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AFFECTIVE QUALITY OF EDUCATIONAL SERVICES MEASUREMENT IN THE CONTEXT OF HIGHER EDUCATION MARKETING

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AFFECTIVE QUALITY OF EDUCATIONAL SERVICES MEASUREMENT

IN THE CONTEXT OF HIGHER EDUCATION MARKETING

by

HANNA V. SHAUChENKA

A thesis submitted to Plymouth University

in partial fulfilment for the degree of

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School of Computing and Mathematics
Faculty of Science & Environment

In collaboration with
Darmstadt Node of the CSCAN Network
At University of Applied Sciences Darmstadt

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I dedicate this thesis to my children Nikolai and Vera.
Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award.

Work submitted for this research degree at the Plymouth University has not formed part of any other degree either at Plymouth University or at another establishment. It has been conducted and supervised under an agreement between the Plymouth University and the University of Applied Sciences Darmstadt concerning the establishment of the Darmstadt Node of the CSCAN Network at the Darmstadt University of Applied Sciences (H_DA).

Relevant scientific seminars and conferences were regularly attended at which work was often presented and several papers prepared for publication.

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Signed

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Abstract

Affective quality of educational services measurement in the context of higher education marketing

Hanna Vyacheslavovna Shauchenka
Dipl.-Ing. (Economics Engineering), M.Sc. (New Media Marketing)

Educational marketing has become an increasingly important area within Higher Education as the competition for students has intensified. Being able to measure and understand the quality of educational services – a key factor in the decision making process for a prospective student – is an incredibly challenging problem as it involves the quantitative measurement of factors such as emotions and affections towards an Institution or programme, which themselves tend to be intangible. The application of total quality management philosophy and methodology in the context of higher education today is fully acknowledged and widely used. These conditions have defined the main task of this research: to develop a methodology for quantitative measurement of the affective quality of educational services for marketing management analysis. In other words offered research investigates how to measure things that have often been considered immeasurable. It was hypothesized that availability of a methodology for quantitative estimation of the affective quality of educational services provides additional important information that ensures an effective decision-making process in the marketing department in higher education institutions.
Kansei engineering formalizes such concepts as affections and emotions and highlights their role in the purchase decision-making process. Our KanMar (short for Kansei Marketing) approach is aimed on the implementation of the main Kansei engineering ideas in the context of educational marketing and provides the framework for the quantitative measurement of educational services’ affective quality. KanMar enables the formalization of the affective quality of educational services for its marketing analysis: comparison, prediction, control, etc. The results of such an analysis help to position own services in today’s competitive market more effectively. Data obtained using KanMar methodology enables to find out the stakeholders’ implicit motivations or attitudes. So, for example, data obtained during the conducted survey has indirectly confirmed the students’ orientation to the practical activity. This orientation is typical for the Universities of Applied Sciences and the respondents for this survey have all been students at one of them. KanMar approach also addresses major gaps of existing instruments based on SERVQUAL methodology aimed to measure service quality in education. The hypothesis was tested and partly confirmed using case study that illustrates the application of the KanMar approach.
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List of Abbreviations

3D 3 Dimensions
AIDA Attention Interest Desire Action
ANOVA Analysis of variance
AQ Affective Quality
CAB Cognition Affect Behavior
CAGR Compound Annual Growth Rate
CMoS Customer Monitoring System
CNBC Consumer News and Business Channel
DAAD German Academic Exchange Service
ENQA European Association for Quality Assurance
ES Educational Service
EU European Union
EURASHE European Association of Institutions in Higher Education
GEMS Global Education Management Systems
HE Higher Education
HEI Higher Education Institution
ISO International Organization for Standardization
IT Information Technologies
<table>
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<th>Description</th>
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<tbody>
<tr>
<td>KanMar</td>
<td>Kansei Marketing</td>
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<tr>
<td>MRT</td>
<td>Magnetic Resonance Tomography</td>
</tr>
<tr>
<td>PCA</td>
<td>Principle Components Analysis</td>
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<tr>
<td>PCP</td>
<td>Personal Construct Psychology</td>
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<tr>
<td>PDCA</td>
<td>Plan Do Check Act</td>
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<td>PR</td>
<td>Public Relations</td>
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<td>QM</td>
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<td>QMS</td>
<td>Quality Management System</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development RepGrid</td>
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<tr>
<td>RGT</td>
<td>Repertory Grid Technique</td>
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<td>SD</td>
<td>Semantic Differential</td>
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<td>SMS</td>
<td>Short Message Service</td>
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<td>SOR</td>
<td>Stimulus Organismus Response</td>
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<tr>
<td>SR</td>
<td>Stimulus Response</td>
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<tr>
<td>TQM</td>
<td>Quality Management</td>
</tr>
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<td>ZMET</td>
<td>Zaltman Metaphor Elicitation Method</td>
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Chapter 1 Introduction

Nowadays education is often mentioned as one of the most rapidly growing and perspective industries in the world (Economy Watch, 2010; Education Sector Factbook, 2012; Higher Education Facilities, 2007; Research and Markets, 2011a). According to some sources, the global education industry is the second-largest industry after health care (Research and Markets, 2011a). Thus, the market for global education expenditure could top $6.3 trillion by 2017, according to Gilfus Education Group estimates.¹ The Whitehouse Report, published in September 2011, stated that in the USA the education industry is valued at $1.33 trillion and is the second largest industry in this country next to health care (Whitehouse, 2011). The smart education² and learning market was worth $73.8 billion in 2011 and is expected to have an impressive CAGR (compound annual growth rate) of 20.3% from 2012 to 2017 (Research and Markets, 2012). TechNavio’s analysts forecast the Global m-Education³ market to grow at a CAGR of 32.50% over the period 2012–2016 (Research MOZ, 2012). In the 2000s the US educational market comprised about 60% of the global market, with the next big player being Europe with 15% (Research and Markets, 2011a; Research and Markets, 2011b). Today the ten most significant players in the global education market are: the USA, the UK, France, Australia, Germany, Japan, South Africa, Canada, the Russian Federation and Italy (Research and Markets, 2011b). More than two-thirds of international students choose these countries (Research and Markets, 2011b). Thus, it is often said that in the UK the

¹http://www.gilfuseducationgroup.com/education-market-factbook
²Smart education is also known as digital education
³Mobile education
The contribution of international students plays a significant role in the country’s economy (Research and Markets, 2011a; The Guardian Professional, 2012). At the same time, the developing countries, especially India and China, have huge potential and reflect the rising awareness in the education area (Research and Markets, 2011a, 2011b).

In the “Education Sector and Changing Trends” report, published on 11 January 2011, the special focus was on the opportunities for the private players (Research and Markets, 2011a). This highlighted the for-profit education sector as an alternative to the public institutions. Shares of US for-profit education companies are traded successfully in New York (Yahoo News, 2013). In spite of some criticism and long-time debates, this sector has demonstrated an explosive growth in the last few years (Lee, 2012; Boston College, 2012). For example, enrolment at for-profit colleges in the USA grew by 225% in the period from 1998 to 2008 (Lee, 2012). In the same period enrolment at all degree-granting higher education institutions grew by only 31% (Lee, 2012). One Dubai-based for-profit education company, GEMS Education, is planning to invest up to $1 billion in the coming years to expand the global education market (CNBC College, 2013)

The education industry had also even demonstrated stability during the period of the world financial crisis of 2007/2008 and had shown reasonable growth during the difficult-for-many year 2009 (The Economic Times, 2010). In spite of the world economic downturn, the number of students going abroad was also rising globally (Research and Markets, 2011a).
It could be said that the education market has developed in recent years as an attraction for many business players.

Higher education market is considered in the scope of offered research as system of the social-economic relations between educational institutions and its stakeholders with the purpose of exchange process.

Following important aspects of this definition should be underlined:

- Presence in higher education market of heterogeneous stakeholder groups with different expectations and perceptions. The main stakeholder groups are: society in general, state, government, scientific society, industry, staff, students and employers.

- Presence of heterogeneous exchange objects depending on stakeholder group. For example, for the scientific society the fundamental character of education is of extreme importance, while industry needs more applied orientation.

Efficiency increase of education market functioning (exchange process) could be provided by introduction of marketing approach in the sphere of educational services.

At the moment there are a lot of different players in the higher education market. They represent different countries with different education systems, and could be
public or sponsored by religious organizations or be purely for-profit organizations (DAAD, 2006; Hayes, 2007). The education market is competitive now, but even more players are expected in higher education in addition to all those existing at the moment (The Economic Times, 2010; Hawkins & Frohoff, 2009). This situation has led to increasing attention being given to the quality of the educational services provided: “The less efficient providers of higher education will find the going tough and like in any other competitive market, quality will be the determinant of success in this field” (The Economic Times, 2010). Along with the focus on this essential internal aspect (quality), the need for external competitive positioning among other players has also increased. The development of the educational market as an attractive business, high competition in the educational industry, the wide spectrum of proposed educational services and the need for stable financing require educational institutions to cope with modern marketing approaches (Brueser, 2006; DAAD, 2006; Firdaus, 2006; Hayes, 2007; Hawkins & Frohoff, 2009; Kotler & Fox, 1985; Voss & Gruber, 2006). Indeed, in recent years a stable interest has been observed in educational marketing (Azaryeva et al., 2006; Bok, 2003; Burton, 2002; Guide to Bologna Process, 2006; Hayes, 2007; Kotler & Fox, 1985). Marketing in the education industry today is a rather routine phenomenon: there are special journals dedicated to educational marketing; numerous books, researches and articles address this area; branch, PR and marketing managers specialize in the education sector; and it is usual practice to have a position of head of marketing in many higher education institutions. Educational marketing is presented not only in practice, but also in science and public discussions (e.g. numerous blogs dedicated to this theme confirm this point). Both practice and theory demonstrate a certain progress despite the relative novelty of the educational marketing phenomenon. Among the most
significant works are first of all the books of some of the world’s leading marketing gurus: Ph. Kotler and K. Fox, *Strategic Marketing for Educational Institutions*, and T. Hayes, *Marketing Colleges and Universities: A Services Approach*. Some consultancy agencies specialize in the education marketing area, e.g. the Gilfus Education Group,\(^4\) 360 Education\(^5\) and the 11ten Group.\(^6\)

A literature investigation reveals that the conceptual framework of educational marketing is quite well defined today (Bok, 2003; Brueser, 2006; Burton, 2002; Crosier et al., 2007; DAAD, 2006; Firdaus, 2006; Gibbs & Knapp, 2002; Kotler & Fox, 1985; Pankruhin, 2005; Trajnev et al., 2007). However, some problem areas still demonstrate the huge research potential. The relative novelty of the educational marketing phenomenon means that there is a lack of experience and knowledge. Thus, there is a strong demand for specific technologies and methods (DAAD, 2006; Firdaus, 2006; Kotler & Fox, 1985; Schmidt, 2007). For example, there should be technologies that bridge the gaps between ephemeral categories of marketing with its related disciplines (psychology, sociology, etc.) and the possibilities of applied information technologies. Within the offered research this gap is addressed by introducing an author’s integrative theoretical approach KanMar.

\(^4\)http://www.gilfuseducationgroup.com/

\(^5\)http://www.360education.co.uk/

\(^6\)http://www.11tengroup.com/
1.1 Research framework

Orientation to their customers and satisfaction of their aspirations in receiving high-quality education is the basis of effective activity for any of today's educational institutions (Hayes, 2007). In the competition for customers, educational institutions compete among themselves first of all in their ability to give the customers the best-quality educational service (Schmidt, 2007; The Economic Times, 2010). In this context, educational marketing should actively develop in new directions: for example, to create qualitatively new educational services, which have added value both for the customers and for the educational institution (DAAD, 2006; Dorweiler & Yakhou, 1994; Kotler & Fox, 1985). At the same time, educational services with new qualities (new specialities, high levels of knowledge, updated learning process, etc.) should impress the customers. In this context, more detailed research is required in such areas as customer behavior (Kardes, 2001) and the decision-making process concerning the choice of higher education institution. These research areas deal with special features of educational services, which belong to different domains, such as psychology, philosophy, sociology, culture.

Products in the modern market are very similar in price and characteristics and it is generally recognized both by marketing theorists and practitioners that impressions from the products are becoming extremely important for differential advantage (Athiyaman, 1997; Barnes et al., 2008; Barnes & Lillford, 2009; Bell, 1976; Brown, 1993; Carman, 1990; Cho & Wright, 2009; Elliot, 1997; Gibbs & Knapp, 2002; Gyure & Arnold, 2004; Kvale, 1992; McDougall & Levesque, 2000). Marketing
should evoke the right feelings through the product design and positioning; it operates with concepts and ideas from psychology, art and culture (Barnes et al., 2008; Bell, 1976; Carman, 1990; Elliot, 1997; Kotler & Fox, 1985; Peters, 1988). At the same time, the role of exact quantitative analysis and computer simulation in marketing is of extreme importance, because it enables the marketing analysis, prediction, planning and correction of marketing activities (Best Colleges Online, 2011; Kotler & Fox, 1985). To develop an effective marketing strategy, numerous investigations, comparisons and quantitative estimations have to be carried out. However, real experiments are often impossible because of the large number of subjects (for example, customer target groups). Modern marketing deals with intangible ephemeral categories (for example, “value of educational service”) also complicate the application of information technologies, realization of analysis and quantitative estimation. Thus, we have approached the fundamental contradiction. Offered research is based on this contradiction. It could be formulated as follows: the contradiction between the need for quantitative measurement and analysis in educational marketing and the presence of intangible categories and the large number of subjects in it. In other words, offered research investigates how to measure things that have often been considered as immeasurable.

Taking into account the recent status of the higher education market, the central problem of educational marketing can be formulated as: how to introduce educational services as a set of clear, attractive and important attributes for the customer. In connection with such a problem statement it is important to estimate the affective quality of educational services. It is not the actual real value or quality, but the mental structure that locates in a customer’s mind and creates the decision-
making process to purchase educational services. The following example illustrates this phenomenon:

*The vast majority of university entrants and their parents will accept the offer to study in Harvard University without any doubts, even being not informed on real quality of education at this university. The affective quality of the education in Harvard is extremely high and guarantees the decision for this University in the case there would be no limitations regarding finance and entrance requirements.*

It is possible to say that the affective quality of educational services is the main factor that determines the position of higher educational institutions in the marketplace (Athiyaman, 1997; Kotler & Fox, 1985). The customers themselves can not express a degree of affective quality, or, in particular, give a quantitative interpretation to this phenomenon (Nagashima et al., 2008). But the quality of a product perceived by the customers is very important information for experts in marketing, as it allows them to position their services in the market most effectively (Brueser, 2006; Kvale, 1992).

Hence, *the research problem of the quantitative measurement of the affective quality of educational services has been identified.*
Such a problem statement implies following the subject matter of the research and scope of the research:

- Subject matter of the research is the affective quality of educational services.
- Scope of the research is the quantitative measurement of this.

The proposed research occurs in the marketing context. This context requires the answer to the question “How can the phenomenon of the affective quality of the educational service be formalized for further marketing analysis?” The main task of this research is to develop a methodology for quantitative measurement of the affective quality of educational.

Based on the main task of the research, the following research hypothesis is offered: availability of a methodology for quantitative estimation of the affective quality of educational services provides additional important information that ensures an effective decision-making process in the marketing department in higher education institutions.

In accordance with the formulated main task and research hypothesis, the following research objectives could be assigned:

- To provide the social economic background for the proposed problem statement.
• To reveal the processes in marketing, education and quality areas that cause and influence researched topic.
• To analyse the concept of quality in the educational sector and to substantiate its affective dimension.
• To analyse the current higher education measurement tools and to reveal their limitations.
• To create a conceptual framework for the own approach.
• To substantiate the methodological foundation for author approach.
• To present the own approach and its application mode.
• To carry out a pilot survey illustrating the validity of the own approach.

1.2 Research methodology

This work makes an attempt to connect technical approaches with pure humanitarian ephemeral categories applied to educational marketing. Such a problem statement challenges the analysis on different abstraction levels from general societal conditions to a personal level, and also causes the nature of the research to be trans-disciplinary with approaches from psychology, marketing, mathematics and philosophy. The well-founded choice of methodology is a significant part of this research and lies behind the consistency of the whole work.

The complex nature of the offered researched problem defines the set of disciplines involved and chosen methods. This research offers the opportunity to create a dynamic and permanent methodology that will help in the analysis of customers’
attitude to educational services, and in a form that enables use of the results on different management levels (strategic and operational) and by different specialists (both teaching and administrative staff). The development of such an approach requires the use of ideas from different areas of thought, consideration of various trends in society generally and in the educational sector in particular and adequate selection of the set of methods. The main research task implies both the development of author’s methodology for quantitative estimation of the affective quality of the educational service and also a well-founded approach that substantiates the necessity, topicality and adequacy of the offered methodology in the current conditions in the educational sector, society and science. The research occurs in a complex context that includes connections between different disciplines and abstract levels.

The initial level for research is the current philosophical paradigm. The changes on this level of abstraction have caused essential trends in all aspects of human life. Education is a complex societal sector that is also involved in current moves, which is embodied in a set of quite revolutionary moves in education such as the appearance of educational marketing, the merger of marketing and management in HEI, the application of ISO standards and the infusion of TQM philosophy in education (Kotler & Fox, 1985). These moves were initiated by changed conditions and formalized by political initiatives. Current conditions also influence the paradigm of the nature of scientific knowledge with the dissemination of transdisciplinary researches and simulation models. The set of chosen methods such as personal construct theory, the Kansei engineering approach, and others, is influenced by current philosophical conditions and current movements in the educational sector and is focused on the problem area. The methodological apparatus
of the offered research will be considered in detail in the chapter “Theoretical-methodological grounds of research”.

The methodological basis of this research is composed of both general and special scientific methods. General methods are introduced by theoretical, experimental and theoretical-experimental methods.

General theoretical scientific methods used in the offered research:

- Going from abstract to particular – the investigation of the subject matter of research starts from general philosophical and societal conditions, goes through the political and sectoral trends and initiatives and then focuses on the detailed analysis of the object itself.

- Idealization – this method is used for simplification of the difficult systems and processes that allow those properties and relations that cause unnecessary complication to be excluded. This method was used, for example, for the definition of the term “Kansei”, construction of the affective quality of the educational services model and during the design of the CMoS.

- Formalization – this research makes an attempt to formalize and measure mathematically (using mathematical signs) things that are usually interpreted as immeasurable.

