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## Competences Assessment and Evaluation Differences and Errors – a Case of IT Profession

**Abstract:** The purpose of this paper is to verify the hypothesis assuming that appraisal evaluation in companies is overestimated, especially in the case of male IT professionals. Although a valid and reliable evaluation and assessment method exists, and the Development Center method could be mentioned in this context, competences are not assessed properly enough in business. To achieve this goal, the authors analyzed a competence profile relevant to labour market regarding interns graduated from the Polish-Japanese Institute of Information Technology (P-JIIT). The authors explored the results of competence assessment conducted with the Development Center method, as well as the results of performance evaluation upon the completion of a three-month internship in the leading IT companies. The analysis of differences with respect to gender was made basing on the two sources of information on competences. It is preceded by an introduction outlining the main competence-related issues, the Development Center and the performance evaluation principles and errors, as well as the project for IT graduates carried out in the P-JIIT.

The findings of the study show that in terms of the performance women in IT industry are evaluated by employers lower than men. This, however, is not the case when we take into consideration reliable scores of assessment conducted by objective assessors during the processes of Development Center.

**Key words:** Development Center, performance evaluation, IT professional, evaluation errors, gender differences, Poland.

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## Preface

This article discusses the problem of competences assessment. Namely, it addresses the observed differences and mistakes in assessment depending on the method applied and the gender of the assessed individuals. A reliable and valid employee and candidate competences assessment is important, since personnel decisions regarding employment and career development depend on it. The goal of this article is to confirm that performance appraisal performed by immediate superiors is too positive, especially in the case of male IT specialists. The authors carried out the analysis of this problem among IT professionals, specifically graduates of the Polish - Japanese Institute of Information Technology (P-JIIT), which offers its graduates internships in top IT companies.

Empirical data have been gathered from both participants and organizers of the P-JIIT's internship programmes. Intern's Development Center results and the results of performance evaluation upon the completion of a three-month internship have been used. First, differences in the results of assessment conducted with the use of both methods are contrasted. Next, it is assessed to what extent the differences are grounded in the prognostic relevance of DC. The analyses have been conducted separately for male and female assessment subjects.

For the purpose of this article, subject-matter literature has been analyzed in the scope of competences, employee appraisal and Development Center. Desk research has been conducted in relation to IT specialists' job and competences as well as competency assessment statistical analysis and its prognostic relevance.

The article is composed of several sections, starting with the preface, followed by the definition of the term competence, the explanation of the main rules for employee appraisal and mistakes typical for the process, and the description of Development Center with its reliability and validity criteria. Further, the branch and profession of IT specialists is presented, including the goals of IT professionals education and P-JIIT interns development programme. The following section presents empirical data analysis and conclusions. Application and scientific recommendations are presented in the Conclusions section.

## Competence

The exploration of competence as one of employee's characteristics goes back to the 1970s when McClelland [1973] published a research paper 'Testing for competence rather than for intelligence'. At that point competence became a key component of employee characteristic in terms of their effectiveness and performance. Neither intelligence tests scores nor academic aptitude can determine job performance or lifelong success.

Thanks to Boyatzis [1982] it was confirmed that competence is a bundle of knowledge, skills, abilities, traits and behaviors. Thus, competence reflects the ca-

pability of performing rather than the actual performance itself. Later it was confirmed by Spencer and Spencer [1993] that competence as an individual's characteristic determines their behavior and performance at work, i.e. in their professional settings, which is a fundamental finding.

Competences manifest themselves in behaviors. As Jabłońska – Wołoszyn [2008, pp.48] emphasizes, competence “is expressed through behavior, the way in which a professional works, which allows them to achieve outstanding results, expected by the organization.” Employee's competences by Rostkowski [2014, pp. 42] are defined as “knowledge, skills, abilities and attitudes of employees, activated in the process of work and aimed at the implementation of the organization's strategy”. Thus, employee's competence comprises whatever employee has and engages in order to pursue the organization's strategy.

Competence as an individual's feature is their intangible value. Therefore, they can make decisions concerning the way and the area in which they use competence. Competences are not about willingness or possibility, they are disclosed in one's behavior. Professionals transfer competences from vocational settings to personal area; they act and express themselves in line with their underlying competences. Their behaviors provide relatively valuable material for further observation and evaluation. Due to this fact, competences can be measured at several levels of excellence. However, competence evaluation score cannot be regarded as definite, since the level of competence may change over time; consequently, it can increase or decrease. Despite the ongoing discussion aimed at establishing to what extent specific competences can be changed, they seem to be developed with the aim of satisfying an immediate need.

