philippines. Bradley (1998) investigated the link between cognitive reasoning abilities and performance in ill-structured accounting tasks (particularly in business valuation). Jones and Davidson (2007) measured accounting students' problem-solving abilities using two measures of linguistic performance and one of cognitive complexity. Hasan et al. (2020) investigated the influence of, among others, critical thinking disposition and rule observance attitude on Australian auditors' material judgments. In a study of financial analysts in Singapore, Li et al. (2022) showed that abstract thinking improves forecast accuracy and the informativeness of recommendations. Eynon et al. (1997) examined the moral reasoning abilities (MRA) of Certified Public Accountants.

Emotional intelligence has also been measured in accounting research, which may be surprising to someone who views accounting stereotypically. Australian researchers Jones and Abraham (2008), justifying their study of emotional intelligence, wrote that developing it is very important when preparing accountants for today's global business environment. With a similar mindset, the emotional intelligence of Canadian students was studied by Nicholls et al. (2012). In addition, they evaluated the two measurement tools they used (the Emotional Quotient Inventory – EQ-I – and the Mayer-Salovey-Caruso Emotional Intelligence Test – MSCEIT,) stating that they must be improved, as respondents can manipulate their results.

Resilience is also sometimes the subject of research. However, it is not generally studied as a trait that affects performance at university or work performance in accounting, but as a coping strategy for reducing stress and preventing burnout or turnover/departure intention. Such a study was conducted by Smith et al. among US accounting students (2019) and auditors (2020).

Occupational stress and burnout are, next to personality and learning style, the most common areas of psychometric research in accounting. Stress and burnout are psychological states rather than characteristics of the psyche, though their measurement falls within the concept of psychometrics. In 1981, a pioneering article on the measurement of burnout was published (Maslach, Jackson, 1981), and two years later, Rose (1983) reported on burnout among accountants.

In a study that inspired subsequent researchers, Fogarty et al. (2000) developed a model of antecedents and consequences of professional burnout specifically for the accounting profession, with role stress as an antecedent and job satisfaction, job performance and turnover intention as consequences. Similar studies were conducted later by, among others, Almer and Kaplan (2002), Guthrie and Jones III (2012), and Smith et al. (2017). In turn, Cooper et al. (2019) examined the relationship between role stress and exhaustion, which is one of the dimensions of burnout. Law et al. (2008) examined the impact of a person's childhood on role stress-related exhaustion. Smith et al. (2020) considered resilience, which is perceived as a reducer of stress and burnout. Herda and Lavelle (2013) researched burnout and turnover intention in relation to the quality of the relationship between auditors and their firms.

The vast majority of relevant studies on burnout or job stress in the accounting profession were conducted in the USA and concerned Certified Public Accountants. As the amount of interesting and high-quality research from other countries is scarce, the following are worth mentioning: three studies from Iran, which concerned resilience, stress and audit quality (Arad et al., 2020), the impact of personal characteristics, quality of working life and psychological well-being on burnout (Salehi et al., 2020), as well as the relationship of stress and burnout with auditors' job performance (Hosseini et al., 2015); a study from Malaysia on the relationship between burnout and turnover intention (Mansor et al., 2018); a study from China examining the relationship between the auditor's stress and audit quality (Yan, Xie, 2018), and a study from Jordan indicating a significant relationship between exhaustion and risk assessment conducted by an auditor (Abuaddous et al., 2018).

Accounting research also concerns work engagement, which is considered the antipode of burnout. It is defined as "a positive, fulfilling work-related state of mind that is characterized by vigor, dedication, and absorption" (Schaufeli et al., 2006). Yakin and Erdil (2012) studied the relationship between work engagement and job satisfaction. Their study also measured self-efficacy, which is one of the most studied aspects of human psychological functioning (Ziemiański, Zięba, 2014, p. 91). Palumbo (2022) measured accountants' work engagement as a mediator in the relationship between involvement and the ability to deal with work-life balance.