General empirical scientific methods:
• Methods of observation, experimentation and comparison were applied during the experiment design and results analysis stages.

• Modelling – the studied object model was developed and its properties were researched based on this model.

General empirical-theoretical methods:

• Abstraction – this was used at different stages in order to exclude insignificant characteristics of the researched object to concentrate on its most significant characteristics.

• Induction – this allowed theoretical knowledge to be created on the basis of empirical data obtained in research experiment.

• Deduction – allowed prove knowledge received by an inductive way and remove its hypothetical character.

During the investigation the following special scientific methods were applied: statistical analysis, psychological analysis, online survey and expert interviews. The methodological base of the offered research will be considered in detail in the fourth chapter: “A Critical Review of Kansei Engineering”.
1.3 Thesis structure

The following second chapter gives an overview of the higher education environment. The main trends that influence the evolution of the educational sector are discussed. Special attention was paid to the marketing context of the research and the concept of quality with its affective dimension. All highlighted categories and trends are presented as not separate but logically joined by the concept of postmodernism that reflects today’s societal conditions.

The state of the art of the approaches that try to integrate the service quality concept with its formal measurement are discussed in Chapter 3. This chapter also highlights conceptual limitations and problem areas of the existing measuring instruments. The chapter ends with the points that define the shape of further researches that could overcome the presented limitations. These points were chosen as the scheme orientation for the offered research.

The fourth chapter provides an insight into the Kansei engineering approach – an umbrella research methodology. This chapter provides the methodological base for the Kansei engineering application conducted in the fifth chapter.

The fifth chapter contains an elaboration of the own approach made in the context of three focal points of the own methodology described in the previous chapter. It
provides the application of the KanMar methodology and ends with the description of the Kansei oriented system CMoS.

The sixth chapter is dedicated to a validation experiment that was conducted to illustrate the functionality of the proposed methodology. It describes the data collection stage and provides a results analysis made by the corresponding CMoS methodology.

In the seventh chapter, a qualitative evaluation of the research with experts related to the research domains is presented. It describes the preparations stage and discusses the outcomes of the expert interviews.

Finally, the eighth chapter summarizes and concludes the results achieved. Additionally, it discusses the limitations of the research as well as directions for further work based on the results of this project.
Chapter 2 Background

Education is a unique sociocultural phenomenon that is the result of current societal conditions as well as the precondition that influences the future evolution of society. Education influences the development of culture, economics and politics. At the same time education depends on current societal requirements and fulfils social functions (Pansare, 2014): it completes the socialization process of individuals, transmits a central heritage, supports the state’s formatting of individuals’ social personality, supports the economy and societal progress by transferring required skills and knowledge, imparts values and integrates the society. In other words, education has coordinative and integrative functions. Today education is embedded into the system of societal relationships and can not be analysed without an understanding of the current societal paradigm.

This chapter provides an analysis of the higher education environment, which influences its evolution. The most important in the context of research trends that occur in the educational sector are also shown. Special attention was paid to marketing: its role in society, the phenomenon of educational marketing and its current trends. The concept of quality and its actual affective dimension is also presented in this chapter. Education, marketing and quality are viewed here not as separate phenomena, but as strongly concerned with the logic of the offered research (see Introduction) and logically joined by the concept of postmodernism (see section 2.1) categories.
Thus, this chapter aims to justify the topicality of the offered research, as well as its practical and theoretical significance.

2.1 The phenomenon of postmodernism

There have been a lot of attempts that have tried to find an approach explaining the processes in recent decades. Among the most significant can be counted the “network society” approach of American sociologist M. Castells, the “global village” and “electronic society” of Canadian philosopher M. McLuhan, “the third wave” of American writer and futurist A. Toffler, and the concepts of society of German sociologists N. Luhmann and R. Stichweh. A common issue for all these theories and concepts is the sociocultural change caused by the informatization of all spheres of human activities. The actual stage of society evolution is even known sometimes as the “information society”. The most popular synonyms for this term are: the “post-industrial society”, “media society” or “global society”; these terms illustrate the accent of theories on the new role of information technologies and its consequences.

For the purposes of the offered research the concept of postmodernism was chosen as the phenomenon that illustrates the actual state of society. Today postmodernism is not just a well-founded philosophical paradigm of contemporaneity, but also an acknowledged approach in many disciplines.

In the scope of the offered research, the term “postmodernism” is understood as follows: *postmodernism is a specific type of societal transformation based on a*
combination of traditional values with new information technologies and production, new social, political and economic realities and challenges.

Postmodernism deals with the philosophical substantiation of the problems of the offered research and explains trends that occur in today’s marketing and education. Even the format of the offered research could be seen as typical of postmodernism with its transdisciplinary nature and attempt to formalize intangible categories.

This choice was caused by the following reasons:

- Postmodernism provides a universal philosophical perspective that includes all spheres of human life not limited to one discipline. This approach is widely used in politics, sociology, economy, literature, philosophy and other disciplines. It fits well to the transdisciplinary nature of the offered research.

- Postmodernist approach prevails in today’s philosophy and is well developed. Among the most significant authors that could be mentioned are J. Baudrillard, J.F. Liotard, G. Deleuze, J. Derrida (Postmodernism(a), 2015).

It is complicated to provide an unambiguous interpretation of postmodernism, because it implies a comprehensive philosophical dispute that is superfluous in the context of the offered research. However, interpreting postmodernism is widespread in humanitarian sciences depending on the research framework (goals, object and subject, etc.) (Belyakovitch, 2010). In this research it was decided to define
postmodernism through the conditions, offered by Firat and Venkatesh (1993) that help to define the framework of postmodernity, if not in a concise universal form, at least in a generally acknowledged form (Brown, 2006; Brown et al., 1993; Firat et al., 1995). This definition fits the purposes of this research because it explains the background tendencies of all the highlighted concepts and categories and even substantiates the choice of research methodology, content and structure. Thus, as Firat underlines, discussions on these conditions pertain to marketing independently of the disciplinary origin. At least this fact illustrates the special relationship between marketing and postmodernism, which will be reviewed more appropriately in section 2.3.2.

Thus, the main postmodern conditions are (Brown, 2006; Firat et al., 1995):

- **Hyper Reality** – characterized, according to Eco and Baudrillard, as based on simulation; reality is rather constructed as given; the distinction between real and unreal is implicit. In his classical work *The Postmodern Condition: A Report on Knowledge*, Jean Francois Lyotard connects the evolution of cybernetics with the occurrence of a special “postmodernist” vision of the world (Featherstone, 1988). The character of knowledge is changed. The imitation of reality takes on a special significance. In the early 1980s, Jaron Lanier introduced what has become a popular term: “virtual reality” (Featherstone, 1988). The simulation of normal life activities became typically characteristic of modern society (for example e-learning). The postmodern way of thinking is consonant with global information technologies. So, virtuality, intertextuality and global discourse are typical for both of them.
Postmodernism aims at the creation of an essentially new environment – virtual reality and new art of contact with this environment – interactivity (Alieva et al., 2008).

- **Fragmentation** – the individual is divided into a set of self-images; lack of commitment to any central concept; abandonment of history and context. Consumption is based rather on fragmentation than on unification. It demands a special attention to the analysis of individual customers’ preferences. Individual requirements and expectations play an important role in politics, economy and production. In this research the importance of individual attitudes is addressed by many concepts: the importance of customer requirements in quality management in sections 2.4.1 and 2.4.2, and the role of customers’ moods in sections 2.2.2, 2.2.3 and Chapter 4.

- **Reversals of production and consumption** – the appearance of the “consumer society”; the consumer becomes co-producer. These trends are viewed more appropriately in section 2.2.2.

- **Decentering of the subject** – individuality is historically and culturally constructed; communicative subject instead of cognitive subject. Postmodernism changes individuals’ role in cognition. Individuals build their own knowledge systems, bring their own context with them and interpret the environment in their own way. This point leads to the popularity of the concepts that interpret the human psyche as a set of constructs influenced by the environment. Personal construct theory and its main method, repertory grid technique, both classical in this context approach, are looked at in section 4.4.

- **Juxtaposition of opposites** – differences and oppositions exist freely. Some researchers even name pluralism as the main characteristic of postmodernism
(Alieva et al., 2008). Peaceful coexistence of different points of view and the negation of diktat promise interesting opportunities not only in politics and society, but also in science. It gives a chance to transdisciplinary researches and to the application of discipline-specific methods in areas that are not traditional for them. Also in this research an attempt to measure things often considered immeasurable is undertaken.

These conditions influence the scientific area as well. The current stage of science evolution can also be characterized by a postmodernism spirit. It has reshaped all forms of human activities and fixes the mental specificity of society today. Practically all parties and aspects of modern life are involved in this cultural-philosophical trend. Lyotard emphasizes that the nature of knowledge cannot remain constant as general changes caused by rash progress of information technologies occur in different spheres (Featherstone, 1988). The way of thinking has changed. In science real experiments are often replaced with experiments on models and simulations using information technologies. Computer simulation is one type of virtualization, which is actively used in various areas of science.

This stage of science evolution can be characterized by a very good opportunity for humanitarians. Humanitarian science areas often have research objects that are intangible, immeasurable concepts (culture, political attitudes, etc.) and often deal with complex systems (public classes, etc.). Realizations of real experiments in these conditions are impossible or extremely complicated. As information technologies progress they provide new opportunities in the field of the analysis of complex
systems and intangible objects. In this context the area of computer simulation looks very promising. Science reorients from subject to problem. A trans-disciplinary approach applying experiences from different areas is very popular today.

The proposed research makes an attempt to connect technical approaches with pure humanitarian ephemeral categories applied to education marketing. It has typical attributes of postmodernists’ orientation of science: a trans-disciplinary nature, the application of logic-linguistic structures, IT expansion in non-technical disciplines and virtualization.

2.2 Marketing in a postmodern time

2.2.1 Relationships between marketing and postmodernism

In the context of this research, the most intriguing aspect of the variety of intellectual comprehension of postmodernism is the emphasized leading role of the marketing phenomenon acknowledged by most commentators from different disciplines (Brown, 1993, 2006; Middleton, 1990; Rorty, 1979). Marketing is regarded by non-marketers as one of the distinguishing characteristics of postmodern thoughts and the expression “consumer society” has become close today to the synonym of the “postmodern society” (Featherstone, 1988). Consumption is now in the focus of social theory as playing a pivotal role in “… the way the social world is constructed” (Elliot, 1997). There is no universal approach to the relationships between marketing
and postmodernism. Different commentators sometimes offer contrary understanding of this problem.

Three main approaches, however, can be recognized:

- **Marketing as the precursor of postmodernism.** According to Firat, marketing was even born postmodern (Firat et al., 1995). Since the time of marketing formalization in the early 1900s, marketing practitioners have known the power of product image. One famous adage from the early days of marketing illustrates it as: “sell the sizzle, not the steak”. This simple sentence Firat even calls “the quintessence of marketing approach” (Firat et al., 1995). And this, purely postmodern, acknowledgment preceded the first discussion about the transformation of modernity into postmodernity in the 1970s. In fact, marketing had many elements of postmodern thought from the beginning of its development and some researchers assign its pivotal role to the transformation from modernity to postmodernity (Firat et al., 1995).

- **Changes in marketing generated by postmodernism as an ordinary part of general changes.** Some observers state that marketing experiences the changes caused by the general transformation from modernism to postmodernism, but they do not note the special peculiar role of marketing in this transformation. All the changes that occur with marketing are fully congruous with those in other fields of human life (Ogilvy, 1990).

- **Marketing as the essence of the transformation to postmodernity.** According to Firat, this is the strongest. Firat and Venkatesh even state the identity between marketing and postmodernity and clarify marketing as the “… conscious and
planned practice of signification and representation, the paramount processes of life according to postmodern sensibility” (Firat et al., 1995).

The author’s position concerning the relationships between marketing and postmodernism in the context of this research has a lot in common with the third view. The evolution of society gives a chance for just such phenomena as marketing. It is not an achievement or logical phase of marketing’s evolution, which actually even conflicts with the postmodern spirit, but the result of the social-political process taking place in recent decades.

It should be stated that:

- The pivotal role of the marketing spirit in postmodernism has an objective nature.
- This role has affected all fields of human life.

The concept of postmodernism is interlaced with marketing thoughts and it seems irrational to research any marketing problems without taking into account the postmodern conditions.
2.2.2 The concept of consumer in postmodernism

It is no longer possible to comprehend any conditions independently of human sensation, perception and interpretation. Perhaps the most essential difference between today’s postmodern consumer and the previous one is that he/she becomes aware that they are not just the consumer, but a “…customizer and a producer of (self-)image at each consumptive moment” (Firat & Venkatesh, 1995). Postmodern marketing doesn not reckon the individual consumer as the end-user, as the subject of conclusion anymore. The consumer is conceptualized as a fragmented set of self-images. He/she is no longer interesting as a consistent individual, but just as a member of a relatively homogenous market segment, caused by many sociocultural conditions. The market is revisualized as a set of fragments. According to Firat, the main goal of homo consumericus is “to (re)present and (re)produce oneself as an image” (Firat & Schulz, 1997). One important task for the marketer is to reveal these fragments and to build the concept that could efficiently appeal to them. Personal construct theory allows this characteristic to be considered.

The second important characteristic of today’s consumer is his/her developing customizer nature. This idea traces back to postmodernism guru Baudrillard, who first suggested that consumption becomes a productive process (Firat et al., 1995). Competition growth, the postmodern spirit and developed technologies give the opportunity to a consumer to become the co-producer. It is a warmly welcomed practice from the marketing side to give today’s consumer the opportunity to construct different styles or types of the same product or to influence the product’s end version. Precisely through this customizing process, the consumer produces
his/her own self-image in different situations and reflects his/her belonging in some fragments (Firat & Schulz, 1997). According to Cova, postmodern society, unlike modern society, is constituted not by self-centred individuals, but by a set of sociocultural groups. He argues that it “looks like a network of societal micro-groups in which individuals share strong emotional links” (Cova, 1997). On the one hand, this characteristic presumes consumers’ predictability, which is very important for marketers; on the other hand, it requires excellent consumer feeling, new marketing approaches and instruments, and outstanding creativity. The convergence of cultural recognition of a consumption-production identity provided by postmodernism and intensive technological development allows individuals to be involved in the production or product/service design process as the consumer, not as an employee. The consumer becomes a partner.

To gain success in postmodern conditions every organization should provide the opportunity to the customer to find the product or service helpful in projecting his/her self-image. It is especially important to provide a context within which the consumer can experience and experiment with his/her self-image (Firat & Schulz, 1997). Products and services are become highly dependent on markets and their marketable image. In these conditions it is extremely important to pay attention to the consumer’s feelings and emotional perception. Some commentators even state the primacy of the consumer’s feelings among such categories as demography, lifestyle, opinions and beliefs (Nagamachi, 2011; Sigg, 2009). The “simpler ‘rational’ consumer of the past is replaced by a more complex ‘explainable’ consumer” (Firat et al., 1995). Concepts such as Kansei engineering arise that puts at the centre of product or service design consumers’ perceptions and emotions (see
Chapter 4). The ideological author of *Kansei Engineering*, Mitsuo Nagamachi, believes that for successful Kansei design it is necessary to also understand the psychological angle of philosophy (Pospelov, 2009). The category of perceived value came to light in the early 1970s (Firat et al., 1995). In today’s conditions, when product/service is viewed as the variable that attempts to represent the image (Firdaus, 2006), this category becomes of crucial importance. Value imbued in product/service image becomes a core element of market exchange. Nike, Chanel or Mercedes do not sell shoes, cosmetics and cars, they create images; the perceived value of their products is much more important for success than the actual functional value. The modernist idea that satisfaction results from material or functional elements of product is fully rejected by postmodernism. Brown underlines the allusive, indirect, subtle, insouciant nature of postmodernist commercials, and notes that “… they work on the basic premise that advertising-inculcated images … are the essence of the product offer” (Brown, 2006).

The concept of perceived value is very close to the Kansei engineering approach used in this research. Section 5.1 of this thesis explores the terms related to the term “perceived value” and illustrates its connection to the Kansei.

2.2.3 Marketing trends

Marketing guru Philip Kotler gives the following orientation for future marketing evolution (Kotler et al., 2010):
• Real-Time marketing — real-time information tracking and decision-making. Some companies try to practice real-time marketing even now. For example, one airline company has a room with monitors that shows real-time information about competitors, timetables, prices and weather. However, at the moment there is a problem of information overloading and real-time marketing techniques need further development.

• Financial orientation of marketing – marketers should estimate the return of investments in a marketing action. Only then will profitable marketing remain. The well-known statement of American merchant John Wanamaker – “Half the money I spend on advertising is wasted; the trouble is I don not know which half”\(^7\) (Kotler et al., 2010) – seems to be a part of the history of marketing.

• Marketing becomes more technological – information technologies and natural sciences transform marketing. New transdisciplinary knowledge areas such as neuromarketing appear. The latter is very promising for today’s vector of marketing evolution.

The most revolutionary marketing trend for today – neuromarketing – includes all these tendencies mentioned by Kotler. Neuromarketing is generally accepted as a revolutionary phenomenon. Its appearance changes marketing on a theoretical level as well as in practice. In the context of the offered research, neuromarketing is understood as follows: neuromarketing is marketing that evokes the necessary response using different stimuli affecting the human brain.

\(^7\)John Wanamaker, US department store merchant (1838–1922)
The objects of this impact are typical of the marketing concept: customers, consumers, business partners, employees etc. Stimuli used by today’s neuromarketer are extremely diverse. For example, here are some of them:

- Stimuli accepted through sight – pictures, illustrations, colours, videos, photos etc.
- Stimuli accepted through the sense of smell – scents, smells, perfumes etc.
- Stimuli accepted through the sense of touch – materials with different tactile sensation, touch and tactile contact.
- Gustatory feelings – tastes.
- Remembrance – associations, music, smell etc.
- Human social skills and human values – words, texts, videos, events, emotions, look etc.

Neuromarketing tries to understand and to forecast customers’ behavior and to improve customers’ selective perception (Sigg, 2009). Purchasing is a self-image construction rather than a satisfaction of rational needs (see section 2.2.4). Markets become irrational.