### **Performance Evaluation Standard and its Errors**

Competences can be assessed for several reasons. Employees' competences are assessed according to performance feedback scale. The focus here is on the way in which employees behave when fulfilling their tasks, rather than on what kind of outcome they produce at work. Performance appraisal can be conducted by other individuals who witnessed how an appraisee behaves at work. It is noteworthy that a number of organizational roles entail performance review of employees or interns.

The immediate supervisor is usually in the best position to observe and evaluate the performance and the competences of their subordinates. Upward evaluation can also take place when subordinates assess how competent their immediate supervisor is. Peer appraisal is carried out when employees at the same level of job responsibility appraise each other. When appraisee is asked to evaluate themselves, we speak of self-appraisal. Typically, a team of appraisers cooperate to establish the final score of competence level. In some cases a rating committee operates, when 3 - 4 supervisors evaluate the level of competence.

Apart from this, human capital specialists assess employees' competence. They are involved in the assessment process on special occasions such as promotion, training plan, human capital audit or shortlisting the candidates applying for work.

In all the above cases the process of appraisal is conducted by individuals. Naturally, we can expect that as humans they will be different from each other. For instance, we will observe a variety in terms of their competence necessary for objective assessment of other people's behaviors reflecting their competences. There are several errors that affect the quality of assessment they perform. In this connection, a number of examples can be quoted, which illustrate the factors affecting performance and competence appraisal [Biddle 1987]. The most common of them include:

- Unclear Standards – ambiguous goals and appraisal dimensions can result in a biased appraisal process.
- Halo or Horn Effect – the influence of an appraisers' general impression on the final score. The halo effect occurs when one positive factor overshadows all the negative factors, whereas the horn effect is opposite - it can be observed when the impact of a negative factor or score alters other scores and the overall appraisal.
- Leniency or Strictness – some appraisers have a tendency either to overrate or underrate the evaluated individuals. We deal with leniency when an appraiser tends to offer a higher score than it is demonstrated by particular performance. At the same time, we can speak of strictness, as opposed to leniency, when the score is evidently lower than it could be expected.
- Attribution bias or stereotyping – preconceived views on individuals or groups such as age, race, gender or other characteristics can result in abnormally low or high scores.
- Central Tendency – it occurs when appraisers stick to the middle of the rating scale, thus rating everyone as average in every dimension of performance evaluation.
- Recency bias – we speak of it when the following interrelation is observed: the more recent a particular behavior is, the more likely it is to influence the score in a positive or negative way [Dessler 2012].

Assessors tend to make mistakes in their evaluation. Nevertheless Latham and Wexley [Hedge and Kavanagh 1988] suggested that rating errors are pervasive, and raters simply do not know how to correct them. Generally, the trend to overestimate rather than underestimate results from the evaluating supervisors' preoccupation that excessively unfavorable score may demotivate the appraisee or reveal the supervisor's insufficient involvement in monitoring their employee and supporting them in case they face difficulties [Prowse P., Prowse J., 2009]. In addition, appraisal score often influences one's career development; it may be either inhibited

or accelerated. Typically, high score obtained by an intern offered a wider prospect for their further career upon the internship completion. This might have prompted the assessors to give their subordinates a more favorable score. Furthermore, a relatively low objectivity of assessment results from adopting the “top-down” evaluating approach” [McGregor D., 1957]. This kind of assessment is inherently gender biased, which significantly disrupts the process of evaluating women by their supervisors [Fletcher C., 1999]. On the one hand, women are perceived as demonstrating feminine features and therefore more competent in communication and cooperation; on the other hand, their competence in handling tasks or dealing with difficulties is evaluated as insufficient. This error is frequently combined with another presumption – as Landy and Earr [1980] indicate, in occupations perceived as masculine, ratings of females tended to be lower than males.

IT-related jobs are perceived as masculine. At the same time, in IT industry the male programmers absolutely outnumber the female ones. This may pose the risk of Double Standards and Extremity Effects emerging. A woman, unlike a man, is not a model IT professional. Therefore, women are assessed in a more restrictive way – they have to demonstrate more competences to achieve the same rating as the representatives of the dominating group, in this case, the group of men (this applies to good and higher ratings) [Eagly A. H., Karau S. J., 2002].

