



## The Real and the Ideal Engineer-technologist in the View of Employers and Educators

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### ABSTRACT

In accordance with the tendencies of socio-economic development and a high need for competitive engineers-technologists in contemporary society, Russia needs such a modernization of higher professional technical education system that takes into account the requirements of modern manufacture. Therefore, this article is aimed at expert research by employers and university teachers of professional and personal qualities of a competitive engineer-technologist. The leading methods in the study of this problem are the observation, conversation, expert interviews, questionnaires and testing allowing reveal an assessment by employers and teachers of most important professional competence and personal qualities of engineers-technologists. The paper finds that the most important professional competences, communication skills and moral qualities of the ideal and the real engineer - technologist, allocated by business leaders and teachers of the university, in fact are the same. Also it reveals discrepancies in the evaluation by employers and educators of engineers'-technologists' personal qualities. The materials of this article may be useful in the selection and structuring of the content of engineers-technologists' training, and may be taken into account in the implementation of students' training and industrial practice.

**Keywords:** Real, Ideal, Engineer - technologist, Employers, Educators

**JEL Classifications:** A22, I23, Z39

### 1. INTRODUCTION

Challenges of innovation development of economy and the formation of a society based on knowledge require the study of the interaction between the various institutions in the fields of education and manufacture.

The current situation on the labor market indicates that the level of graduate student's training does not necessarily correlate with the requirements of the employer. In this regard, there is the problem of actual and future specialists' competencies' matching. This agreement certainly should be conducted between the representatives of modern manufacture and the educational system (Khairullina et al., 2015;

Shaidullina et al., 2015; Gumerov et al., 2015; Torkunova et al., 2014).

However, there are a number of studies (Kuzmina, 2001; Markova, 1990; Mitina, 2003; Zeyer, 2002; Zimnaya, 2003; Kovaleva, 2005; Chuchalin and Pokholkov, 2004; Tarasova, 2001; Fatkhutdinov, 2005; Andreev, 2004; Khutorskoy, 2003), which represent different types of competences, but the greatest difficulties arise in determining the list of competencies necessary for the mastering of almost every particular specialty.

In this regard, the problem of this study, which would designate a group of competencies allocated by employers and teachers are obvious now.

## 2. MATERIALS AND METHODS

### 2.1. Research Methods

During the studies of this problem the following methods were used:

- Theoretical methods: The study and analysis of educational, methodical literature, documentation of high school on the topic of research, materials of teaching experience and their theoretical analysis.
- Empirical methods: Observation, conversation, expert interviews, questionnaires, testing, experiment.
- The statistical processing methods of the experimental results: A comparison, ranking, establishment of statistical relationships between variables, correlation analysis, and others.

### 2.2. Experimental Base

Two groups of experts participated in the experiment: Enterprises heads of Kazan light industry and the faculty of Kazan State Technological University (KNRTU). It should be noted that experts of two groups during the interview were given equal time to respond and created equal psychological and pedagogical conditions, excluding the impact of external factors on respondents.

## 3. RESULT AND DISCUSSION

### 3.1. A Study of Professional Competencies

#### 3.1.1. Assessment of engineer-technologist's professional competences by business leaders

Among the actual professional competencies the business leaders distinguish: Developed intuition (7.3 points), the ability to think logically (7 points), and the development of engineering thinking: Ability for professional self-development (6.8 points).

An interesting fact is that according to experts- managers, the engineer-technologist may not have a high level of development of creative abilities (5.5 points). This position is quite convenient for the administration from the perspective of authoritarian leadership, when the engineer is able quickly and competently to offer various solutions of professional tasks without taking initiative.

To the most important professional competencies of an ideal engineer-technologist the business leaders refer: The ability to professional self-development (8.9 points), the ability to think logically (8.3 points), development of intuition (8.3 points), and the ability to critically analysis in their professional activities (7.8 points) (Figure 1).

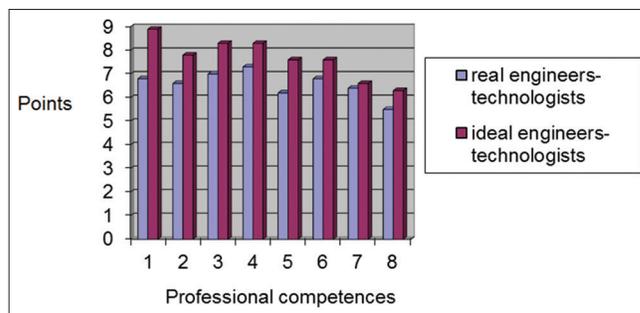
The biggest gap in the assessment of professional competences is the ability to professional self-development (2.1 points).