Thus various lists of the “marketing trends of the year 20XX” meet such “new” trends as scent marketing, emotional marketing, sensory marketing, music in
marketing and others. These are some of the numerous examples of today’s popular neuromarketing interpretations. The Kansei engineering approach, used in this research as the main methodological framework, can also be seen as an example of neuromarketing thoughts. Neuromarketing researcher Barbara Sigg notes that *homo economicus*, who makes decisions based on rational criteria, doesn’t exist, so the orientation on rational usefulness maximization is mistaken (Sigg, 2009). She proposed orienting also on emotional aspects of the decision-making process. Neuromarketing and its different interpretations have something in common with prestidigitators and fortune-tellers because they also try to evoke responses that are necessary for them in influencing the human subconscious. The difference is that neuromarketers are perfectly armed with the latest scientific research from different disciplines (psychology, chemistry, biology, physics, neurology and others).

Neuromarketing appeared in the USA in the 90s. A group of psychologists from Harvard University ascertained that human cognitive power is 90% determined by the subconscious. Manipulation of the human subconscious affects actions to a far greater extent than purely rational argumentation. The first conference on neuromarketing took place in Carnegie Mellon in 1997 (Sigg, 2009).

One of the most famous neuromarketing technologies is ZMET – Zaltman Metaphor Elicitation Method – which was developed in the 90s by Harvard professor Gerald Zaltman and is actively used by such companies as Procter & Gamble, Nestle, General Motors and Coca-Cola. ZMET methodology is based on the reconnaissance of the human subconscious using a set of special selected pictures. Some
pictures can evoke a positive emotional reaction that stimulates purchasing. Detected pictures and images become a basis for commercial posters and advertising. Analysis occurs using only psychological methods and techniques. However, there are many other methodologies that use different instruments from such disciplines as chemistry and medicine. So, in Atlanta (USA) in 2002–2003, the Brighthouse Institute for Thought Sciences realized a neuromarketing research company “Uses neuroimaging to unlock the consumer mind” (Brighthouse Institute, 2002). The used methodology had a lot in common with ZMET, the difference being that the human reaction to pictures and images was investigated not using psychological methods, but the analysis of brain areas based on magnetic resonance tomography (MRT). Chemistry, neurology and medicine provide a lot of information that could be used for manipulation purposes. Thus, researchers from the Neuroeconomic Claremont Graduate University in Switzerland have investigated the influence of injections of the hormone oxytocin on the decision-making process. Among the psychological methods, researchers in neuromarketing use the observation of different human reactions (with different impacts), for example: looks, pulse, pressure, mimicry, gesticulation, skin moisture and others. However, the well-known firms that use neuromarketing research generally do not reveal this to the public. There are legal and ethical limitations that constrain neuromarketing investigations that use methods and techniques from other disciplines in addition to psychological and economical ones.

However, it is expected that neuromarketing will develop quickly. This concept fits very well with the need for irrational differentiation, caused by the homogenization of products and services and forced price-lowering competition, which can be seen
today. As Barbara Sigg underlines, there are two ways of doing this in today’s saturated markets: price lowering or positive emotional differentiation (Sigg, 2009). Sigg’s definition of emotional differentiation is assumed in the context of the offered research as the basic one: *emotional differentiation is a company’s dissociation with competitors based on irrational aspects*. As Sigg notes, emotional differentiation today should be part of the content of marketing strategy. The role of emotions in today’s marketing is discussed in more detail in the next section.

The next factor that determines the content of annual lists of marketing trends is the rapid evolution of technique. Every year there are some variations on the IT theme among other trends. All technical instruments that could be used for marketing purposes are under the close scrutiny of the marketers. These could be, for example, the usage of e-mail, the Internet, mobile technologies, Twitter, Facebook or popular gadgets.

Annual marketing trends are usually seen quite differently by different authors and can often have a lot in common with previous years. There are, however, some general characteristics that define the content of marketing trends in recent years:

- Customer-centric orientation – this could be the usage of new techniques or approaches in customer research, brand loyalty building, new concepts in communications with customers.
• Different versions of neuromarketing interpretations – scent marketing, music in marketing, emotional marketing, brand sense, marketing as a myth, storytelling, visual merchandising etc.

• New media in marketing – Twitter mania, digital brand management, Internet, mobile marketing, Facebook marketing, e-mail marketing, online marketing, etc.

• Human-centricity moods in marketing companies – stop animal testing, underlying sponsorship, attraction for the customer’s position in questions of ecology or ethics, fair trade, etc. Philip Kotler even defines the human-centricity as Marketing 3.0. In his opinion the human-centricity is a future of today’s marketing (Kotler et al., 2010).

Peter Fisk, the famous British marketer, calls individuality, connectivity and sustainability “the big three” trends that will shape today’s marketing (Fisk, 2006). At the end of this section his trends list for the year 2013 is provided as an example of the mentioned tendencies and grouped according to them (Fisk, 2012). This list was chosen as an example for the offered research because it is well-founded and fuller than many others.

New media in marketing:

• Solomo consumers – social local mobile consumers that are guided by their smartphones.

• Predictive economics – development of predictive techniques.
• Augmented reality – e.g. Google glasses or apps on smartphones that allow information to be found about the object in real time.

• Zero moment in truth – advanced search techniques.

• Integrated communication – building more coherent and interactive media solutions.

Customer-centric orientation:

• Participation platforms – building sustainable relationships with customers, e.g. IBM’s “Smarter Planet” or COCE’s “Live Positively”.

• Black marketing – “under-radar activities” for target customers such as sponsorship, events and parties.

• Trusted at home – Avon, Tupperware sales strategies, customers find new customers.

• Urban formats – adaptation to urban customers, such as smaller cars.

• Crowd creativity – involving customers in problem solving.

Neuromarketing interpretations:

• Branded voices – the association of the brand with a celebrity.

• Guest designers – e.g. H&M fashion by Kylie Minogue.
• Viral advocacy – classical word of mouth multiplied by new media, such as Twitter, Facebook, mobile apps, blogging and Internet forums.

• Spreading happiness – building strong happiness associations, e.g. Zappos shoes and Coca-Cola.

• Freemium pricing – the adaptation of the well-known policy of free apps and games to other markets.

• Brand gaming – game approach that differentiates brands and makes them more attractive, e.g. Nike’s GRID.

• Diffusion of brands – the development of additional brands for better acceptance and emotional differentiation.

• Brand storytelling – emotional satiation of a brand, e.g. Marlboro Man.

• Well-being theme – the association of a brand with well-being, e.g. the Nintendo Wii Fit.

• New tribal communities – building communities with strong affection for a brand.

• New business models – rethinking of the business and creation of value-added solutions, such as by Apple or Google.

Human-centricity:

• Social innovation – trying to make the world a better place.

• Concept innovation – innovating around a concepts such as learning or exploring that could make life better.
To the main ideas of this section belongs the importance of the recognition of an emotional component in today’s marketing. This idea correlates with the concept of the offered research and is presented in more detail in sections 4.2.1. and 5.1.

2.3 Higher education in a postmodern time

2.3.1 Main trends in higher education area

Today’s trends in higher education reflect current processes and changes in society, economy and politics. The prospective global market size for the education industry is about USD 5,508.7 B for the year 2015 with an average growth of about 7% p.a. (Education Sector Factbook, 2012). Some sectors of the education industry demonstrate even higher rates: higher ed eLearning with 25%, social learning with 40% or for-profit sector growth with 17% p.a. (Education Sector Factbook, 2012). The place of education in the society depends on the role that knowledge development plays and people’s professional abilities and skills. This role increased in the second part of the twentieth century and constantly grows. The rapid development of information technologies and formation of the new\textsuperscript{8} societal paradigm put information and knowledge on the forward plan of economical and societal development.

\textsuperscript{8}In the scope of this research, the new society paradigm is understood as postmodernism.
The main tendencies of the evolution of the global education sector illustrate this interdependence (Solovov, 2006; Learning Unesco Report, 1996):

- Knowledge becomes a profit source – the professional skills and abilities of their employees become a central resource for many companies. Thus, the AskMe Corporation provides the following data: knowledge deficiency in the Fortune-500\(^9\) companies has led to losses of USD 57 B and this deficiency will grow by 19–32 % p.a. (Learning Unesco Report, 1996).

- Marketization of education – educational institutions become market-oriented, competitiveness between educational institutions grows, educational marketing appears, etc.

- Transformation and widening of the word “education” – today it is not identified only with schools or higher education institutions; e.g. many companies and religious organizations transfer new skills to people, or even give professional qualifications. Thus, many companies in Germany have places for employees that get professional education working at the company (so called “Weiterbildung”).

- Transition to the personality development concept – the individualized approach in an education that aims to allow every person to find an educational programme that is suitable for their individual needs, e.g. the development of educational offers for disabled persons or seniors, the offering of flexible timetables, the blended-learning concept, etc.

\(^9\)Annual list published by *Fortune Magazine*. Includes top 500 US companies.
• Appearance of the lifelong learning concept – Solovov gives the following example: not so long ago good handwriting could guarantee a successful lifelong career and now one of the General Motors Corporation directors says that they need specialists not with four or six, but with 40 years of education (Solovov, 2006).

• Competence-based approach in education – this approach assumes, besides professionalism itself, that it is necessary today to have general skills and abilities, such as in foreign languages, IT or communicative skills.

• Transformation of knowledge to the commodity – knowledge could be sold as good or even be leased. Thus, one of the Russian aircraft manufacturing enterprises has an agreement with Boeing that expert groups periodically go to Boeing for construction work (Solovov, 2006).

• Integration of education – education has become a global priority; this trend reflects the globalization process, education institutions act on the global educational market and interact with other institutions abroad.

• Education becomes more technological – technology-based training (TBT) comes instead of traditional face-to-face education and paper-based data carriers. New forms of educational process appear, such as e-learning, blended learning, etc.

Analysis of the numerous trends lists in the education area led to similar results as with the marketing trends lists (section 2.2.3). They can contain different trends or repeat trends of previous years from other lists. These trends, however, illustrate the
general tendencies in the development of the educational sector evolution, listed above.

In line with the marketing trends analysis in this section, some of the most recent educational sector trends lists are presented in accordance with the mentioned general tendencies.

Marketization of education:

- More institutional self-sufficiency and competition, e.g. “in the US, post-recession budget cuts in state universities and colleges have prompted many to increase their recruitment focus on international students who pay higher, out-of-state tuition fees” (Elliot, 1997).

- Increasing focus on managing risk and assuring quality is another consequence of the financial crisis (Elliot, 1997).

Transition to the personality development concept:


- Personalization of education – individualized education plans (IEPs), adaptive and assistive technologies (Core Education’s Ten Trends, 2014; Kruse, 2013).
• Learning analytics – “is an emergent field of research that aspires to use data analysis to inform decisions made on every tier of the educational system” (Horizon Report, 2013).

• A key outcome of learning analytics pertains to the students and their individual path in higher education (Horizon Report, 2013).

Integration of education:

• MOOC – Massive Open Online Courses – act on the global scene and give the opportunity for the education community to change their knowledge and gain information about the different universities and their programmes. A very popular MOOC platform today is coursera.com. The role of MOOCs did increase in recent years (Vance, 2013; Heick, 2012; Choudaha, 2013).

• The Smart Web – the further development of Internet-capable consumer appliances and geo-location devices; convergence of Internet-enabled devices in the classroom (Core Education’s Ten Trends, 2014).

• Digital citizenship – global connectivity and global research (Core Education’s Ten Trends, 2014).

• 3D thinking – growth of consumer-level 3D tools and applications (Core Education’s Ten Trends, 2014; Gyure & Arnold, 2004).

• Social web – the shift from consumers to prosumers, and connectivism: it is not what you know, it is how you locate, use, process and apply that information (Core Education’s Ten Trends, 2014).
Ubiquitous learning – increasingly personalized pathway through learning for each individual using mobile technologies, cloud computing, online services and UFB access (Core Education’s Ten Trends, 2014).

Education becomes more technological:

- Blended learning – called by the facultyrow.com website the main education trend of the year 2013 (Vance, 2013); it comprises hybrid courses supplemented by online components.

- Increasing role of social media in education in 2013 – SMS, YouTube, Facebook, etc. will be involved in the educational process (Englar, 2013; Heick, 2012).

- More education will offer online learning (Englar, 2013; Heick, 2012).

- Tablet computing – the tablet itself is a portable personalized learning environment; education institutions will have their own tablet apps, e.g. a campus map, access to grades, university news, timetables and others (Gyure & Arnold, 2004).

It should, however, be noted that many of these trends have been well known for many years. For example, the blended learning theme was developed by a team based at Darmstadt University of Applied Sciences since the beginning of 2000s (Bleimann, 2004). The emergent need for learning analytics was identified in the year 2008 as the starting point for the offered research. It is more appropriate to
consider these trends as long-term tendencies rather than short-term trends that change every one to two years.

2.3.2 Appearance of the marketing of higher education

As mentioned above, postmodernism causes the interweaving of marketing thoughts in all areas of human life and provokes the appearance of new areas of marketing application. The classic example of this trend is the appearance of educational marketing. Marketing guru Kotler notes that many educational institutions actively used a marketing approach in practice while they were theoretically sceptical of its application in the educational sector (Kotler & Andreasen, 2003; Kotler & Fox, 1985; Sevier, 2003). Higher educational institutions become aware of marketing when they meet market changes, such as the reduction of numbers of students, finance and members and the appearance of competition (Bok, 2003; Brueser, 2006; Gibbs & Knapp, 2002; Mittal et al., 1998; Kenneth, 1994; Kotler & Andreasen, 2003). Kotler identifies the 1970s as the starting point of the marketing approach in the educational sector and binds its permeation in education with previously mentioned reasons (Kotler & Fox, 1985). It was precisely at this time that attempts at the formalization of postmodernism occurred.

Today, a marketing approach is accepted by higher educational institutions and is applied in its daily activity. As Gyure and Arnold note, an increasing number of higher educational institutions have a marketing director position, while over half of higher educational institutions adopt marketing activities and conduct market
research (Berry et al., 1988; Gyure & Arnold, 2004). The official emergence of the marketing of higher education as a full-value concept refers to the mid 1980s and represents an offshoot of the area of health-care marketing (Hayes, 2007). Several researchers, among them Philip Kotler and Tom Hayes, noticed some common challenges and parallels between the health-care and education markets and made the first steps in the conceptualization of the marketing of higher education (Kotler & Andreasen, 2003). Philip Kotler published a book on educational marketing after a successful one on the marketing of health care. Some observers note the similarities between the tendencies of the health-care field and those of the higher educational market.

It is worth mentioning that the listed tendencies have also influenced the appearance of postmodernism as a reflection of today’s society (Bloland, 1995; Hayes, 2007):

- Demographic changes: potential number of 18-year-olds entering the market is declining steadily.
- Increased operating costs: newer and better but expensive equipment is entering the market; government subsidies are limited.
- Resistance within the organization: on the one hand it is precisely the marketing approach that causes the survival and success of many health-care and educational institutions; on the other hand, many specialists from these fields hold the opinion that marketing degrades health care/higher education.

These tendencies could be widened through other challenges faced by higher education institutions:
• Globalization.

• Ethnic changes.

• Marketization of different spheres of human life described above.

• Financial problems.

• Increasing competition in the educational sector.

Sometimes marketing is associated only with aggressive communication such as ads and PR. This lack of understanding was increased by the absence of theoretical research and practice in educational marketing. The first marketers who came to higher education from industry had no experience in this specific field. In this research, the following definition of marketing, made by one of the most significant marketing gurus, Philip Kotler, is accepted (Kotler & Fox, 1985): marketing is the analysis, planning, implementation, and control of carefully formulated programmes designed to bring about voluntary exchanges of values with target markets to achieve institutional objectives. Marketing involves designing the institution’s offering to meet the target market’s needs and desires.

To prevent a distorted picture of the marketing concept, two of the most significant characteristics of the marketing concept should be underlined (Kotler & Fox, 1985):

• Meeting customers’ wants and needs.

• Serving the long-time interests of consumers and society.
Today’s marketing concept is inherently linked with such concepts as TQM and strategic management planning (Cova, 1997). For more on this point see also section 2.3.3. And, as will be described in section 2.3.3, it tends to merge with strategic management and TQM in an integrative approach.

Marketing is not a simplistic sales-oriented concept, as it is sometimes understood. As neatly pointed out by Ng and Forbes (2009), “… fortunately, marketing has a healthier respect for the consumer than academicians have for marketing”. The postmodern marketing concept takes into account increasing competition, the changed consumer, today’s complex environment, and the changing needs of society and organizations. The mix of various disciplines within the marketing concept is the peculiarity of the postmodern spirit that promises a broad perspective. The global process that occurs in today’s society under the aegis of postmodernism also influences higher education.

Higher educational institutions are not just “timeless citadels in a world of shifting sands, they … have developed and adapted over the centuries” (The Quality Assurance Agency, 2009). This adaptation is a key point defining success. The permeation of a marketing philosophy in the higher education area in today’s postmodern conditions could be thought of as unavoidable (Essbach, 2004; Mahapatra & Khan, 2007a, 2007b; Saldak et al., 2006).
One widespread problem of educational marketing until now is the fact that many marketers market the educational service as a product (Hayes, 2008; Hawkins and Frohof, 2009). The distinctiveness of the marketing of the service as a self-contained phenomenon was only acknowledged in the mid 1990s (Hawkins and Frohof, 2009). Educational marketing should consider both the specificity of service marketing and the uniqueness of the educational sphere. As some researches state, even today both these dimensions can be ignored by educational marketing practitioners (Hayes, 2008; Hawkins and Frohof, 2009).

So, Hawkins and Frohoff note that the classical “four Ps” framework for product marketing is often understood and implemented in educational marketing even today as a classical scheme and without any adaptations (Goi, 2009; Hawkins and Frohof, 2009). However, a more appropriate approach was offered by Booms and Bitner, who expanded this scheme to “seven Ps” for the case of service marketing (Toolshero, 2013). They added “people”, “processes” and “physical evidence” to the classical “product”, “price”, “place” and “promotion”. This extension has achieved widespread acceptance in service marketing (Groucutt, 2004; Rafiq & Ahmed, 1995). Rafiq and Ahmed (1995) state, based on a survey among European marketing academicians, that the seven Ps framework has gained a high level of acceptance as the generic marketing mix.
2.3.3 Strategic planning for quality in higher education

Sections 2.2.1 and 2.2.2, provide an analysis of today’s sociocultural realities and demonstrate the pivotal role of marketing as a social-philosophical, not just a managerial, concept. The marketing approach permeates in all spheres and becomes a strategic, not just a technical, component. Firmly in line with this characteristic of today’s reality are the results of the Delphi Study, described by Tom Hayes (2007, 2008), which indicate the unavoidable merger of the departments of higher educational institutions responsible for strategic planning with marketing departments. Marketing vision as a strategic philosophy of educational institutions replaces marketing as today’s acknowledged part of the administrative structure.