### **Validity and Reliability of Assessment and Development Center (AC/DC)**

Assessment and Development Center can be described as multidimensional processes of competence assessment by selected independent and objective assessors. This involves a specific arrangement of methods, assessors and assesses gathered in one location for one or two days. The definition of Assessment and Development Center proposed by Rowe [2013, p. 37] provides as follows: “An assessment center is a process employing multiple techniques and multiple assessors to produce judgments regarding the extent to which a participant displays selected competences”. Although the definition quoted above is influential, still it has certain limitations. The main reservation concerns judgment development. We can rightly treat judgments as absolute conclusions, expressing certainty, whereas competence assessment serves as a reliable method involving limited prediction. Even though the AC/DC has a higher efficiency and validity in comparison to other evaluation methods, its predictive value is not higher than 76% [Wąsowska-Bąk K., Górecka D., Mazur, M. 2012]. The method can be applied any time, depending on an organization or a society needs. Development Centers are focused on assessing competences and an individual’s potential to fulfill specific roles. Therefore, they are organized with the intention of developing a strategy for career planning, training, or people’s development. As a result, the evaluation is performed of the gap between the competences expected and those actually held; moreover, the follow up is offered on how to improve them.

The basic elements of Assessment and Development Centers which guarantee the validity and reliability of the prediction include the following activities:

- Job analysis or competence modeling identifies dimensions or other variables to assess.
- Multiple assessment techniques are used to elicit relevant information.
- The assessment techniques include simulations of job-relevant situations.
- Multiple, trained assessors are involved.
- Overt behavior demonstrated by participants is classified with respect to dimensions or other variables.
- Systematic procedures are used to record, classify, report, and occasionally rate behaviors.
- Integration of the data across assessors, exercises, and categories is carried out within a certain time span after the observation by means of a systematic process [Thornton III G. C., 2011 ].

Another key factor determining the reliability and validity of DC is the standard of assessors' assessments. The assessors team consists of specially trained people who are not functionally related to appraisers. Work standard regulates the assessors' activities precisely in order to achieve objective evaluation.

Assessors are trained in evaluation issues, in using the competences' scale, implementing the AC/DC standards, and offered special preparation prior to every session, differing in terms of its methodology.

The time to find behavioral evidence by assessor is the period over which the ongoing real time observation takes place of AC/DC exercises, which is aimed at finding behavioral evidence by an assessor. Their main task is to observe, record, classify and evaluate (ORCE) different behaviors of the assessees. All those activities are focused on the competences to be assessed, which are clearly indicated in every exercise. Over one exercise an assessor handles no more than 6 - 8 competences to be assessed [Thornton III G. C., 2011 ], so the number of competences in one exercise never exceeds 6. Apart from this, assessors are familiarized with the scenario of every exercise; thus, they know what kind of behavior indicators are likely to be displayed by the assessees.

They work individually during a DC session and cooperate with other assessors to figure out what the competences characteristics and scores of DC participants are. Each task has to be assessed by at least two assessors. Each of the assessors works individually, however, they ultimately have to reach a consensus as regards the observed behaviors. The best practice seems to be refraining from expressing any opinion regarding DS's competences until the end of the session.

As Rowe [2013] claimed, despite all the existing principles and preparation, the assessors make some mistakes. Their personal characteristics such as kindness or age, combined with certain evaluation errors can be perceived as pitfalls in terms

of assessments outcomes. Still, the evaluation carried out during performance appraisal is less reliable and less valid.

Since the first applications of assessment and development center method, which took place in the 1970s, only a limited number of studies indicated gender bias. Riggi et al. [Bobrow W., Leonards J.S. 1997] when analyzing the ratings with respect to the gender of a session participants did not find significant differences in ratings for men and women ratees on any of the assessment dimensions.

### **Competence Assessment and Evaluation in the Developmental Project for Interns from Polish – Japanese Institute of Information Technology**

The IT sector is highly innovative, where employees' competences serve as the key to success. Some competences are specific, they require a wide scope of knowledge, experience, skills, abilities and talents which are necessary to perform professional tasks in a specific workplace and within the profession [Research Reports, 2012-2014] – where major emphasis is made on technology.

Despite the necessity of specific competences, some transferable competences such as predispositions and potentials of qualifications, as well as the experience determining efficient performance in various professional contexts and enhancing the full potential of the qualification and professional experience [Turek, D. and Wojtczuk-Turek, A. 2010] are also important [Wojtczuk-Turek A., 2014]. People who have transferable competences are still sought for on the Polish labor market [Kompetencje... 2011]. Thus, the combination of transferable and specific competences is necessary to be effectively employed in IT sector.