#### 3.1.2. Assessment of engineer-technologist's professional competences by the university faculty

As it is seen in Figure 2, the teachers the indicated real engineer-technologist's professional competences evaluate fairly equally due to the fact that they have an idea about professional competences describing the graduates (Figure 2).

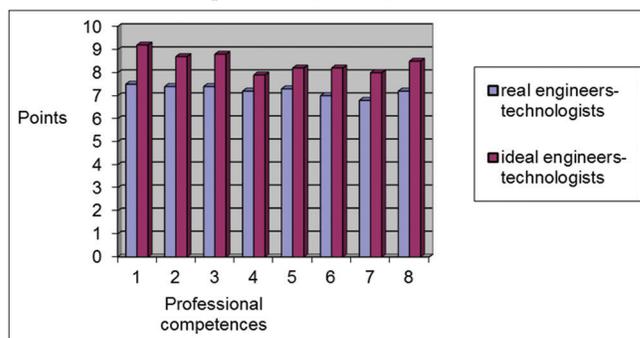
Among the most important professional competencies the experts allocate: The capacity for professional self-development

**Figure 1:** Assessment of engineers' - technologist's professional competences by business leaders



The horizontal scale - competences: (1) Developed engineering thinking: Ability for professional self-development, (2) the ability of critical analysis in their professional activities, (3) the ability to think logically, (4) development of intuition, (5) the ability to integrate ideas, (6) the ability to highlight important from the unimportant, (7) a healthy ambition, (8) creativity

**Figure 2:** Assessment of engineers' -technologist's professional competences by faculty members



The horizontal scale - competences: (1) Developed engineering thinking: Ability for professional self-development, (2) the ability of critical analysis in their professional activities, (3) the ability to think logically, (4) development of intuition, (5) the ability to integrate ideas, (6) the ability to highlight important from the unimportant, (7) a healthy ambition, (8) creativity

(7.5 points), critical analysis in their professional activities (7.4 points) and the ability to think logically (7.4 points).

Remarkable is the fact that the high level of students' creative abilities formation and in the future of specialist is, in the opinion of the teaching staff, one of the components of professional culture (7.2 points).

The distribution of the professional competencies of the ideal competitive engineer-technologist by the expert teachers is similar to the real competences and in point expression is manifested in the following way: The capacity for professional self-development (9.2 points), critical analysis in their professional activities (8.7 points), and the ability to think logically (8.8 points).

### 3.2. A Study of Personal Qualities

#### 3.2.1. Assessment of engineers-technologists' personal qualities by business leaders

To the most important personal qualities of a real engineer-technologist business leaders refer: Hard work (8.3 points), accuracy (7.7 points), the tendency to self-examination

(7.6 points), mandatory (7.5 points), stress-resistance (7, 5 points), good intuition (7.4 points) and the ability to take responsibility for their words and deeds (7.4 points) (Figure 3).

To the least important personal qualities the expert group refers: The nobility (6.2 points) and a rich life experience (5.4 points).

High ratings of personal qualities of an engineer-technologist received such qualities as patience (9.1 points), industriousness (8.3 points), good intuition (8.9 points), efficiency (8.7 points), resistance to stress (8.6 points) and accuracy (8.5 points).

Similarly, business leaders do not allocate for a real engineer-technologist qualities such as nobility (7.3 points) and a rich life experience (6.1 points), considering them unimportant for professional success.

Thus, to the basic personal qualities of the engineer-technologist by the business leaders are referred industriousness, punctuality, ability to resist to stress and good intuition.

Among systemically important qualities the largest gap between the ideal and the actual performance of its manifestation revealed by the assessment a good intuition (1.5 points). In other qualities is patience (2 points). The smallest gap is the nobility (by 0.1 points).

**3.2.2. Assessment of personal qualities of engineer-technologist by faculty members**

To the most important personal qualities of a real engineer-technologist the instructors refer: Mandatory (8 points), the ability to take responsibility for their words and deeds (7.9 points), industriousness (7.8 points), the tendency to self-examination (7.2 points) courage (7.2 points) and good intuition (7.1 points).

The lowest ratings were received by qualities: Rich life experience (6.1 points) and resistance to stress (5.9 points).

Among the important personal qualities of an ideal competitive engineer the university professors distinguish: The ability to take responsibility for their words and deeds (8.8 points), mandatory (8.6 points), industriousness (8.5 points), patience (8.3 points) and good intuition (8.2 points).

The last ratings were received by: Nobility and desire to get to the truth of 7.4 points out of 10.