The reasoning for this evolution is explained by Hayes (2007) based on three main domains:

- Shaping the mission and vision of an organization: both marketing and strategic planning are based on the analysis of internal and external realities, and it is precisely this market situation that causes the relation between an institution and its resources.

- Utilization of information for the decision-making process: both marketing and strategic planning make the various researches and competitive analysis, and combining these two departments brings more effect.

- The same outcome: namely, communication of the mission, vision and values.
So, the next “big thing” in marketing will be the focus of higher education institutions on integrated marketing. For higher education institutions it means the fusion of marketing vision with strategic management planning and whole organizational structure under the aegis of TQM philosophy. TQM in its turn also embraces the whole organization instead of focusing on one department.

The classical planning sequence scheme offered by Sallis (1996) looks as follows:

- What business are we in?
- Who are our customers and what do they expect?
- What do we need to be good at?
- How are we going to achieve success?
- How are we going to deliver quality?
- What will quality cost?
- How do we know if we have been (un)successful?

The first step, vision, mission and values should overcome the conflict of the commercial nature of marketing with the complex nature of the education phenomenon. By defining the area of activities, goals and philosophy of an educational institution the role of marketing acquires a shape and purposes that are not necessarily identical with those from industry and commerce. In general, in this step the question “what business are we in?” should be clarified.
The second step, “market research”, represents the level on which the offered solution should operate. This step should reveal customer groups and their expectations. Different customer groups have different needs and structures and require different approaches. Market research can not be done once, it should have a cyclical, dynamic character. Market research is necessary for implementing TQM, the managerial decision-making process, the design of programmes and teachers’ orientation. The first two steps define all further steps by giving the strategy (first) and necessary information (second).

2.3.4 The philosophy of quality in higher education

The application of total quality management (TQM) philosophy and methodology in the context of higher education today is fully acknowledged and widely used (Crosier et al., 2007; Filippov, 2006; Guide to Bologna Process, 2006; Ibrahim et al., 2012; Possa, 2006; Sallis, 1996). In this research, Sallis’s (1996) definition of TQM is accepted as the base one: “TQM is a philosophy of continuous improvement, which can provide any educational institution with the set of practical tools for meeting and exceeding present and future customers’ needs, wants, and expectations.” The need to use the TQM philosophy is aimed at providing educational services and the results of academic and research activities. This situation is embodied by the implementation of TQM methods in the ISO quality standards 9001:2000, also stated by the Bologna Process as the basic quality principles for higher education institutions (Essbach, 2004).
On the international political level the need for quality management in higher education is also formulated and conceptualized within the aforementioned Bologna Process within the variety of complementary communiqués, for example (Communique, 2009; Communique, 2005; Crosier et al., 2007; Guide to Bologna Process, 2006; Marimon et al., 2009; ENQA, 2005; Universities UK, 2007, 2008a):

- **1999:** 29 European countries signed the so-called Bologna Declaration. The most important issue of this declaration in the context of this research is bringing into the education sector the principles of ISO 9001:2000, made by this declaration, which have a crucial impact on the educational sector. The quality model in ISO 9001:2000 is quite different compared with 9001:1994. It is now based upon a process model that any higher educational institution can use (Firdaus, 2006). For more on this point see the next section.

- **2001:** Prague Communiqué with its key issue that quality management systems should ensure the high level of quality in higher education and provide comparability of qualifications within the EU.

- **2001:** Bergen Communiqué with its key issue about further development concerning the participation of students in a quality management process and international co-operation.

- **2003:** Berlin Communiqué that declares the importance of an effective quality policy and the development of quality criteria and methodology on different levels.

- **2005:** Helsinki Standards and Guidelines for Quality Assurance in the European Higher Education Area declared by the European Association for Quality Assurance in Higher Education. The key issues here are the underlined
role of students in the quality management process and the need for permanent quality monitoring.


There is no unified terminology and the term “quality of education” is understood in different ways by different authors. All authors, however, follow the understanding of quality from industry in their interpretation of quality of education, as, for example, in the following definitions: excellence in education (Gilmore, 1974); value addition in education (Brigham, 1994); fitness of educational outcome and experience for use (Dorweiler & Yakhou, 1994); defect avoidance in the education process (Crosby, 1979); meeting or exceeding a customer’s expectations of education (Parasuraman et al., 1985).

Among the most significant reasons for the growing importance of the concept of quality in higher education can be included, among others:

- Liberalization and economization.
- Growing competitiveness.
- Internationalization and globalization.
Changes in the labor market.

In his turn, Sallis defined four imperatives that cause the involvement of the educational sector in quality assurance activities and reflect the complex environment in which educational institutions operate (Sallis, 1996):

- The moral imperative – the link with customers: customers (students, families, society) deserve the best quality of educational service.
- The professional imperative – the link with the professional role of educators: linked with the moral imperative and interprets professionalism as the striving for the fulfilment of students’ needs most appropriately.
- The competitive imperative – the link with competitors: higher education institutions meet the challenge of competition by improving the service quality.
- The accountability imperative – the link with constituent groups: as part of communities, higher education institutions should meet political demands, and demonstrate high quality of services.

2.4 The concept of quality in higher education

2.4.1 Key points of ISO 9001:2000 standards

The previous ISO 9001 (1994) standard has in the past led to a stagnation of quality management systems because of the lack of a clause requiring the continual
improvement (Communique, 2009). ISO 9001:2000 overcomes this problem and has more new characteristics.

The most significant of these in the context of research are:

- Customer satisfaction has to be measured.
- More explicit requirement for the continual improvement of the QMS.
- The need for the presence of measurable managerial objectives.
- Appliance of a process approach that is based on the PDCA (Deming) cycle.
- Reference to customer perception of performance.
- Focus on customer satisfaction, the customer’s needs become the explicit drivers of QMS.
- Factual approach to decision-making, decisions are made based on data analysis.
As previously mentioned, the ISO 9001:2000 standards encourage a process-based model of QMS. Figure 1 illustrates four approach elements that correlate with ISO 9001:2000 standard chapters (Biazzo & Bernardi, 2003):

- management responsibility: this part contains the requirements for quality system development and improvement, customer needs orientation, planning, quality policy formulating, communication and responsibilities definition;
- Resource management: the management of human and infrastructural resources in order to enhance the quality and to satisfy customers’ requirements in the most optimal way.

Figure 1: Prozess based quality management system recommended by ISO 9001\(^\text{10}\)

- Product realization: product design, service delivery, purchasing, controlling.
- Measurement, analysis, improvement: represents the requirements for monitoring information on customers’ satisfaction, monitoring and analysing products and services, internal audit, non-conformity detection.

Evidently, the customer plays a central role in this approach, the customer’s exact requirements are the input of the whole model, the customer’s satisfaction is continually analysed and the system’s output is also oriented on the customer’s satisfaction. The whole model influences the current research, but the “measurement, analysis, improvement” part is the main point of interest. Today, ISO 9001 is one of the ISO’s most widespread standards with more than a million certificates all over the world. This standard undergoes periodic revision every three to five years\(^1\).

The new edition is expected in 2015. However, due to Nigel Croft, chair of the ISO subcommittee that is revising ISO 9001, the core concepts that are focused on in this research and are important in the context of the offered research are still on the agenda, namely\(^2\):

- Process approach illustrated in Figure 1 and the accent on the merging of the quality management system and strategic management.
- Plan-Do-Check-Act concept that underlines the continual improvement.

\(^1\) http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1905

\(^2\) http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1905
The third core concept that constitutes the shape of the new version of the 9001 standards is an increased importance given to risk. The concept of affective quality measurement offered in this research is firmly in line with other initiatives, for example with the European standards for quality assurance in higher education.

The most important points from this standards list in the context of this research are the following (ENQA, 2005):

- Existing need for institutions to have a quality policy, strategy and associated procedures for quality assurance.
- Crucial role of an institution’s stakeholders, especially of students in defining and realizing the quality policy.
- The need for formal mechanisms for permanent monitoring of offered programmes.
- The need for relevant information as the basis for the managerial decision-making process.
- The need for a periodical nature for the quality assurance process.

Another initiative that correlates with the problem area of the research is the report “Modernising HE careers education. A framework for good practice” made by the UK Universities Group. It states some analogues to the above-mentioned issue recommendations, among them, for example:
• The recommendation that “institutions should review their systems for monitoring the extent to which … services meet their … objectives. They should also review how they use this information to ensure they are promoting continuous improvement”.

• the need to review the labour market needs and those of its customers, and to identify gaps.

• The need to review their processes for gathering and using customer feedback to ensure that they are thorough and that they influence decisions about the role of services and activities and the performance expected of them.

• “Institutions should review their links with employers to seek to ensure that these connections meet their needs as institutions. This should include attention to the availability of work experience opportunities as well as jobs for those leaving the institution.”

EURASHE,\textsuperscript{13} in its turn, focuses among other objectives on the continued improvement and quality assurance of higher education, the employability of graduates and the relevance of programmes to the labour market. The UK Universities Group also recognized in its executive summary the need for routine monitoring and reviewing in order to ensure the programmes remain current and vital. The executive summary of UK Universities (umbrella group for the UK university sector) also underlines the increasing involvement of students and other

\textsuperscript{13} EURASHE is the international educational association of European Higher Educational Institutions.
university stakeholders in the process of internal and external review with the aim of quality improvement (Universities UK, 2008b).

This document also brings in correlation with quality assurance procedures between the following aspects (Universities UK, 2008b):

- Responding to feedback and interaction with students, employers and professional, statutory and regulatory bodies.
- Mechanisms designed to engage and involve students, with the aim of involving them as “co-creators in their own learning”, in all aspects of quality assurance.

Students’ interests are declared as the central point of the review’s focus. Students’ engagement in the quality reviewing process is encouraged and realized through regular feedback, consultative committees, formal annual monitoring and periodic review activities. In the Communiqué of the Conference of European Ministers Responsible for Higher Education in Berge in May 2005 it was also underlined that “… there is still progress to be made, in particular as regards student involvement” in the area of quality assurance in higher education (ENQA, 2005).

2.4.2 The total quality management in higher education

QM or TQM is considered in this research as an umbrella term for all activities concerning quality. TQM is a comprehensive management strategy and philosophy
developed by Feigenbaum and first used in Japan about 50 years ago. Three gurus, Deming, Duran and Crosby, defined the shape of the TQM concept that is today the state of the art in the QM theory. The Deming cycle (also known as the PDCA cycle) is the primary approach that was conceptualized in the process-based quality management system (Total Quality Management, 2009). Continual improvement as a core point of the ISO 9001:2000 standards is based on the PDCA cycle. The PDCA cycle is a consequence of the four cyclical processes, described in the ISO 9001 description as follows\textsuperscript{14}:

- **Plan**: establish the objectives and processes necessary to deliver results in accordance with customer requirements and the organization’s policies.
- **Do**: implement the processes.
- **Check**: monitor and measure processes and product against policies, objectives and requirements for the product and report the results.
- **Act**: take actions to continually improve process performance.

Deming is well known for his answer regarding destroyed post-war Japanese industry. He told the Japanese business audience that they should, first of all, find out what their customers wanted, and then design their products and methods based on this knowledge. This simple and ordinary for today clause was revolutionary for the 1950s. The Japanese realized this approach in practice and started the quality revolution (Sallis, 1996). It is acknowledged today that Japanese market dominance is the result of their attention to quality. The Japanese business elite have absorbed the most progressive ideas from the West and today offer their own unique

approaches and philosophies concerning quality, such as, for example, the Kansei engineering approach widely used in Asia that began its development in the West (for more on this point see Chapter 4).

As well as Deming there are two well-known writers on the quality theme who shaped today’s TQM philosophy and defined the development of quality approaches until now, namely Crosby and Juran. The main ideas of these gurus shaped the TQM approach.

Deming describes his approach to the quality problem in his main book Out of the Crisis (1982). His ambitions are to change the style of American management because all quality questions and problems he binds together with management. He states that the real measure of an institution’s success is a satisfied customer, not the formal performance indicators (Sallis, 1996). As the most important of Deming’s ideas in the context of the offered research, the following should be noted: long-term instead of short-term planning; the importance of strategic management vision; monitoring and satisfying the constantly changing needs of customers; statistical tools and techniques necessary for the monitoring and improvement of quality should be provided for staff of all levels; the continuous nature of the quality improvement process; quality improvement is “everybody’s job”; and all staff members should be involved in the quality improvement process.
Joseph Juran is the second key person in quality theory. He also binds quality problems together with management and offers the 85/15 rule, where 85% of institutions’ problems lie with management. He also developed the approach called “Strategic Quality Management” where three management levels are responsible for their own field of quality management: senior management for the strategic view, middle managers for the operational view and the workforce for quality control.

Another worthy of mention in the context of the considered theme is Philip Crosby. He is well known for his idea that quality is free (savings from quality improvement compensate for all costs for quality programmes) and for his quality approach that constitutes not just a theoretical approach (like, for example, that of Deming), but a plan of concrete actions, consisting of 14 steps. This plan has a cyclical nature, a quality programme that never ends. One of the most important steps in the plan is the measurement of quality, which assumes the use of statistical data and customers’ feedback. This quality measurement enables objective evaluation and further corrective actions.

In this research, as was mentioned above, Sallis’s definition of TQM is accepted as the base one (Sallis, 1996): *TQM is a philosophy of continuous improvement, which can provide any educational institution with the set of practical tools for meeting and exceeding present and future customers’ needs, wants, and expectations.*
TQM offers a philosophy with the following basic principles (Sallis, 1996):

- Never-ending improvement.
- Focus on customers.
- Focus on preventing problems.
- Quality is seen as a means to improve customer satisfaction.
- Existence of a strategy, policy and plan for quality.
- Long-term quality improvement instead of short-term expediency.
- Decisions delegated to the appropriate level.
- Accent on a small achievable project instead of grandiose schemes.
- People produce the quality and they need appropriate tools for quality management.
- Upside-down institutional structure (see Figure 2) whose inverted hierarchy demonstrates service-giving relationships and the pivotal role of customers.
- Bringing together of a range of tools that help to implement the concept of TQM.
Any discussion on the quality theme in both today’s theory and practice concentrates on the central role of the customer, which is graphically conceptualized in Figure 2. Sallis defines quality as “that which best satisfies and exceeds customers’ needs and wants” (Sallis, 1996). He also calls it “quality in perception”. He argues that perfectly good products could be rejected by the market just because the producer and consumer think in different ways. Tom Peters also assumes the crucial role of customers’ perception of quality and notes that the perceived quality of product/service is the main factor defining success (Peter et al., 1993). It is also recognized that customers’ needs and expectations have a short-term character (Sallis, 1996). This substantiates the need to be close to the customers and to be able to react to their changing tastes and moods. It is also the reason for the development of such tools as those offered in this research. Marketing guru Kotler sees customers’ wants and needs as the starting point for the discipline of marketing (Kotler & Fox, 1985). In the 1990s, the higher educational institutions also became aware that they needed to understand what their consumers wanted. For example, Ford analysed
students’ views of their education whereby they place difference levels of importance on different parameters (Ng & Forbes, 2009). This understanding of customers’ role is fully in line with the postmodern conceptualization of customers’ role, presented in previous sections.

The majority of literature dedicated to the theme of TQM deals with product, not with services. This can be explained by two essential aspects of the TQM approach, namely, quality measurement and quality evaluation. In the case of the service sector, and especially in the educational sector, customers’ expectations and perceptions complicate the measurement and further evaluation. The second problem in the context of the educational service is the presence of heterogeneous stakeholder groups with different expectations and perceptions (staff, students, employers, society, state etc.). Furthermore, the educational service, as a unique and complex phenomenon, comprises many specific aspects and characteristics and requires special consideration. That is why it is necessary to develop a well-founded approach that enables the measurement and evaluation of quality. This should include a set of sector specific-service dimensions, take into account the variety of stakeholder groups and consider customers’ perceptions and expectations.

2.4.3 Quality of product vs. quality of service

A three-dimensional service scheme is assumed in today’s marketing (Kotler & Fox, 1985) and defines service in the same way as physical implementation defines product (Edvardsson, 2005; Kotler & Fox, 1985; Trajnev et al., 2007). These
dimensions are: conditions, process and result. In the context of this research it is appropriate to view an educational institution as a service provider, because all three dimensions are present in educational services (Kotler & Fox, 1985):

- Conditions: infrastructure, enrolment conditions, etc.
- Teaching and learning are not the end points, but a process.
- Result: knowledge, degree.

According to classical service interpretation, services have a set of characteristics that differ them from products (Badri et al., 2005; Burton, 2002; 108, McDougall & Levesque, 2000; Sallis, 1996):

- Direct contact between producer and customer.
- Service can not be mended.
- Service can not be resold.
- Service is intangible.
- Production and consumption are inseparable.
- Can not be stored.
- Services are variable, the quality of the same service can vary depending on the provider.
- Quality of service is difficult to quantify.
- Heterogeneous in delivery.
According to Lovelock’s classification there are four main categories of services (Moudi & Cottam, 1993):

- Tangible actions directed at people’s bodies.
- Tangible actions directed at goods and other physical possessions.
- Intangible actions directed at people’s minds.
- Intangible actions directed at intangible assets.

Educational services belong to the third category.

Thus, the quality of a service can not be measured based on a predetermined set of specifications, as a tangible product can. Service quality is very dependent on the customers’ affections and behavior (Jiao et al., 2006). The development of a methodology for monitoring quality should consider customers’ emotions and feelings. In other words, the affective dimension of quality should be considered. The specificity of this category also influences the implementation of TQM principles. In the context of this research, the category specificity is reflected by applying personal construct theory, which enables analysis of cognitive constructs in people’s minds (more on this point in Chapter 5).