**The IT-related jobs are perceived as those performed by men. The main reason for this is the existing stereotype classifying computer science as men's preserve [Mitura A., 2012]. There are more men than women choosing technical majors during their studies, which also applies to computer sciences. So, 91% of IT sector employees are college graduates [IT@PL..., 2013]. If we look at companies operating in programming and IT consulting, we can notice that they employ (62%) men and women (38%).**

It seems to be important for universities of technology to educate professionals equipped with reliable skills in computer science, as well as the necessary knowledge and attitude to work as IT specialists on individual and team tasks.

As an example of an institution of higher education satisfying these requirements we should mention the Polish Japanese Institute of Information Technology, where an undergraduate program of computer science at bachelor level is focused on:

- providing current learning outcomes and market verification of skills by integrating the program with professional certification paths in IT recognized in the labor market;

- the development of social competences necessary for creative work, teamwork and entrepreneurship.

Recurring surveys of students' opinion show that the educational program of the Faculty of Information Technology is highly valued. Students appreciate the emphasis made on practice, selective approach to theory, program adjustments aimed at keeping up with market changes and meeting the requirements of employers, access to the courses and an opportunity to obtain certificates (including those of Cisco and Microsoft), as well as modern teaching methods.

An additional activity supporting students development is career counseling. Students can choose career paths based on individual competence diagnosis and labor market opportunity. The P-JIIT facilitates employment decisions by searching interesting vacancies, apprenticeships and internships programs.

In order to comply with the European priority of promoting technology-related sciences among young women and supporting their career development, the P-JIIT has initiated specifically tailored activities.

A 'University Closer to Business - Graduate Closer to Work' Project offered an opportunity of a 3-month internship for 76 students over the period of 2011-2012. Female students were encouraged to participate in it. Over the selection process students or graduates who applied for an internship were subject to several stages of evaluation, which were aimed at assessing their the core labor market competences. The P-JIIT in cooperation with employers selected the interns, whose competences were assessed by independent assessors. During the assessment session, the Development Center assessors focused on competences desirable in the labor market such as: Entrepreneurship, Consistency of goal's pursuit, Dealing with difficulties, Cooperation, and Communication.

Students took a 3-month internship in the key companies of the IT sector; upon their completion they obtained the evaluation of their work. In addition, the internship keepers – companies employees completed the internship evaluation survey, which comprised an overall performance evaluation and individual characteristics based on interns performance and behavior. With the information gained on competence scores, the analysis of competences assessment and evaluation differences was possible.

### **Analysis**

Analyses were conducted based on the data regarding the interns' competence assessment gathered during the Development Center, as well as the interns' performance evaluation obtained from their supervisors upon the completion of a three-month internship in IT companies. DC allowed for the assessment of competences that are important to commence and persevere in their careers. At the same time, the scores obtained after the internship enabled the verification of the competences advancement during the work process.

In order to perform the analysis a recalculation of rating scales was necessary. During DC a 1 - 4 rating scale was used; however, during performance evaluation of interns a 1-5 rating scale was used. Ratings were transformed so that the maximum score was 100 and the minimum equaled one. For example, a score of 4.1 on a five-point scale is interpreted as 82; similarly, the score of 2.6 on a four point scale equals 65. For comparisons we used an average assessment of all the ratings of competences obtained from DC, as well as general evaluation performance scores of internship.

**Table 1. Recalculation of evaluation and assessment scores**

Source	Evaluation and assessment dimensions	nominal rate	recalculated score	nominal rate	recalculated score
		women	women	men	men
employer	General	4.1	82	4.3	86
DC	Average	2.6	65	2.4	60
employer	Team work skills	4.5	90	4.2	84
DC	Cooperation	2.7	67.5	2.3	57.5
employer	Communication skills	4.5	90	4.3	86
DC	Communications	2.7	67.5	2.4	60
employer	Consistency in words and deeds	4.6	92	4.5	90
DC	Consistency of goal's pursuit	2.6	65	2.3	57.5

Source: own.

Next, the dimensions (in case of DC) and characteristics (in case of employer) were selected, which are comparable in terms of team work skills and cooperation, communication skills and communications, consistency in words and deeds and consistency of goal's pursuit; the corresponding results are presented below (see Table 1).

In general, the interns received higher scores from their superiors in comparison to those obtained during DC. The evaluation of the interns was higher by at least 4 points, with a maximum of 32.5 points (see Table 2).