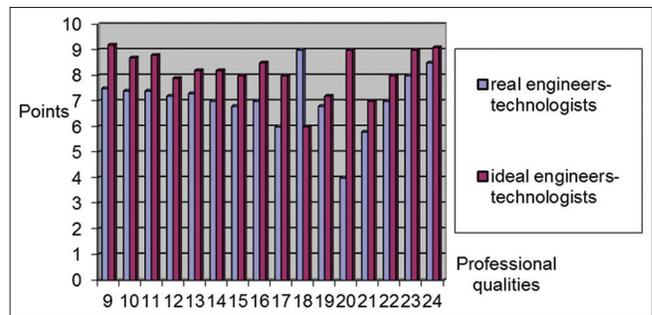
**3.3. The Study of Moral Qualities**

**3.3.1. Assessment of moral qualities of engineer-technologist by business leaders**

The moral qualities of a real competitive engineer-technologist, allocated by business leaders are: Independence, impartiality (7.2 and 8.2 points, respectively), the moral high ground (7 and 8.2 points, respectively), as well as honesty and integrity (7 and 7.9 out of 10 points) (Figure 4).

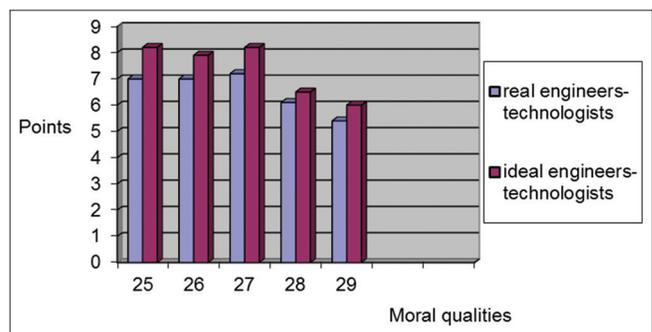
In addition, according to the enterprises' heads, the pursuit of justice, even at the expense of personal interests is the least important moral quality as that of the real and so of the ideal engineer (5, 4 and 6 points, respectively).

**Figure 3:** Assessment of personal qualities of a competitive engineer-technologist by business leaders



The horizontal scale - personal qualities: (9) Courage, (10) mandatory, (11) punctuality, (12) accuracy, (13) industriousness, (14) patience, (15) efficiency, (16) nobility, (17) resistance to stress, (18) good intuition, (19) the tendency to introspection, (20) adequate perception of criticism, (21) ability to take responsibility for their words and deeds, (22) rich experience, (23) the ability to predict the course of events, (24) the desire to get to the truth

**Figure 4:** Assessment of moral qualities of engineer-technologist by business leaders



The horizontal scale - moral qualities: (25) The moral high ground, (26) Honesty and integrity, (27) the independence, impartiality, (28) patriotism, (29) the pursuit of justice, even at the expense of personal interests

**3.3.2. Assessment of moral qualities of the engineer-technologist by faculty of the university**

To the most important moral qualities of the real and the ideal engineer-technologist experts - teachers of KNRTU refer: Independence, impartiality (7.6 and 8.3 points, respectively), the moral high ground (8 and 8.3 points, respectively), as well as honesty and integrity (7 and 7.8 points out of 10 points).

To less important moral qualities of the real engineer-technologist they refer: The pursuit of justice, even at the expense of personal interests (6.6 points), for a perfect specialist - Patriotism (7.2 points) (Figure 5).

**3.4. Study of Communicative Abilities**

**3.4.1. Assessment of communication skills of an engineer-technologist by business leaders**

Business leaders ranked the communication skills of a competitive real engineer-technologist in the following order: The ability to defend their point of view (8 points), the ability to listen and understand the interlocutor (7.6 points) and the ability to build

long-term business relationships (7.4 points). For an ideal engineer is important the ability to defend their point of view (9.2 points), the ability to build long-term business relationships (8.8 points) and being non-conflict (8.4 points).

To less important communication skills of a competitive real and ideal engineer-technologist experts referred the sincerity (6.6 and 6.9 points, respectively) (Figure 6).

The greatest discrepancy between actual and ideal manifestation of engineer-technologist’s qualities experts note in the ability to build long-term business relationships (1.4 points) and being non-conflict (1.4 points). In their view, the ideal level engineers-technologists have achieved in the ability to listen and understand the interlocutor (a difference of 0.1 points).