Service quality is a difficult concept and there are many different approaches within this problem area. Asubonteng et al. (1996) give the following definition: “the difference between customers’ expectations for service performance prior to the service encounter and their perceptions of the service received”. Gefan (2002)
interprets service quality as a subjective comparison between the quality of the service that the customers want to receive and what they actually get. However, most researchers from this research area view service quality perception as the difference between consumers’ expectations and their perception of actual service performance (Ayas, 2008; Mattsson, 1992; Parasuraman et al., 1988; Pakash, 1984). This widely used until now approach is based on a well-founded theory of the disconfirmation paradigm that was developed within American consumer behavior research and constitutes the main idea of this approach (Bloland, 1995). The more advanced version of this approach, offered by Mattsson (1992), brings to the approach the concept of ideal standard. The concept is illustrated in Figure 3:

![Diagram](https://via.placeholder.com/150)

*Figure 3: Model of the evaluation of service encounters (Mattsson, 1992)*

New in this approach is the use of a perceived ideal standard against which the experience is compared. This approach brings us closer to today’s topping postmodernism concept with its underlining subjective nature of all attitudes and relationships and brings the perceived dimension in the satisfaction concept. Taking into account the co-creative nature of educational experience and the key position of students/consumers in this co-creation students’/consumers’ attitude to service and their estimation of service quality play a very important role in analysis and planning. In today’s competitive markets, consumers have a right and opportunity to
choose. Consumers compare, analyse, select and make purchasing decisions based on their perception of the quality offered and resources needed. Today’s consumer seeks the best perceived value-to-resource choice available; perceived value defines the purchasing decision (Groth & Dye, 1999). In the context of this research, the affective dimension of quality is analysed, not the quality itself.

2.5 Summary

This research presumes the current prevalence of postmodern spirit in society. Recent decades have been marked by the epochal transformation from the modern to the postmodern era. Taking into account the hegemony of postmodern thought in today’s intellectual milieu, it is not surprising that postmodernism has attracted a lot of attention from both marketing academics and practitioners. Keeping a close watch on the relationship between marketing and postmodernity is important both for marketing theory and practice. Before the focus on these relationships the concept of postmodernity was introduced and its understanding in the context of the offered research was clarified. The appearance of the educational marketing phenomenon is fully appropriate to the shown current conditions in society and tendencies in the educational sector.

The appeal to postmodernity in this research is also caused by the special relationships between marketing and postmodernity examined in section 1.1.2. Starting with a brief overview of the approaches to these relationships, the author’s
position is presented and explained. The pivotal role of a marketing spirit in postmodernism is accepted in this dissertation as having an objective nature and affecting many fields of human life. The higher education sector didn’t stand aside. The starting point of a marketing approach in education concurs with the formalization attempts of postmodernism in the 1970s. The concept of marketing is accepted and widely used in today’s educational institutions.

Among the standard characteristics of the marketing concept, such as meeting customers’ wants and needs and serving the long-term interests of the consumer and society, the evolution of educational marketing today can be characterized by the trend to merge with strategic management and TQM in an integrative approach. This point was examined closely in section 2.3.3. Effective management has become a key factor in the successes of educational institutions, and at the same time the quality management issues in higher education have been recognized as being of top priority. The need for the TQM approach in higher education institutions is even stated on the international political level.

One of the most significant consequences of this trend for higher education institutions is the adoption of the ISO 9001:2000 business standards that focus on the measurement of customer satisfaction and consider customers’ needs and wants as the explicit drivers of a quality management system. It is shown that the offered research is firmly in line with the mentioned trends and represents an important part of QMS as it is understood in the TQM approach. The TQM approach, based on the Deming cycle, assumes permanent customer satisfaction analysis. The integration of
marketing and management under the TQM philosophy in an integrative strategic management system can be seen as the next big thing in educational marketing.

Taking into account the current conditions in society, generally and in the educational sector in particular, the concept of affective quality comes to the foreground. Positive emotional differentiation is recognized today as a central point for the marketing strategy in competitive markets, and neuromarketing is very popular today. These tendencies are fully in line with the postmodern interpretation of the consumer. Kansei engineering was chosen as being appropriate for the concept of the research goals that reflect all mentioned conditions and trends. A detailed presentation of the chosen methodology is presented in the fourth chapter. Finally, to the reasons for postmodernism consideration in the context of this research was added the specific concept of the consumer in postmodernity, examined in section 2.2.2. The customer’s sensations and interpretations come into the foreground and anticipate the appearance of approaches and theories that enable customers’ perceptions to be taken into account by creating products and design. The similar concepts of affective/perceived/Kansei quality become extremely important both for marketing theorists and practitioners. As previously mentioned, this point is addressed in the offered dissertation by the application of the Kansei approach and repertory grid technique. In its turn, the need for analysis, prognosis and control functions in marketing has led to the focus on quantitative measurement of the affective quality.
Chapter 3 A Literature Review of Higher Education Service Quality Measurement Tools

Today’s conditions presented in the sections above have led to the appearance of approaches that try to integrate the service quality concept with formal measurement. It is significant in the context of this research characteristic of these concepts that they are grounded on customer perception and expectation evaluation. Service quality is a general opinion that the client forms regarding its delivery, which is constituted by a series of successful or unsuccessful experiences (Parasuraman et al., 1985, 1988, 1991, 1994; Ruby, 1998; Yin, 1994; Zeithaml et al., 1990). To assess this category, two arguments can be taken into consideration, namely the customer perception and their initial expectation regarding the service received (Hoefer & Gould, 2000; Hubbard, 2007; Parasuraman et al., 1994; Zeithaml et al., 1990). Customers’ attitude or affective quality is in focus. This chapter provides an overview of the state of the art of this subject in the context of higher education.

3.1 SERVQUAL

One of the most extensively used service quality measurement tools is SERVQUAL, because of its ease of use, possession of simple structure and capability of generalization (Parasuraman et al., 1985, 1988; Saleh & Ryan, 1991; Zeithaml et al., 1990). According to Zeithaml, Parasuraman and Berry, SERVQUAL is a universal
method and can be applied to any service organization to assess the quality of services provided (Zeithaml et al., 1990). Regardless of the type of service, consumers basically use the same criteria to assess quality. Service quality is a general opinion that the client forms regarding its delivery, which is constituted by a series of successful or unsuccessful experiences (Brown, 1991).

The conceptual model of SERVQUAL is based on the assessment that satisfaction is found in situations where perceptions of service quality meet or exceed consumer expectations (Carman, 1990). Client satisfaction is the result of the difference between expectation and the performance obtained. In other words, service quality is evaluated by comparison between customer perception and expectation \((SQ=PE)\). The SERVQUAL scale compares consumers’ perceptions of 22 aspects of service quality against their rating of each factor’s importance (expected service quality) (Krus & Kennedy, 1977; Parasuraman et al., 1991, 1994; Ruby, 1998; Zeithaml et al., 1990). In their initial study, Parasuraman and associates (1985) found that there were ten determinants that characterize customers’ perceptions of the service provided. However, as a result of a later study they reduced the ten determinants of service quality to five. They were able to identify the following five dimensions of service quality: reliability, tangibility, responsibility, security and empathy (Ottavio & Ferreira, 2009; Parasuraman et al., 1988; Ruby, 1998). These dimensions are briefly commented on below (Ottavio & Ferreira, 2009; Ruby, 1998).

- Reliability: the most important dimension for a consumer of services. This dimension expresses the accuracy and dependability with which the company provides its services and enables the answers to the following questions to be
obtained. Is the company reliable in providing the service? Does it provide as promised?

- **Tangibility**: the service provider’s physical installations, equipment, staff and any materials associated with service delivery. Since there are no physical elements to be assessed in services, clients often trust the tangible evidence when making their assessment.

- **Responsibility**: is the demonstration of the company employees’ ability to provide the best service for the customer. This dimension is responsible for measuring company and employee receptiveness towards clients.

- **Security**: encompasses the company’s competence, courtesy and precision in providing their service. This dimension enables the answer to the following question to be obtained. Are employees well informed, educated, competent and trustworthy?

- **Empathy**: the capacity a person has to experience another’s feelings. It can be formulated as the following question. Does the service company provide careful and personalized attention?

The SERVQUAL instrument was developed based on these five dimensions, rating 22 aspects (questions) of service quality. The SERVQUAL scale (questionnaire) has two sections: one to map client expectations in relation to a service and the other to map perception in relation to a certain service company. However, as suggested later, the 22 attributes of the original SERVQUAL instrument, as well as the five dimensions, do not always accurately describe all aspects of a given service
An adapted version of the SERVQUAL scale for higher education services was proposed through a review of literature in (Ottavio & Ferreira, 2009). Table 1 shows the first part (for the Reliability domain only) of the adapted questionnaire model that was used to conduct the quality expectations and perceptions survey for the Production Engineering programme at UNESP/Bauru by its students (Ottavio & Ferreira, 2009).

**Table 1: The Questionnaire for the Higher Education Service (Ottavio & Ferreira, 2009)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Expectation (E)</th>
<th>Perception (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. When excellent institutions of Higher education promise to do something in a certain time, they must do so.</td>
<td>1. When your institution of Higher education promises to do something in a certain time, it does so.</td>
</tr>
<tr>
<td></td>
<td>2. When a student has a problem, excellent institutions of Higher education demonstrates sincere interest in solving it.</td>
<td>2. When you have a problem, your institution of Higher education demonstrates sincere interest in solving it.</td>
</tr>
<tr>
<td></td>
<td>3. Excellent of institutions of Higher education will do the job right the first time and will persist in doing it without error.</td>
<td>3. Your institution of Higher education will do the job right the first time and will persist in doing it without error.</td>
</tr>
</tbody>
</table>

These questions should be scored on a Likert scale from 1 (strongly disagree) to 7 (strongly agree). The scored results E and P from the two sections (Perceptions and Expectations) of Table 1 are compared to reach a parameter (difference) for each of
the questions, that is, the final score is generated by the P–E (Perception-Expectations) model. A negative result indicates that the perceptions are below expectations, revealing the service failures that generate an unsatisfactory result for the client. A positive score indicates that the service provider is offering a better service than expected.

The main idea of the SERVQUAL authors was that the differences between perceived performance and expected performance determine overall service quality and can be evaluated with the following P–E measurement model (Parasuraman et al., 1988):

\[ SQ_i = \sum_{j=1}^{k} w_j(P_{ij} - E_{ij}) \]

where \( SQ_i \) is the overall perceived service quality of stimulus \( i \); \( k \) is the number of attributes; \( P_{ij} \) is the performance perception of stimulus \( i \) with respect to attribute \( j \); \( E_{ij} \) represents service quality expectation for attribute \( j \) that is the relevant norm for stimulus \( i \); and \( w_j \) is the weighted factor if attributes have different weights (Khan, 2007; Teas, 1993). SERVQUAL has been criticized for not being applicable to all services without modification for the dimensions being dependent on the type of service (Babakus & Boller, 1992; Carman, 1990; Teas, 1993). Moreover, some authors described that the relationship between service and quality is different from one service industry to another (Carman, 1990; Taylor & Baker, 1994). New factors should be added and taken into account based on generic dimensions and the appropriateness of service sectors.
Further research has been conducted and new results have indicated that perceived quality alone correlates better with service quality than does the SERVQUAL gap analysis of the difference between perceived and expected quality (Babakus & Boller, 1992). According to Babakus and Boller (1992) conventional disconfirmation model has conceptual, theoretical and measurement problems. Some of the issues pointed out are within the framework of the service quality measurement by SERVQUAL (Parasuraman et al., 1988).

Because of these problems, the following evaluated perceived performance model has been developed addressing the ideal point problem (Miller, 1997; Swan & Trawick, 1980) by formally incorporating the classic ideal point concept into a perceived quality model (Teas, 1993). Within this research, service quality has been interpreted according to Monroe and Krishnan (1985), who perceived product quality as “the perceived ability of a product to provide satisfaction relative to available alternatives”. On the basis of this definition and the assumption that the perceived ability of a product to deliver satisfaction can be conceptualized as the product’s relative congruence with the consumer’s ideal product features, the following probabilistic model of perceived quality has been proposed (Teas, 1993).

\[
(3.2) \quad Q_i = -\left(\sqrt{\sum_{j=1}^{m} w_j \sum_{k=1}^{n} P_{ijk} | A_j - I_j |^r}\right).
\]

where \(Q_i\) is the individual’s perceived quality of object \(i\); \(w_i\) is the importance of attribute \(j\) as a determinant of perceived quality; \(P_{ijk}\) is the perceived probability that object \(i\) has amount \(k\) of attributes \(j\); \(A_{jk}\) is the amount \(k\) of attributes \(j\); \(I_j\) is the ideal amount of attribute \(j\) as conceptualized in classical ideal point attitudinal models; \(m\)
is the number of attributes; \( n_j \) is the number of \textit{amount} categories of attribute \( j \); \( r \) is the Minkowski space parameter. Multiplying the right side of the equation by 1 results in larger values of \( Q_i \) being associated with a higher level of perceived quality (Teas, 1993).

The proposed perceived quality model (3.2) is a general model allowing several alternative perceived quality concepts and measures derived from (3.2) to be obtained along with a simplified version of this model for the Minkowski distance space parameter \( r=1 \). For example, if it is assumed that the individual evaluates object \( i \) with perceived certainty and that object \( i \) has a constant amount of each attributes, the next deterministic model of perceived quality for \( r=1 \) can be derived (Babakus & Boller, 1992; Teas, 1993).

\[
(3.3) \quad Q_i = -\left[ \sum_{j=1}^{m} w_j \mid A_{ij} - I_j \mid \right].
\]

where \( Q_i, w_j \) and \( I_j \) are defined in equation (3.2). \( A_{ij} \) equals the individual’s perceived amount of attribute \( j \) possessed by object \( i \). This model is \textit{Manhattan Distance}, or \textit{City Block Distance} metric for the ideal point model (Thurstone, 1928).

The perceived ability of the product to deliver satisfaction can be conceptualized as the product’s relative congruence with the consumer’s ideal product features. If the object \( i \) is defined as the excellence norm that is the focus of the revised SERVQUAL concept, the above metrics can be used to define the perceived quality of excellence norm \( Q_e \) in terms of the similarity between the excellence norm and the ideal object with respect to \( m \) attributes. If the quality of another object is \( i \), and \( Q_i \) is
relative to the quality of the excellence norm, then normed quality (NQ) is (Stewart et al., 1981; Seth, 2005):

\[(3.4) \quad NQ_i = Q_i - Q_e\]

where \(NQ_i\) is the normed quality index for object \(i\); \(Q_e\) represents the individual’s perceived quality of the excellence norm object and \(Q_i\) is defined in equation (3.2). If the excellence norm is equal to the ideal or perfect object (\(Q_e=0\)) then normed quality \(NQ_i=Q_i\).

The last equations (3.3) and (3.4) can be used to derive the following modified SERVQUAL model that addresses the ideal point problem by incorporating the ideal point concept (Teas, 1993).

\[(3.5) \quad NQ_i = -\left(\sum_{j=1}^{m} w_j \left( I_j - | A_{ij} - I_j | \right) \right)\]

where \(NQ_i\) is the normed quality index for object \(i\); \(A_{ej}\) represents the individual’s perceived amount of attribute \(j\) possessed by the excellence norm. The meaning of \(w_i\) and \(I_j\) is the same as in equation (3.2) and \(A_{ij}\) is defined in (3.3). For infinite ideal points, normed quality is (Seth, 2005; Teas, 1993).

\[(3.6) \quad NQ_i = \sum_{j=1}^{m} w_j \left( A_{ij} - A_{ej} \right)\]

The last equation is similar to the original SERVQUAL model described in (3.1). Two assumptions are used in equation (3.6), namely all the \(m\) attributes have infinite classic ideal points and that the SERVQUAL normative expectations concept is redefined as the excellence norm specified in (3.5). Poor reliability and inter-factor correlations of SERVQUAL lead to proposing SERVPERRF (perception-only model)
and HEdPERF (Higher Education PERFormance) for efficient measurement of service quality (Abdullah, 2005; Khan, 2007).

### 3.2 SERVPERF

Due to the controversy relating to the SERVQUAL instrument, a more direct approach to the measurement of service quality has been proposed (Cronin & Taylor, 1992, 1994). This new approach was developed as a measurement instrument called SERVPERF, which is used for service quality assessment. The SERVPERF instrument, like the SERVQUAL, uses an attribute approach. But in contrast to SERVQUAL the SERVPERF tool measures customers’ experiences of service only. This instrument makes use of the original SERVQUAL scales and also requires the consumer to rate the provider’s service performance on a seven-point scale. In contrast to SERVQUAL, SERVPERF uses a single set of questions concerning post-consumption perceptions of service quality and does not seek to measure expectations (Cronin & Taylor, 1994). It was illustrated that service quality is a form of consumer attitude and the performance-only measure of service quality is an enhanced means of measuring service quality (Cronin & Taylor, 1994; Parasuraman et al., 1985). According to this research, service quality can be conceptualized as similar to an attitude and can be regarded as an adequacy-importance model. Thus service quality is evaluated by perceptions only without expectations and importance weights as follows (Khan, 2007; Seth, 2005).

\[
(3.7) \quad SQ_i = \sum_{j=1}^{k} P_{ji}
\]
where $SQ$ is the overall service quality of object $i$; $k$ is the number of attributes; $P_{ij}$ is the performance perception of stimulus $i$ with respect to attribute $j$ (Khan, 2007).

### 3.3 HEdPERF

A new industry-scale called HEdPERF (Higher Education PERFormance) has been developed comprising a set of 41 items (Firdaus, 2006). This instrument aims to consider not only academic components, but also aspects of the total service environment as experienced by the student.

The author identified five dimensions of the service quality concept:

- **Non-academic aspects**: this dimension includes items that are essential to enable students to fulfil their study obligations, and relates to duties carried out by non-academic staff.

- **Academic dimension**: this means the responsibilities of academics.

- **Reputation**: importance of higher learning institutions in projecting a professional image.

- **Access dimension**: this dimension includes the following issues: approachability, ease of contact, availability and convenience.

- **Programme issues**: this aspect concerns the importance of offering a wide ranging and reputable academic programmes/specializations with flexible structure.
The SERVPERF and HEdPERF scales were compared in terms of reliability and validity and it was concluded that the new proposed measurement was superior (Firdaus, 2006).

### 3.4 FM-SERVQUAL

FM-SERVQUAL was developed based on the original SERVQUAL, i.e. through the mechanism of comparison between customers’ perception of services provided by the local authority compared to the expectation of services desired by customers (Parasuraman et al., 1988; Zahari et al., 2008). It includes the use of an integrated facilities management framework, a combination of perception statements and expectations, using positive wording solely to avoid confusion as well as the development of a measurement element according to the appropriateness of rule and function services of the local authority to the community.