**Table 2 Scores differences by assessment method**

Source	Dimensions	Women	Men
employer	general	82	86
DC		65	60
	differences	17	26
employer	cooperation	90	84
DC		67.5	57.5
	differences	22.5	26,5

employer	communication	90	67.5
DC		86	60
	differences	4	7.5
employer	consistency	92	90
DC		65	57.5
	differences	27	32.5

Source: own.

The superiors' general performance evaluation of the interns reached 82 points for women and 86 points for men. In several dimensions female interns were evaluated by the supervisors higher than male. The biggest discrepancy was noted in terms of creativity and independence of problem solving, as well as substantive preparation. In all other dimensions men were evaluated higher than women. Although the general evaluation of women is lower than that of men, all scores average amounted to 4.4 and was the same for men and women.

However, during the DC assessment, women were scored higher than men. Their general rating was 5 points higher than that of men; this was even more evident in other dimensions of assessment.

**Table 3. Interns' DC scores distribution by gender**

Evaluation dimension	Women	Men	Differences
General score	65	60	5
Cooperation	67.5	57.5	10
Communication	67.5	60	7.5
Consistency	65	57.5	7.5

Source: own.

DC assessment and performance evaluation are the two methods representing different approaches. The development center is a method whose validity, reliability and prognostic relevance have been acknowledged, in this case further analysis was made. With the assumption that the prognostic relevance of DC is not higher than 76%, the potential scores of performance evaluation were calculated, based on prognostic relevance of 62%, due to specific group and methodology adopted. Hence, the performance evaluation score could be higher or lower by 38% from DC assessment scores. For example, a DC score of 60 could generate the performance appraisal score between 37.5 and 82.5. The calculation was made with respect to gender, which is shown in table 4 and 5. A conclusion can be drawn that every performance evaluation in case of men was overestimated; the scores are higher than the potential maximum. Even though performance evaluation scores are higher than those obtained during DC in case of women, the scores fit the intervals, with one exception, namely that of consistency.

**Table 4. Prognostic relevance calculation of men scores**

	<b>DC</b>	<b>Min</b>	<b>max</b>	<b>employer</b>
General score	60	37.5	82.8	86
Cooperation	57.5	35.6	79.3	84
Communication	60	37.2	82.8	86
Consistency	57.5	35.6	79.3	90

Source: own.

**Table 5. Prognostic relevance calculation of women scores**

	<b>DC</b>	<b>Min</b>	<b>max</b>	<b>employer</b>
General score	65	40.3	89.7	82
Cooperation	67.7	42	93.4	90
Communication	67.7	41.8	93.1	80
Consistency	65	40.3	89.7	92

Source: own.

## Conclusions

The purpose of this paper is to verify the hypothesis assuming that appraisal evaluation in companies is overestimated, especially in the case of male IT professionals. Furthermore, competences evaluation performed in organizations only by line managers has certain drawbacks in terms of its reliability and validity. These drawbacks do not exist when Assessment and Development Center is applied.

Hence, theoretical and empirical analysis conducted in IT sector in Poland, provided the data allowing for the formulation of the following conclusions:

- Evaluation of the competences performed by individuals lacking preparation is unreliable. Such evaluation is fraught with stereotypes and evaluation errors. As a result, internship keepers evaluate the interns too favorably; furthermore, men obtain higher scores than women.
- DC represents a reliable and valid assessment tool for competence evaluation, which has been confirmed in numerous studies. The obtained outcomes based on DC allow for the estimation of the area of uncertainty. Competence assessment obtained by interns is supposed to be objective. The analyzed information of the DC competence scores has brought the authors to a conclusion that interns have not reached a good score; with women having slightly higher scores than men.
- Employers appraise IT female professionals unreasonably lower than their male counterparts. The scores obtained are not justified by underlying facts, which was confirmed by the analysis and comparisons of the evaluation and assessment scores. As a result, the scores got by women from the interns keepers were more adequate, while the assessment of men was overestimated.

The conclusions were drawn basing on our specifically developed and conducted Project, whose outcomes provide interesting data for further research. This sample can serve as the illustration of a phenomenon rather than scientific evidence applicable to general population.

The authors are fully aware of the fact that the study has its constraints such as a limited number of individuals subject to research, different evaluation criteria and assessed competences, or the assumption of the highest possible predictive value of DC results.

The analysis presented can serve as the first stage to further more detailed investigation to be carried out. Over the prospective activities it would be useful to adopt other methods of assessment of competence, for example, 360 degrees evaluation of 360, as well as target a more relevant research sample.

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