**3.4.2. Assessment of communication skills of engineer-technologist by faculty of the university**

The experts of the university allocate the following important communication skills of a competitive real and ideal engineer-technologist as: The ability to “play by the rules” (7.8 and 8.8 points, respectively), sincerity (7.9 and 8.7 points). For a real engineer is also important the ability to listen and understand the interlocutor (7.8 points), for an ideal - the ability to build long-term business relationships (8.8 points) (Figure 7).

To less important communication skills of the real engineer-technologist instructors refer being non-conflict (7.2 points), in the ideal model - the ability to defend their own point of view (8.3 points).

It is interesting that experts and professors as well as experts, business leaders believe that the level of manifestation of the engineer’s ability to build long-term business relationship is far from perfect one (by 1.5 points).

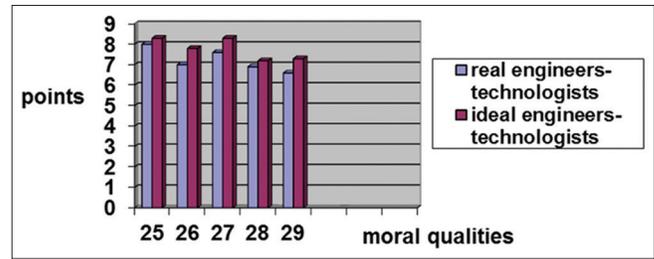
**4. CONCLUSION**

The experimental data shows that the evaluation of professional competences of real and ideal engineer-technologist is higher in case with the experts - teachers, because of their focus on “perfect - like in the book” model of a professional.

The most important professional competences and personal qualities of the ideal and the real engineer-technologist, allocated by business leaders and faculty members are actually the same. To the main backbone personality traits they refer: Industriousness, a tendency to introspection, commitment, good intuition and the ability to take responsibility for their words and deeds. To the least important personal qualities of a real competitive engineer-technologist experts of the two groups refer a rich life experience. The difference between the estimates of the two groups appeared only in respect of quality - resistance to stress.

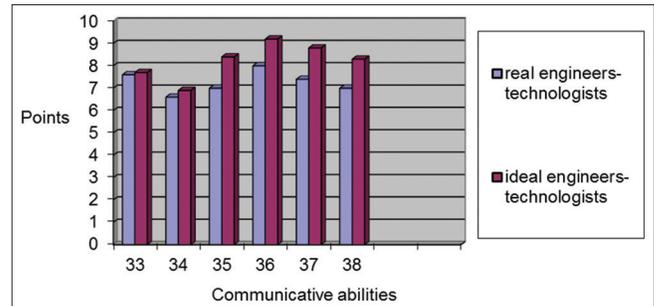
The picture on the personal qualities of an ideal engineer given by expert representatives of the two groups is quite different. To the personal backbone qualities they refer only patience, industriousness and good intuition. To the least important personal

**Figure 5:** Assessment of the moral qualities of the engineer-technologist by faculty members



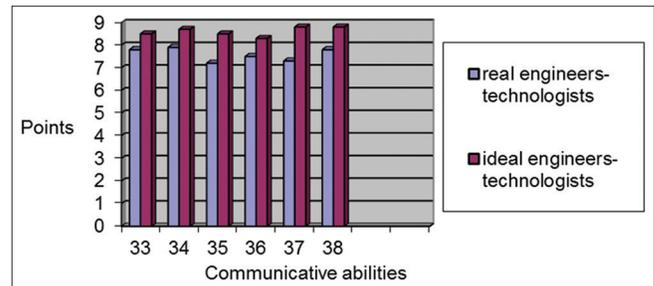
The horizontal scale - moral qualities: (25) The moral high ground, (26) integrity, (27) the independence, impartiality, (28) patriotism, (29) the pursuit of justice, even at the expense of personal interests

**Figure 6:** Distribution of communicative abilities of engineer-technologist by business leaders



The horizontal scale - abilities: (33) Ability to listen and understand the interlocutor, (34) sincerity, (35) being not conflict, (36) ability to defend their own point of view, (37) ability to build long-term business relationship, (38) ability honestly to “play by the rules” (such as confidentiality)

**Figure 7:** Evaluation of communicative abilities of engineer-technologist by faculty members



The horizontal scale - communication skills: (33) Ability to listen and understand the interlocutor, (34) sincerity, (35) being non- conflict, (36) ability to defend their own point of view, (37) ability to build long-term business relationship, (38) ability to “play by the rules” (such as confidentiality)

qualities of competitive engineer experts of the two groups refer nobility.

Comparing the real and the ideal picture of the communicative abilities of the engineer it should be noted that the most important communication skills of the real engineer is the ability to listen and understand the interlocutor, of the ideal - the ability to build long-term business relationship.

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