The FM-SERVQUAL instrument is able to measure the service quality of the local authority delivery system (Zeithaml et al., 1990). FM-SERVQUAL can also serve as an essential gauge in the policy formulation and future planning of an organization. FM-SERVQUAL is a tool for measuring service quality in local authorities through comparing customer perception and expectation of the quality of services provided. The structured survey in such a design is suitable for collecting data in big sample sizes for evaluating the quality of services in local authorities. The process of constructing FM-SERVQUAL comprises several steps. It starts by defining the assessment of service quality through the formula $\text{SQ} = \text{P|E}$. The variation $\text{P|E}$ is
where the perception of the service quality received is requested with respect to the customer’s expectation of what was actually received (Zeithaml et al., 1990). Then 90 items have been created that will characterize the concept of service quality based on the integrated facilities management framework. The next steps deal with data collection and data analysis, identification of service quality, and FM-SERVQUAL reliability and validity evaluations (Zeithaml et al., 1990).

3.5 INTQUAL

Quality is widely studied using various adaptations of the SERVQUAL instruments as has been shown in previously presented results. As one of the SERVQUAL adaptations, the internal service quality measure called INTQUAL was developed by Caruana and Pitt (1997). The INTQUAL model is an internal service quality measure for service organization as an alternative to SERVQUAL with more of an emphasis on the customer’s point of view. It is an attempt to establish an operational method for internal measurement of service quality. INTQUAL is an adaptation of the SERVQUAL model. It is used by Berry and Parasuraman (1988) for service quality measures in the management of expectation and service reliability as an adopted model for internal measurement of service quality.

Frost and Kumar (2001) developed a conceptual model that they called INTSERVQUAL, based on the SERVQUAL scale proposed by Parasuraman et al. (1985). The study was conducted in a major international airline for measuring the expectations and perceptions of internal customers. According to the authors, the two
scales exhibited adequate validity as separate measures of front-line staff (customer-contact personnel) expectations of support services and their perceptions of the support staff’s performance. The results indicated that the scales can be successfully used to assess the magnitude of the gap between front-line staff perceptions and expectations.

3.6 DL-eSQUAL

DL-eSQUAL was introduced as there was a need for an instrument to measure the quality of online education. The previous SERVQUAL and e-SQ models measured the quality of traditional and eCommerce services and there are no instruments available to measure the quality of distance-learning services. In their research, Shaik et al. (2006) found that the DL-eSQUAL scale demonstrated psychometric properties based on validity and reliability analysis. Their findings from exploratory research offered useful initial insights into the criteria and processes that students use in evaluating distance-learning services. These insights, in addition to serving as a starting point for developing a formal scale to measure perceived DL-eSQUAL, constituted a conceptual blueprint that distance-learning administrators can use to qualitatively assess the potential strengths and weaknesses of their services. It also helps target specific service elements requiring improvement, and training opportunities for staff. Analysed at the item level, data drawn from the application of the DL-eSQUAL instrument have practical implications for distance-learning administrators. This is an exploratory study with the goal of developing a DL-eSQUAL scale. The scale should be viewed as a preliminary scale because the
sample is limited to a single distance-learning institution located in the south-east part of the United States and represents the service experiences of students at that institution. Due to the limited nature of the sample, the results of this study cannot be generalized beyond the specific sample domain. The generalizability of the results of this research study is also constrained by the absence of standardized data for comparison (Merican et al., 2009).

3.7 EduQUAL

Khan (2007) have made an attempt propose a new instrument based on ANN (Artificial Neural Networks) (Berry et al, 1988; Boser et al., 1992; Cao et al., 2003; Vapnik, 1998, 2006) for measuring technical education quality known as EduQUAL using SERVQUAL as a basis for evaluating quality at an aggregate level fitting most of the important stakeholders. Accepting the fact that an educational system caters to the needs of a large number of stakeholders, the students have been treated as the internal customer and alumni, parents and recruiters as the external customer (Khan, 2007). Each of these groups has diverse expectations and perceptions that need to be prioritized and reconciled. The variables and items for service quality for each stakeholder are conceptualized to identify their needs. Taking into consideration the views of the experts and the quality items mentioned in the literature, a set of items relevant to technical education in India containing 43 survey items was compiled. Then 28 items that loaded more than 50% are kept under five dimensions: Learning Outcomes, Responsiveness, Physical Facilities, Personality Development and Academics. Twenty-eight items under five dimensions constitute various relevant
variables for the proposed instrument, EduQUAL, to measure education quality in a technical education system (Khan, 2007). The 15 items that failed to get loaded more than 50% are deleted from further consideration within EduQUAL. The 28 items and corresponding dimensions are presented in Table 2.

Table 2: EduQUAL Dimensions and Items (Khan, 2007)

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Outcomes</td>
<td>1. Training on state-of-the art technology.</td>
</tr>
<tr>
<td></td>
<td>2. Practical orientation in education.</td>
</tr>
<tr>
<td></td>
<td>3. Adaptability to modern techniques.</td>
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<tr>
<td></td>
<td>4. Design of course structure based on job requirements.</td>
</tr>
<tr>
<td></td>
<td>5. Problem solving skills.</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>7. Prompt service at service departments.</td>
</tr>
<tr>
<td></td>
<td>8. Courteousness and willing to help.</td>
</tr>
<tr>
<td></td>
<td>9. Cleanliness, orderliness, systematic and methodical</td>
</tr>
<tr>
<td></td>
<td>10. Transparency of official procedure, norms and rules.</td>
</tr>
<tr>
<td></td>
<td>11. Adequate facilities/infrastructure to render service.</td>
</tr>
<tr>
<td>Physical Facilities</td>
<td>12. Well equipped laboratories with modern facilities.</td>
</tr>
<tr>
<td></td>
<td>13. Comprehensive learning resources.</td>
</tr>
<tr>
<td>15. Aesthetic views of facilities.</td>
<td></td>
</tr>
<tr>
<td>16. Training in a well equipped communication laboratory</td>
<td></td>
</tr>
<tr>
<td>17. Opportunities for campus training and placement.</td>
<td></td>
</tr>
<tr>
<td>18. Effective classroom management.</td>
<td></td>
</tr>
<tr>
<td><strong>Personality Development</strong></td>
<td></td>
</tr>
<tr>
<td>19. Encouragement for sports games and cultural activities</td>
<td></td>
</tr>
<tr>
<td>21. Adherence to schedule.</td>
<td></td>
</tr>
<tr>
<td>22. Extra academic activities.</td>
<td></td>
</tr>
<tr>
<td>23. Recognition of the students.</td>
<td></td>
</tr>
<tr>
<td><strong>Academics</strong></td>
<td></td>
</tr>
<tr>
<td>26. Close supervision of students work.</td>
<td></td>
</tr>
<tr>
<td>27. Expertise in subjects and well organized lectures.</td>
<td></td>
</tr>
<tr>
<td>28. Good communication skill of academic staff</td>
<td></td>
</tr>
</tbody>
</table>

After data reduction and statistical analysis it is concluded that 28 service items are important for improving quality in a teaching education system relevant to the
important stakeholders such as students, alumni, parents and recruiters. These 28 service items are grouped into the five dimensions mentioned before. The actual responses of the stakeholder are analysed in order to gain an insight into the relative importance of the items and dimensions of EduQUAL for each stakeholder. For these analyses, only the perceptions of the stakeholders are taken into consideration as this has a greater impact on the quality of service (Babakus & Boller, 1992; Khan, 2007). Perceptions of the stakeholders are treated as response score.

As has been pointed out by Likert (1932), the sequences of prioritization of dimensions according to the perceptions of the stakeholders are significantly different from each other. Table 3 summarizes the prioritization of dimensions for all stakeholders considered in this study (Khan, 2007). At the top of this table is the highest level of priority, going down to the bottom of Table 3.

Based on the above-presented dimensions and corresponding items, neural networks models have been designed for the analysis and evaluation of service quality in education with input data such as customer expectations and perceptions and the gaps (Khan, 2007).

Table 3: Prioritization of Dimensions (Khan, 2007)

<table>
<thead>
<tr>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
</tr>
<tr>
<td>Learning</td>
</tr>
<tr>
<td>Outcomes</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Physical Facilities</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Personality</td>
</tr>
<tr>
<td>development</td>
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<tr>
<td></td>
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<tr>
<td>Responsiveness</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

The following models have been implemented within this framework.

- **Model-I** is the P-E gap model. In this network model, the input is defined using the traditional SERVQUAL-based gap, which means the perceptions of customers minus the expectations (Parasuraman et al., 1988). This resulted in 28 input nodes, a hidden layer and an output layer consisting of one node representing the overall evaluation of service quality.

- **Model-II** is the P-only model. The use of a perception and expectation gap raised concern among the researchers due to its low reliability and poor inter-factor correlations (Cronin & Taylor, 1994). It is argued that customer perceptions are more important than the gap between their perceptions and expectations.

- **Model-III** is the E-P gap model. Generally, it is assumed that most customers enter a service situation with some expectations (Khan, 2007). These expectations are formed either by previous experiences of the same or a similar service, or simply expectations generated by customers independently. So a
customer usually undertakes a service experience with some preconceived expectations and thereafter develops a perception of that experience.

### 3.8 SQM-HEI

The new Service Quality Measurement in Higher Education in India (SQM-HEI) model has been proposed as an effective tool for the measurement of service quality in higher educational institutions (Senthilkumar & Arulraj, 2011).

According to SQM-HEI methodology the data are collected by means of a structured questionnaire comprising six sections. The first section consists of ten questions concerning teaching methodology (TM), the second section includes five questions pertaining to the environmental change in study factor (ECSF), the next section consists of questions relating to disciplinary measures taken by the institutions, the fourth section is related to the placement-related activities, and the fifth part provides an overall rating of the service quality (Senthilkumar & Arulraj, 2011). The last part includes respondents’ demographic profile information. The first five sections were presented as statements on the questionnaire, using a seven-point Likert-type rating scale. In addition to the main scale, respondents were asked in the fifth section to provide an overall rating of the service quality satisfaction level. SQM-HEI has been proposed for the purpose of improving the quality of higher education in India. The

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15 Person who is asked for certain oral or written information during a survey,

Read more: http://www.businessdictionary.com/definition/respondent.html#ixzz3VECGavov
model would help in identifying three service areas to be focused on in the higher educational institutions for improving the quality (Senthilkumar & Arulraj, 2011).

SQM-HEI methodology and tools can be regarded as some of the adaptations of SERVQUAL for the estimation of higher education service quality in India. The proposed domains and questionnaire include the specific attributes of the Indian educational service.

3.9 Limitations of existing service quality measuring instruments in the context of today’s higher educational institutions

There are two main categories of the SERVQUAL and SERVQUAL-based instruments’ application problems: conceptual and empirical.

Conceptual problems of the SERVQUAL and SERVQUAL-based applications can be defined as follows:

- Application of two independent methods of assessment of perceptions and expectations for the further definition of a third independent concept of service quality.

- Uncertainty of the “expectation” concept. R. Kenneth Teas (1993) criticizes the “expectations” used in SERVQUAL as a concept that could be differently defined, e.g. as the customer’s desires and needs, or as the standard normative
expectations, or as the service level that the consumer imagines and predicts. These various definitions of “expectations” can lead to problems with the reliability of results measurements.

- Complications with the application of a uniform method in various branches and situations. James Carman in his research devoted to the SERVQUAL application in four different branches came to the conclusion that adequate quality service assessment in different situations demands additional branch-specific information (Gibbs & Knapp, 2002; Teas, 1993). We have the same situation with two other SERVQUAL-based methods: INTQUAL and SERVPERF.

Empirical problems in many respects are the consequences of these conceptual problems. Mainly, this concerns the use of the difference between perceptions and expectations. So the following points can be counted among the empirical problems (Gibbs & Knapp, 2002, Teas, 1993):

- Low reliability.

- Instability of used variables.

- Insufficient validity.

As was mentioned above, poor reliability and inter-factor correlations of SERVQUAL lead to proposing SERVPERF (perception-only model) and HEdPERF
(Higher Education PERFormance) for efficient measurement of service quality (Abdullah, 2005; Cova, 1997; Khan, 2007).

The more correct and less labour-intensive modification of SERVQUAL and SERVPERF, has gained wide acceptance in practice. Nevertheless, this approach is also criticized because of its disadvantages. The main criticism consists in the lack of close causal connection between expectations and performance. It is doubtful that the quality of a service could be estimated based only on the performance.

The measuring instrument HEdPERF (Higher Education PERFormance) was developed as the answer to the critical point about complications with the application of the uniform method SERVQUAL in various branches and situations (see above). This new instrument concentrates only on one branch – higher education. This helps to avoid many of the restrictions of the SERVQUAL instrument caused by its universal nature.

However, there are some limitations of the HEdPERF instrument that have to be considered in future development:

- Measurement items include only positively worded statements. According to some researchers, good research should include both positively and negatively worded statements (Gilmore, 1974). This limitation also extends to the INTQUAL instrument.
• This instrument concentrates only on students. Higher educational institutions have many more different stakeholder groups, e.g. parents, industry, state and society as a whole. All these groups should be considered.

The variety of SERVQUAL-based instruments cannot overcome the restrictions of the initial method. Each instrument concentrates only on one aspect and cannot overcome the complex limitations of SERVQUAL. So, EduQUAL was developed to suit the technical education system (Abdullah, 2005). SQM-HEI is aimed at service quality management in higher education institutions in India (Abdullah, 2005). DL-eSQUAL was developed as an instrument to measure the quality of online education.

The analysis of the provided service quality measurement instruments has revealed some problem areas that have to be worked on in detail by developing a new approach. The most important of these are:

• There is a problem with the formal and monosemantic definition of the concepts “service”, “quality” and “service quality”. These concepts should be clearly defined and well founded in the context of future research.

• The nature of service quality as an attitude is important today not only for the marketer. This approach is also widespread among the developers of the service quality measurement instruments. F. Abdullah (2005) notes that “there seems to be a broad consensus that service quality is an attitude of overall judgement about service superiority, although the exact nature of this attitude is
still hazy”. The understanding of service quality as an attitude needs further development.

- As described in this section, instruments can be defined as quantitative multi-attribute measurements. A great number of dimensions, items and criteria exist. Their relevance, clarity, correctness and simplicity are still discussed and criticized. Further substantiation of the service quality measurement criteria in the higher education context is needed. The existence in the new tool of the opportunity (and methodology) to change and correct the criteria dynamically is also expedient.

The application of all analysed service quality measurement instruments in the context of higher education institutions concentrates only on student-customer analysis, regardless of the one-sector (e.g. HEdPERF) or universal (e.g., SERVQUAL) nature of the instrument. However, the perspectives of other groups (employers, public in general, etc.) are also very important in the context of higher education. Existing methods were direct compared to reveal the imitations that could define the directions for future studies. Used criteria set was defined based on marketing context of the research, specificity of educational sector and the research problem statement. The result of this comparison is presented in the Table 4.
Table 4: Comparison of the existing methods

<table>
<thead>
<tr>
<th>Method/Criteria</th>
<th>Differentiation based on stakeholder group</th>
<th>Consistent substantiation of measurement criteria</th>
<th>Clear definition of measured quality</th>
<th>Specificity reflection of education sector</th>
<th>Consideration of both academica and non-academic dimensions</th>
<th>Incorporation of marketing principles</th>
<th>Linguistic Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVQUAL</td>
<td>Concentrates only on students</td>
<td>Is absent based on vague defined concepts of expectation and perception</td>
<td>Additional branch specific informatio n is needed</td>
<td>Both dimension are NOT considered</td>
<td>Is absent</td>
<td>Includes only positively worded statements</td>
<td></td>
</tr>
<tr>
<td>SERVPERF</td>
<td>Concentrates only on students</td>
<td>Is absent based on vague defined concepts of expectation and perception</td>
<td>Additional branch specific informatio n is needed</td>
<td>Both dimension are NOT considered</td>
<td>Is absent</td>
<td>Includes only positively worded statements</td>
<td></td>
</tr>
<tr>
<td>HedPERF</td>
<td>Concentrates only on students</td>
<td>Is absent based on vague defined concept of expectation</td>
<td>Concentrates on education sector</td>
<td>Both dimension are considered</td>
<td>Is absent</td>
<td>Includes only positively worded statements</td>
<td></td>
</tr>
<tr>
<td>FM-SERVQUAL</td>
<td>Concentrates only on students</td>
<td>Is absent based on vague defined concepts of expectation and perception</td>
<td>Additional branch specific informatio n is needed</td>
<td>Both dimension are NOT considered</td>
<td>Is absent</td>
<td>Includes only positively worded statements</td>
<td></td>
</tr>
<tr>
<td>INTQUAL</td>
<td>Concentrates only on students</td>
<td>Is absent based on vague defined concept of</td>
<td>Additional branch specific informatio</td>
<td>Both dimension are NOT considered</td>
<td>Is present, focus on customer</td>
<td>Includes only positively worded statements</td>
<td></td>
</tr>
</tbody>
</table>
The limitations that were revealed through the direct comparison of the existing methods define new directions for future studies. In the context of the offered research the following points were chosen for further, more particular consideration:

- Different customer groups need differentiated approaches and questionnaires within the new methodology. At the same time students should be considered as the primary customers.

- More consistent substantiation of the criteria for the measurement of educational service quality is needed.

- The concept of the quality that should be measured needs appropriate consideration and monosemantic definition, because the uncertainty of the measured concept leads to the result interpretation problems.
• The measurement methodology should reflect the specificity of the higher educational sector.

• Both academic and non-academic aspects should be admitted.

• It would seem rational to develop a new measurement scale that incorporates the marketing principle, which suggests that corporate strategy should flow from consumer needs.

• Measurement items should not include only positively worded statements.

3. 10 Summary

As has been pointed out in this chapter, most of the existing higher education service quality methodologies and measurement tools have been oriented to obtain the answer to whether perceptions of service quality meet or exceed consumer expectations. This is the key conceptual background of SERVQUAL, the most widely used instrument used to measure customer evaluations of service quality, as well as of other tools used nowadays. This is the fundamental issue for higher education service quality methodologies to evaluate customer expectations and perceptions of higher education service quality. There are two common features in modern higher education service quality methodologies and measurement tools, namely the structural representation of service quality as a set of different domains described by a set of questions and the application in most cases of a Likert-type rating scale for evaluation purposes.
Despite its leading position in measuring higher educational service quality, SERVQUAL and other existing tools have some criticisms (Cronin & Taylor, 1992; Peter et al., 1993; Philip & Hazlett, 1997; Van Dyke et al., 1999; Weitzel et al., 1989). These criticisms are related to conceptual, methodological and analytical issues in the SERVQUAL methodology (Khan, 2007). The conceptualization of service quality as the difference between perception and expectation has a lot of criticisms compared with a perception-only approach to service quality measuring (Monroe & Krishna, 1985). The use of the perception and expectation gap measure of service quality raises related analytical concerns about low reliability, poor discriminant validity and parasitic correlations (Cronin & Taylor, 1992, 1994; Khan, 2007; Peter et al., 1993; Trajnev et al., 2007; Van Dyke et al., 1999; Weitzel et al., 1989).