Section 2 mentioned that it is worthwhile studying these traits or psychological states, which we can reasonably assume will have a significant impact on accounting, or else the study will be a mere curiosity. An example of this kind of research is the study of the relationship between accounting students' humor style and academic performance (Chaigusin, Promsri, 2020).

In the course of reviewing the literature, we repeatedly came across studies in which certain variables related to people were measured; however, classifying them as traits or states of psychology seemed debatable. An example of such a variable is organizational commitment (e.g., Lord, DeZoort, 2001; Bline et al., 1991; Dwyer et al., 2000). It is more of an attitude than a trait or a mental state, although it also has an emotional component, called affective commitment (Allen,

Meyer, 1990). Other variables of this type include professional commitment, moral development, and professionalism (Adler, Liyanarachchi, 2019).

At the end of Section 2, following psychologists who specialize in psychometrics, we mentioned the importance of the appropriate quality of measurement tools used. Those in the accounting research community who use psychometric testing are generally aware of this fact. Particular attention to this issue was paid by Duff (2001a, 2001b), who proposed including information about the measurement properties of research instruments used in published papers, arguing that information on the reliability and validity of item scores is useful to readers, journal editors, and reviewers.

The review of the literature, despite its incomplete nature, clearly shows that:

1. Studies using psychometric tests in relation to accounting are numerous worldwide.
2. Studies are differentiated in terms of what they measure, as they concern many traits and mental states, e.g., personality and its dimensions, as well as individual traits, different types of intelligence and mental abilities, and stress and occupational burnout.
3. The majority of these studies suggest varying degrees of association between those traits and states and accountants' decisions, judgments and behavior, and – through them – accounting information.

Thus, the scoping review of the literature also indicates that conducting accounting research with the use of psychometric tests is justified.

Conclusions

The skepticism towards behavioral accounting, exhibited by the infrequent use of psychometric tools in Polish accounting research, is unjustified, considering the broad spectrum of research within the international accounting academic community. The use of psychometric tests in accounting research has undisputedly made and continues to make sense. The awareness that the traits and states of the human psyche affect the accounting process is a result of logical reasoning based on scientific knowledge of psychology and economics. However, it is also evidenced by the numerous and reliable studies of various aspects of accounting that used psychometric tests. Therefore, such research is not just a fad of scholars who are interested in interdisciplinarity but a prerequisite for a full understanding of how accounting information is created, communicated, verified, and used.

Although accounting studies that have used psychometric tests are numerous and varied, there is still much room for new research. There are many aspects of the human psyche whose link to accounting has not been examined sufficiently, if at all. Even those that have been studied several times are worth further research, firstly because new and better psychometric tools are being continuously developed and secondly because accounting is constantly changing. In our opinion, the psychometric trend in accounting is and will continue to be important for a long time to come.

There is huge potential for psychometric research in accounting. This is particularly true for Polish academic society, where such inquiries almost do not exist. Based on the reviewed literature, we specify different research several recommendations concerning the research range and topics:

- Research on the adoption of existing psychometric tools developed in other countries and cultural backgrounds.
- Research on the personality traits (e.g., introverts, Machiavellianism) of Polish accountants.
- Research on how psychological phenomena (e.g., occupational burnout, locus of control) impact Polish accountants.
- Country comparisons that include Poland (e.g., comparative studies that encompass different Eastern European countries, including Poland).
- Research concerning different stages of an accountant's education and professional career in accounting.
- Investigations that compare accountants to different professions.

Moreover, there is great potential for networking and cooperating. We suggest the following:

- cooperation within multidisciplinary teams (e.g., consisting of accounting researcher, psychologist, and statistician)
- cooperating in international teams (for example, researchers from the same region, like Central and Eastern Europe).

Moreover, there are different publication possibilities. Our review shows that they include the following:

- general accounting journals,
- behavioral accounting journals,
- accounting education journals,
- psychological journals,
- journal devoted to international and regional issues.

We hope our recommendations are helpful for Polish accounting researchers undertaking the challenge of conducting accounting research using psychometric tests.

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