The limitations of SERVQUAL and SERVQUAL-based instruments define the directions for further studies. So, more attention should be paid to concept substantiation and branch specificity.
Chapter 4 A Critical Review of Kansei Engineering

This Chapter provides a critical review of Kansei Engineering and other methods that were used by the own approach development.

The offered research is conducted within the scope of Kansei engineering – the special technique and philosophy of design developed at the beginning of the 70s by the Japanese professor Nagamachi Mitsuo. Kansei engineering focuses on the transformation of emotional experiences and feelings to concrete properties of products. In Japan an academic network has been formed to maintain this transdisciplinary research area and to join different research directions and groups. This well-known and widespread in Asia approach has also started expanding as a new scientific approach to design in Europe: there are groups developing this direction, for example “The Kansei Operations Centre” at Linköping University in Sweden, (Linköping University, 2008).

4.1 About Kansei engineering

4.1.1 Kansei engineering in the context of offered researched

Kansei Engineering was chosen as a basis framework for the proposed research. This choice was dictated by the following aspects:
• Kansei engineering approach's perfect compliance to today's trends in society, industry and science.

• Set of limitations presented in the section 3.9.

• Research context.

Kansei engineering approach's perfect compliance to today's trends in society, industry and science (see example of postmodern conditions presented in Section 2.1):

• Hyper-Reality. Kansei engineering is fully consonant with information technologies used for creation of virtual interpretation of reality, intertextuality\(^{16}\) and interactivity. These aspects are also present in offered research due to the formulated research hypothesis, main task and objectives.

• Fragmentation. Individuals are divided into the set of self-images. Kansei engineering approach concentrates on customer's preferences and perception. This focus is consonant with today's consumption based rather on fragmentation than unification.

• Reversals of consumption-production. Consumer becomes co-producer. Kansei engineer is a classical example of this process as the approach that concentrates on customers' perception transferring in to the product design.

\(^{16}\) the interrelationship between texts, especially works of literature; the way that similar or related texts influence, reflect, or differ from each other, http://dictionary.reference.com/browse/intertextuality
Decentering of the subject. Individuals build their own knowledge system and bring their own context with them. The concepts that interpret the human psyche as a set of constructs influenced by reality become more and more popular today. Kansei engineering, especially its modified version that uses Repertory Grid Technique, is a classical example of such concepts.

Juxtaposition of opposites. This condition presumes a peaceful coexistence of different points of view. It gives a chance for trans-disciplinary research and methods. Kansei engineering is a trans-disciplinary, dynamically developing approach, that allows conduct such trans-disciplinary research as offered.

Set of limitations based on direct comparison of existing methods in researched area has also influenced the choice for Kansei Engineering as a framework of offered research because of the following aspects:

- Differentiated approaches and questionnaires based on different stakeholders groups could be conducted.

- Kansei engineering presumes consistent substantiation of the criteria for the product or service estimation. Different methods and techniques could be applied on this stage to fit the purposes of particular research more appropriate.

- The concept of the quality perception is in the focus of Kansei engineering approach.
• The measurement methodology based on Kansei engineering approach could reflect sector specificity of studied object. Both academic and non-academic aspects of education service could be admitted.

• Kansei engineering philosophy is very close to the marketing philosophy (accent on customers' perception), what helps to easy incorporate marketing principals in to the own approach.

• Kansei engineering approach assumes the active work with the linguistic structures to fit the research context and tasks more appropriate, so measurement items could include not only positively worded statements.

Research context has also influenced the choice for the Kansei engineering due to the following aspects:

• Declared attempt to measure immeasurable – emotional dimension of quality. Kansei engineering also works with the quantification and formalization of the immeasurable concepts as emotions, feelings and impressions in quality perception context.

• Appeal to the affections and perception in offered research is fully consonant with the Kansei engineering philosophy that focuses on emotional dimension.

• Total quality management and marketing philosophy (mentioned above) as a research context. Today's TQM is based on PDCA (plan-do-check-act) cycle. This cycle overlaps with one of the focal points of Kansei eengineering, namely, creation of Kansei oriented system.
Another two reasons that complete the argumentation for the Kansei engineering as a research framework:

- Kansei engineering is in Asia a widespread and well-known approach with significant successes examples.
- Kansei engineering is a flexible dynamically developing approach at the moment, what makes its implementation and/or modification very interesting both from scientific and practical points of view.

Considering the above-stated argumentation, the choice for Kansei Engineering approach was substantiated from different points of view.

### 4.1.2 Appearance and success story of Kansei engineering

Kansei engineering was introduced in the 1970s by Professor Nagamachi at Kure University (now Hiroshima International University) (Barnes et al., 2008; Barnes & Lillford 2009; Nagamachi, 2008). The first success of the new concept that includes method and philosophy in industry is attributed to the Mazda Motor Company. In the late 80s, beginning of the 90s, the Japanese automobile designer Toshihiko Hirai, inspired by the works of Nagamachi, created under his patronage a unique car – the Mazda MX-5 Miata. The result was impressively successful – the Mazda MX-5 Miata holds the Guinness Record 2001 as the best-sold roadster over more than 10 years.
The term “Kansei engineering” was proposed by the Mazda Motor Company. Takao Kijima, the designer of the third generation of the Mazda MX-5 and the designer of the first generation, Toshihiko Hirai, wrote a work called *Kansei Engineering*, which was at the root of the scientific substantiation of Kansei engineering (Kansei Group at Linköping University, 2012). For the first time in an automobile design they put as the central focus not the technical characteristics such as acceleration or horsepower, but the emotions and feelings that the driver has – whether he likes the sound of the motor, and whether he receives pleasure from driving and from interaction with the car.

The quantity of the products developed in the scope of Kansei engineering is constantly growing. The greatest of today’s successes are achieved in Japan (Kansei Group at Linköping University, 2012). Impressive examples include: Sharp video camcorders with LCD display (with market share increase from 3% to 24%) and underwear-producing company Wacol (42% market share in Japan) (Linköping University, 2008). The companies that implement Kansei engineering today include Danone, Volvo, Toyota, Cloetta, Axa, SAAB, Scania, Electrolux and others (Kansei Group at Linköping University, 2012). Kansei engineering, as was mentioned above, has also started attracting attention in Europe (Levy et al., 2007; METI Web Site, 2007). In Sweden, the European Kansei Operations Centre was created based at the University of Linköping. With the help of researchers at this center, the Swedish furniture company Kinnarps AB designed a new model of office chair. This chair (see Figure 4), designed according to Kansei techniques in ergonomics, comfort,
usability and emotional perception, is in huge demand despite the high price (Kansei Group at Linköping University, 2012; Pospelov, 2009).

Another example of the latest works of the Linköping group is a joint project with the Volvo Car Corporation. The goal was to find the features in the car that “... give people ‘delight’ and ‘passion’” (Kansei Group at Linköping University, 2012). Surprisingly, many intangible features, such as “smell” and “sound”, were identified as key features (Kansei Group at Linköping University, 2012). This fully corresponds to the marketing trends described in section 2.2.3. The project output is described as “... affective impact was measured and suggestions for further design given” (Kansei Group at Linköping University, 2012).

The application of the Kansei engineering approach is not limited by one or two branches (Levy et al., 2007). At the moment on the website of Linköping University in Sweden different examples of Kansei technique implementation are presented: chocolate snacks, a stick mixer and a warehouse reach truck.

However, it was identified that almost all examples of Kansei engineering implementation belong to products (Levy et al., 2007). It seems very promising to develop the Kansei engineering approach in the service branch. As S. Schuette notes, it is a rapidly growing area [SS: 39]. Other interesting areas for Kansei engineering are Web design and the design of interactive interfaces. The focal point of Kansei techniques lies here not in the functionality or usability, but mostly in the product’s emotional background. Kansei engineering can be applied in the development of any products/services with which the user communicates by means of visual, acoustic or

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18 reprinted from Linköping University website, november 2015, http://www.kansei.eu/
tactile perception. Nevertheless, the product/service should have sufficient flexibility allowing influence its new end-version.

Important in the scope of the proposed research fact about Kansei engineering is its implementation as part of the TQM system “... with the aim of improving the ‘total quality’ of a product concept” (Lanzotti & Tarantiono, 2008).

4.1.3 Application of Kansei engineering

Kansei engineering formalizes such concepts as feelings, impressions and emotions and highlights their role in the purchase decision-making process (Schuette, 2005). As was mentioned above, the role of customers’ emotions and affections is accepted by marketers as being very important for product success. It is very important for many companies to quantify customers’ impressions of a product (Barnes et al., 2008; Kansei Group at Linköping University, 2012). Kansei engineering measures emotions and feelings and correlates them to the product features (Kansei Group at Linköping University, 2012). Kansei engineering tries to transform mental structures in customers’ minds into a product’s features (Levy et al., 2007). Intended feelings can be built into the end product design.

The central concept in this approach is Kansei itself. The etymology of this word led to the Japanese term, which is built from the two words “Kan” and “Sei”. This combination can be translated as “sensitivity” or “sensibility” (Lee et al., 2002; Nagasawa, 2002, 2008; Schuette, 2005).
The final meaning used in Kansei engineering is, however, more difficult and has different interpretations. There are linguistic, philosophical and psychological dimensions of this term to the definitions given by R&D Kansei researchers (Schuette, 2005). In this research the last context, namely the context of Kansei engineering, is adopted. However, also in the scope of Kansei engineering a unifying definition of Kansei doesn’t exist. In his research, dedicated to the exploration of Kansei engineering, Simon Schuette summarizes several approaches to the definition of Kansei together with his own (Schuette, 2005):

- Lee et al.’s definition. According to this approach, Kansei is an aggregated term for the following words: sensitivity, sense, sensibility, feeling, aesthetics, emotion and intuition.

- The approach offered by Shimizu et al. interprets Kansei not only as an aggregated term for the words sentiment, feeling and emotion, but also includes the continuous interaction of these three basic pillars (Schuette, 2005).

- The Japanese Society of Kansei Engineering broadens the term Kansei, supplementing it with the concept of contact. So, Kansei is a process of constant contact with the world. The received information is processed and reflected to the world. This process occurs permanently (Schuette, 2005).

- According to Nagamachi, Kansei exists only through the cooperation of sensation, perception and cognition: “kansei is … customer’s psychological feeling and image regarding a new product” (Schuette, 2005).

- According to Schuette himself, Kansei can be presented as a model. In this model the process of human creativity is affected by the subjective values of
the person. These values are built based on sensory input from the environment (see Figure 6).

![Figure 6: Kansei model (Schuette, 2005)](image)

The author’s interpretation of the term “Kansei” accepted for this research is presented in section 5.1.

Nagamachi described the content of Kansei engineering with the help of the following model that could be accepted as the classical or traditional approach for today (Schuette, 2005):

![Figure 7: Principle of a Kansei engineering system offered by Nagamachi (Schuette, 2005)](image)
As shown in the figure above, the goal of the Kansei engineering system is to transform customers’ feelings into product/service design.

According to Nagamachi, there are three key points to Kansei engineering (Schuette, 2005). These points are addressed in the offered research and represent the formal structure of further Kansei engineering methodology application:

- How to accurately understand customer Kansei: sections 5.1, 5.2.1 and 5.2.2 are dedicated to the first focal point and deal with the term “Kansei” and affective quality.
- How to reflect and translate the understanding of Kansei into product design: the implementation of repertory grid technique tries to solve this problem mostly correctly and represents a compromise between the requirements caused by the ephemeral nature of people’s minds and the need for its further statistical treatment. This focal point is addressed in section 5.2.3.
- How to create a system and organization for Kansei-oriented design: the system approach to the cyclical customer monitoring system that is grounded on topical trends and represents a framework for both strategic and operative levels addresses this question. The concept is presented in section 5.4.

In his article “Perspectives and the new trend of Kansei/affective engineering”, Mitsuo Nagamachi provides an interpretation of the most popular Kansei engineering application mode, called Kansei Engineering Type 1. This method consists of the following ten sequential stages (Nagamachi, 2011):
- Decision of strategy – company’s decisions about product strategy and customer target groups.

- Collection of Kansei words – collection of words related to the product, usually about 30–40 words.

- Setting of SD scale – construction of semantic differentiation scale based on collected Kansei words.

- Collection of product – collection of product samples.

- A list of items/categories – identification of product items and categories; product item is a category such as size, colour, style, etc.; category is more detailed information about each item, e.g. for the item “colour” it could be red, blue, white, yellow etc.

- Evaluation experiment – evaluation of each product sample on the semantic differentiation scale sheet.

- Multivariate analysis – analysis of the evaluated data using multivariate statistical methods: regression analysis, cluster analysis and others.

- Interpretation of the analysed data.

- Explanation of the data.

- Check of designer’s sketch.

Nagamachi underlines in this article that most psychological phenomena are expressed in qualitative style and Kansei engineering practitioners use different
methods to treat these data in multivariate analysis style. In the scope of Kansei engineering for this purpose the “Quantification Theory” is very popular (Nagamachi, 2011).

In Japan, there are different Kansei engineering types and application modes that could be implemented in different contexts (Dahlgaard et al., 2008). In Europe, the best known and most widespread is the Kansei engineering interpretation of Schuette (2005). His model was built on the basis of analysis of different types of Kansei and covers the content of today’s Kansei engineering (Dahlgaard et al., 2008). This framework is adapted also in the proposed research as the basis for further Kansei engineering approach implementation.

This framework can be specified as follows (Schuette, 2005; Wang et al., 2008):

- Choosing the domain: “domain describes the overall idea behind the product type in general” (Dahlgaard et al., 2008). This step assumes the selection of target groups, market niche, restriction of terminology, concept definition of the educational service, and definition of all interested parties. Choosing the domain can be used not only for existing products, but also new concepts, know-how and ideas.

- Span the semantic space: this step assumes the selection of adjectives, ideas or associations that could be used for service perception description. These ideas should be specifically defined in a form that allows further synthesis with property space; the selection could be done manually by experts and also by
implementing statistical methods. Only ideas that have an obvious influence on customers’ perception should be selected. The sources for the semantic space creation are commercials, manuals, experts, users/customers, specification lists, patents etc. The number of words varies between 20 and 800 (Dahlgaard et al., 2008). Rough semantic space will be analysed and the end set of relevant words will be selected. The selected words or expressions could be linked with product properties.

- Span the space of properties: in this step the product/service properties relevant to the semantic space should be chosen. These properties could be chosen from the existing products, patents, design concepts, technical descriptions, standards etc.

- Synthesis: this phase establishes the relationships between the product/service properties and semantic space – these two spaces will be linked together; this step is considered today as a core point of the Kansei engineering approach (Schuette, 2005; Nagamachi, 2008); different methods and techniques could be used for the purpose of this step: manual methods, rough sets theory, category identification etc. (Dahlgaard et al., 2008; Schuette, 2005).

- Test of validity and model building: this step is defined by the synthesis phase and chosen within this phase’s methods; permanent changes in society and education require a corresponding test of validity; the model could be built mathematically or non-mathematically; the data acquired by the synthesis phase could be presented in the following form: \( y(\text{affective value/or Kansei}) = f(\text{service elements}) \).
A group of authors from Nanyang Technological University in Singapore describe another example of the Kansei engineering application mode. They consider four major issues in affective design application (Lian-Yin & Zhong, 2009):

- Extraction of consumer affections about the product in terms of ergonomic and psychological evaluations.
- Identification of design characteristics of the product.
- Acquisition of Kansei knowledge – a core issue that plays a crucial role in affective design; at this stage the relationships between consumer affections and design elements are discovered.
- Establishment of Kansei engineering system to support both product development and consumer purchase decision.

4.2 Understanding customers’ Kansei

The phenomenon of customers’ Kansei is a central concept in Kansei engineering. Due to its exotic linguistic nature and not trivial interpretation this term needs detailed explanation. The following section deals with theoretical substantiation of this term.

In fact, there are a lot of terms and theories related to the customers’ Kansei. These are a customer’s affective/Kansei value or quality, perceived value, customer’s perception, customer’s loyalty, future intention, customer satisfaction, emotions,
attitude and some others (Athiyaman, 1997; Kotler & Fox, 1985; Russel, 2005; Zhang & Wang, 2006). In spite of the many publications on these themes, little work has been done to clarify the interdependencies, causal ordering and conceptual basis of these related constructs. Literature shows that conflicting theories, different interpretations and definitions can even exclude each other. That is why it is important in the scope of this research to give a definition of customer Kansei and to differentiate it from the other concepts. Understanding what customer Kansei is the first step toward the successful application of the Kansei engineering approach. As this work was done in the marketing context, special attention will be given to the emotional dimensions in today’s marketing, which will be considered in more detail in the following section.

4.2.1 Emotions in marketing

Classical marketing considers the customer to be a rational subject while the latest brain research proves their illusiveness (Haeusel, 2012). Some researchers, e.g. American psychologist Richard Lazarus, claim primate of cognition, while others, e.g. German psychologist Hans-Georg Haeusel and American social psychologist Robert Boleslaw Zajonc, state the primacy of emotional dimensions in the human psyche and activities (Haeusel, 2012; Sigg, 2009). The second position has prevailed in recent years over the first due to the rapid development of neurophysiology. Numerous investigations in this area confirm the statement of the primacy of emotional dimension (Bernecker, 2010; Haeusel, 2012; Lindstrom, 2011; Sigg,
The classical “Stimulus-Response” model explaining human behavior offered by behavior psychologists in the early 1900s has now been expanded to the “Stimulus-Organismus-Response” model. This modification reflects the change of paradigm in psychology and brings the psycho-physiological processes of person (“Organismus”) into the central point (Sigg, 2009). In the scope of the previous sequential CAB paradigm (Cognition-Affect-Behavior), the role of emotions as a determinant of behavior was vastly underestimated (Sigg, 2009; Trommsdorff, 2004). According to this paradigm, cognition can be understood as knowledge changed by information and this information affects behavior. The AIDA model, which is very popular until today in terms of its commercial impact (Attention-Interest-Desire-Action) is one of the most famous examples of the CAB paradigm in marketing. New paradigms in behavior psychology brings new approaches in marketing that concentrate on the new role of emotions. Barbara Sigg offers in her work *Emotions in Marketing* a well-founded model of three roles of emotions in marketing based on the new “Stimulus-Organismus-Response” model (Sigg, 2009):

- **Emotional differentiation** – this first emotions role in marketing relates to the stimulus and defines the content of marketing strategy.
- **Emotional reaction** – this role relates to the organismus and describes the psychological condition of the individual.
- **Emotional motivation** – also relates to the organismus and is a cause of individuals’ actions and decisions.
She proposes for her model the term Triple C as the first letters of the words Content, Condition and Cause. In short, this model can be understood as stimulus (Content), neuronal acceptance of the stimulus (Condition) and its implication for trade (Cause) (Sigg, 2009). It should be accepted that the new SOR model supposes the inseparable interaction of the cognitive and emotional/affective dimensions of the human psyche, while the previous one separated cognition and affection. The latter is disproved by the numerous researches and investigations in neuroscience (Akulich, 2011; Haeusel, 2012; Sigg, 2009).

Recent marketing literature often appeals to the emotional dimension of the human psyche. So, Hans-Georg Haeusel proves in his book Emotional Boosting that purchasing decisions are always unconscious and emotional. Unfortunately, the numerous researches in this area are fragmented: there is no complete picture and the terminology is not unified. Barbara Sigg even compares the literature on the subject of emotions in marketing to the jungle, in which it is very easy to be lost (Sigg, 2009). An overview of the actual marketing literature shows the variety of terms and concepts that appeal to the affective dimension of human perception. The book titles speak for themselves: the Corporate Religion of Jesper Kunde, the Emotional Boosting of Hans-Georg Haeusel, the Brand Sense of Martin Lindstrom, the Emotions in Marketing of Barbara Sigg, the Top Emotional Selling of Ingo Vogel, the Emotion Selling of Gerhard Bittner, the Selling as Love of Hans Uwe Koehler, the Emotional Branding of Marc Gobe. The appeal to human affective structures is a real hot topic in both marketing theory and practice. A lot of attention is usually paid to the successes of neurology in the area of the human mind and its impact on
marketing practice, e.g. in the *Emotional Boosting* of H.-G. Haeusel, *Emotion Selling* of G. Bittner and *Emotions in Marketing* of B. Sigg. Others concentrate only on the marketing questions without any excursion into neurology, e.g. *Brand Sense* by Martin Lindstrom and *Emotional Branding* by Marc Gobe. More detailed consideration of listed and some other works did not reveal any universal terminology or classification of the terms “emotion”, “affect”, “feeling” or “sense” in the marketing context. The next section is dedicated to the differentiation of terms both in the scope of Kansei engineering and the marketing context.

### 4.2.2 Differentiation of terms

This section presents the most popular terms related to the Kansei. The terms are explained and ordered in compliance with the research context.

#### 4.2.2.1 Affections vs. emotions

In the scope of the offered approach the differentiation of the concepts “affective” and “emotional” needs special attention. The terms “emotional” and “affective” are very often used as synonyms. For example, the free dictionary gives the pair “feeling or emotion” as one of the explanations of the word “affection”.19 As Justin Taylor (2013) pointed out, it “is a common confusion … to equate ‘affections’ with ‘emotions’”. In the offered research McDermott’s differentiation of the terms

“affections” and “emotions” is adopted. He explains the distinction between these two terms using contradiction pairs (McDermott, 2000). In contrast to emotions, ...

(McDermott, 200; Taylor, 2013):

- Affections are long-lasting, not fleeting.
- Affections are deep, not superficial.
- Affections are consistent with beliefs, not sometimes overpowering.
- Affections always result in action, do not fail to produce productive action.
- Affections involve the mind and will while emotions and feelings are often disconnected from the mind and will.

It should be noted that Taylor and McDermott use the terms “feelings” and “emotions” as synonyms, while Sigg, for example, defines “affection” as a summary term for “emotions” and “feelings” (Sigg, 2009). The latter approach is adopted in the offered research:

- Sigg: affections = emotions + feelings.
- McDermott and Taylor: feelings = emotions; feelings/emotions differ from affections.
- The approach adopted in the offered research: affections differ from emotions, because affections = emotions + feelings.
However, the fundamental difference between feelings, emotions and affections is not so important in the scope of offered approach. It could be of crucial importance for the neurologist or clinical psychologist, but the above-listed differentiation between “emotions” and “affections” made by McDermott and Sigg completely corresponds to the marketing purposes in the scope of the offered research.

In contrast to pure emotions, affections can influence the decision-making process, and they result in action. That is why it is much more important to concentrate on affections than on emotions. Emotions can stay unnoticed and do not lead necessarily to actions. Generally speaking, emotions are too ephemeral for the offered research. Affections are concrete enough to work with them and, at the same time, they represent the emotional, not cognitive dimension of the human psyche. Of course, there are some exceptions, such as the investigation of the image perception. These exceptions are, however, beyond the context of the offered research and usually have an applied character.

Justin Taylor, referring to Sam Storm, gives a simple example illustrating the difference between emotions and affections. This example fits very well the context of the offered research and is worth mentioning here (Taylor, 2013): ... a student who goes off to college for the first time may feel doubtful and fearful. She will probably miss her friends and family at home. A part of her may even try to convince her to go back home. But she will discount these fleeting emotions as simply that—feelings that are not produced by her basic conviction that now it is time to start a new chapter in life. The affections are something like that girl’s basic conviction that
she should go to college, despite fleeting emotions that would keep her at home. They are strong inclinations that may at times conflict with more fleeting and superficial emotions.

A literature overview has revealed not only “affections” and “emotions” but also other related to the Kansei concepts. The next section will continue the consideration of the terms.

4.2.2.2 Attitude vs. consumer satisfaction

The next “emotions” and “affections” related to the Kansei concepts that can often be found in literature are “customer satisfaction”, “perceived value” and “customer attitude”.

In the context of offered research the following definition of the term attitude is used: "a predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation. Attitude influences an individual’s choice of action, and responses to challenges, incentives, and rewards (together called stimuli)"20.

It should be also emphasized that the prevailing today understanding of the term attitude presumes the presence of three dimensions in it (Pickens, 2005):

- Affective: related with emotions and feelings.

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20 http://www.businessdictionary.com/definition/attitude.html#ixzz3gKZtip84
- Cognitive: person’s beliefs or opinions.
- Conative: inclination for action.

According to Athiyaman (1997), attitude and consumer satisfaction have the following functional relationship: Consumer Satisfaction is a function of attribution, emotion, disconfirmation; Attitude is a function of Consumer Satisfaction. McDougall and Levesque, in contrast, cemented the conclusion that consumer satisfaction is a function of perceived value when they proposed the scheme of three drivers of customer satisfaction, namely, the perceived value, the relational quality and the core quality (McDougall & Levesque, 2000).

The term “perceived value” is acknowledged today in service literature and its many researchers note its two significant qualities (McDougall & Levesque, 2000; Ng & Forbes, 2009):

- Perceived value is difficult to define.
- Perceived value is the difference between consumers’ costs and benefits.

It may also be assumed from the literature that the concept of customers’ satisfaction is often understood as a transaction-specific, short-term customers’ attitude (Athiyaman, 1997). Zhang and Wang (2006) deal with the alternative approach that offers the contextual variable when discussing the relationship between affect, perceived service quality and satisfaction.
In addition to the numerous concepts related to the Kansei, some commentators state the hedonic nature of education experience that includes aesthetic and emotional dimensions (Laukenmann, 2003; Nagashima et al., 2008). The emotional angle of the educational process is traditionally not included in administrative procedures of higher educational institutions and does not figure in any documents or plans. This dimension has, however, a very important impact on consumers’ attitude to the offered service. However, the formal distinction of hedonic versus utilitarian services does not work in the case of higher education.

Educational services themselves are a unique phenomenon that evokes both cognitive and emotional responses in customers (Kotler & Fox, 1985). It is impossible to consider it as a pure hedonic or utilitarian service. A combined approach that includes the elements of both variables should be developed to reflect the complexity of the phenomenon of the Kansei quality of educational services. Substantiation of the Kansei concept will be presented in section 5.1.

### 4.3 Measurement scaling techniques analysis

As was shown in section 4.1.2, one of the key stages of the application of Kansei engineering is the synthesis of two semantic fields – property space and semantic space (according to S. Schuette) or lists of product items and categories (according to Nagamachi). Nagamachi prefers to use for this purpose the semantic differential
approach, while Schuette is more flexible in this matter and assumes the application of different methods and techniques, such as manual methods, rough set theory, category identification etc. This section introduces the most popular methods that can be applied at the synthesis stage, including the semantic differential technique offered by Osgood. This technique can be called traditional for Kansei engineering [SS: 17, 18; 103-113]. However, it should be mentioned that Kansei engineering is not a static theory, but a concept in a permanent state of progress and development. The application of different scaling techniques fitted to the project goals is possible [SS: 19, 20].

The various types of scaling techniques used or mentioned in research can be classified into two categories, namely comparative scaling techniques and non-comparative scaling techniques (DeVellis, 2003; Lodge, 1981). In comparative scaling approaches, the respondent is asked to compare one object (product or service) with another. For example, the researcher can ask the respondents whether they prefer the educational service of higher education institution A or institution B. On the other hand, in non-comparative scaling respondents need only evaluate a single object (product or service) (DeVellis, 2003; Lodge, 1981). Respondents using this type of scale employ whatever rating standard seems appropriate to them. Non-comparative techniques are based on continuous or itemized rating scales (DeVellis, 2003). The classification of these scaling methods is shown below in Figure 8 (DeVellis, 2003).
There are some scaling techniques that combine features of two of the above presented groups of classical scaling methods and some approaches of indirect scaling. This is quite interesting for the case of higher education service affective quality measurements. The next sections deal with this theme in more detail.

4.3.1 Comparative scaling techniques analysis

As can be seen, the comparative scales can further be divided into the following four types of scaling techniques: *Paired Comparison Scale*, *Rank Order Scale*, *Constant Sum Scale* and *Q-sort Scale* (DeVellis, 2003; Lodge, 1981). The *Paired Comparison Scale* is a comparative scaling technique in which, according to some criteria, a respondent is presented with two objects at a time and asked to select one of them (Laukenmann, 2003). As a result, the obtained data are ordinal in nature. For example, there are five types, A, B, C, D and E, of the same product. For all types of
product the respondent has a different attitude and that is why they may prefer one type from particular pairs of types. He may, for example, prefer A to B, D to E and so on. For a general case with \( n \) types of the product there are \( n(n-1)/2 \) comparisons. The data obtained due to pairwise comparisons can be presented as \( nxn \) table. In the case of our example the comparison results can be shown as follows (see Table 4).

Table 5: Paired comparisons results (Laukenmann, 2003)

<table>
<thead>
<tr>
<th>Product</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>C</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>D</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>E</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Number of preferences</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: The symbol “+” means that the type of product in this column was preferred over the type in the corresponding row. The number of times a type of product was preferred is obtained by summing the “+” in the corresponding column. Other data can be obtained as the pairwise comparison representing the proportion (in per cent) of respondents that preferred one type of product over another.

Table 6: Paired comparison results in percent (De Vellis, 2003)

<table>
<thead>
<tr>
<th>Product</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-</td>
<td>10</td>
<td>45</td>
<td>69</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>55</td>
<td>31</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>80</td>
<td>84</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>-</td>
<td>70</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>30</td>
<td>-</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>90</td>
<td>47</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Note: The entries in the boxes represent the proportion in percent of respondents preferring the column type of product to the row type. For example, 90% of respondents prefer type A to B and only 10% type B to A. Paired comparison is useful when the number of types of products is limited, since it requires direct comparison.

Rank Order Scaling is a comparative scaling technique in which the respondents are presented with several objects (products, services) simultaneously and asked to order or rank them according to some criteria (DeVellis, 2003). The order or rank could be something like preference, liking, importance, effectiveness, etc. Based on the previous example the respondent can be asked to order each of five types, A, B, C, D and E, of the same product in order of preference. The respondent begins by selecting the type he/she likes most and assigning it to number 1. Then they choose their second most preferred type and assigns it to number 2 and so on. As a result, the following data will be generated.
Table 7: Rank order scaling (De Vellis, 2003)

<table>
<thead>
<tr>
<th>Product</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: It is very important to note that no two types of product receive the same rank order. In rank order scaling only \( n-1 \) decisions need to be made. This scaling technique is commonly used to measure preferences for brands as well as attributes.

Constant Sum Scaling produces what is assumed to be a ratio measurement scale (DeVellis, 2003). With this ordinal level technique respondents are given a constant sum of units such as points, money or credits and then asked to allocate them to various objects. For example, you could ask a respondent to reflect degree of preference, importance or other evaluation of a product and then give them 100 points to allocate to each type of product based on that. If a feature of some type of product is not important then the respondent can even assign this type to zero points. If one type is twice as important as another then they can assign it twice as much. When they have finished, all the points should add up to 100. For our previous example the following results can be obtained.

Table 8: Constant sum scaling (De Vellis, 2003)

<table>
<thead>
<tr>
<th>Product</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
<td>40</td>
<td>15</td>
<td>6</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>
Ratio data, obtained due to constant sum scaling, is the most powerful of all measurement scales because it is characterized by an absolute zero point and an allocation of points, each having equal value. Ratio scales measure the magnitude of a characteristic and scale the differences between alternatives.

**Q-Sort Scaling** is a type of comparative scale where respondents are asked to sort between a sufficient number of objects or statements and classify them into a predetermined small number of sets according to criteria such as preference, attitude or behavioral intent (Stephenson, 1953). In order to increase statistical reliability, at least 60 objects should be used and no more than 140 to be classified into a number of sets (usually no more than 11). This is good for discriminating among a large group of items in a relatively short amount of time (Stephenson, 1953).

### 4.3.2 Non-comparative scaling techniques analysis

Non-comparative scales are often called monadic scales because only one object is evaluated at a time (Narens, 1981; Stevens, 1946). There is no comparison to another object. Non-comparative scaling methods are divided into two classes, namely: Continuous Rating Scales and Itemized Rating Scales (DeVellis, 2003). According to Continuous Rating Scales the respondents are asked to give a rating by placing a mark at the appropriate position on a continuous line. His mark, for example “*”, expresses the respondent’s attitude to a particular type of product (higher education institution service) from a negative, Unfavourable or Very Poor, to a positive one – Favourable or Very Good. The scale can be written on a card and shown to the
respondent during the interview. There are two versions of continuous rating scales and these are depicted in Figure 9.

**Scale type I**

How would you rate institution A?

*Very Poor -* - - - - - - - - - - - - - - - - -* - - - - - - - - - - - - - -* - - - - Very Good

**Scale type II**

How would you rate institution A?

*Very Poor *---*---*---*---*---*---*---*---*---*---*---*---*---*---*---*---Very Good

0 10 20 30 40 50 60 70 80 90 100

*Figure 9 : Continuous rating scales (DeVellis, 2003)*

When scale type I is used, the respondent’s score is determined either by dividing the line into as many categories as desired and assigning the respondent a score based on the category into which his mark falls, or by measuring the distance from the beginning of the scale. Whichever of these forms of the continuous scale is used, the results are normally analysed as interval scaled. With an Itemized Rating Scale respondents are provided with a scale with numbers and/or brief descriptions associated with each category and are asked to select one of the limited numbers of categories. An Itemized Rating Scale has a number of brief descriptions associated with each response category and is very flexible. The Likert Scale is one of the most widely used itemized scales (Likert, 1932). This scale is named after psychologist Rensis Likert, the inventor of this scale (Likert, 1932). The Likert Scale is an
ordered, one-dimensional scale from which respondents choose one option that best aligns with their view. There are typically between four and seven options. Five options is very common. All options usually have labels, although sometimes only a few are offered and the others are implied. A common form is an assertion, with which the person may agree or disagree to varying degrees. In scoring, numbers are usually assigned to each option (such as 1 to 5). Then for all respondents the following problem can be formulated: “Please indicate how strongly you agree or disagree with each statement by placing an X beside a number from 1 to 5 where: 1 – *Strongly Disagree*, 2 – *Disagree*, 3 – *Neither Agree nor Disagree*, 4 – *Agree*, 5 – *Strongly Agree*”. As an example of a Likert Scale let us construct a questionnaire (statements) for our previous example of five types, A, B, C, D and E, of the same product. As an example of the five statements of a Likert scale questionnaire, see the following Table 9. Very often the Likert scale approach is regarded as *Summated Ratings Scaling* measurement in which the respondents are asked to express their degree of agreement or disagreement with each of a number of questions. Thus a respondent’s attitude score is the total score obtained by summing the scale values assigned to each question checked. For example, in developing a Likert, or summated-rating scale, researchers devise a number of statements that relate to a product or service quality. Then respondents are asked to indicate their degree of agreement or disagreement with each statement, as in Table 9. The responses are scored so that they are consistent in terms of directionality, and then added to obtain the respondent’s total attitude score toward the product or service being investigated. A *Likert-type scale* is the most commonly used *summated scale* (DeVellis, 2003; Likert, 1932; Parasuraman et al., 1991).
Table 9: Likert scale measurement result (Likert, 1932)

<table>
<thead>
<tr>
<th>Questioner (Statements)</th>
<th>Strong Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The type A of the product is the best one</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The type B of the product is the best one</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The type C of the product is the best one</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The type D of the product is the best one</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The type E of the product is the best one</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

The main benefit of this approach is that the questions used for the questionnaire are usually easy to understand and so lead to consistent and clear answers. A disadvantage is that only a few options are proposed to respondents, with which respondents may not fully agree. As in the case of any other measurement techniques, the options should be a carefully selected set of questions (statements) that act together to give a useful and coherent response. The reason is that some problems can occur where respondents may become influenced by the formulated question and the way they have answered previous questions. That is why a more sophisticated questionnaire should be constructed. A simple modification of the
The semantic differential scale is a scaling tool that has been often used in the field of linguistics and social psychology, and was first devised by Osgood et al. (1957). The semantic differential measures a respondent’s attitude in terms of ratings on bipolar symmetric scales defined by contrasting adjectives at both ends. An example of the semantic differential scale is shown in Figure 10.

Good ___ ___ ___ ___ ___ ___ ___ Bad

-3  -2  -1   0   1   2   3

Figure 10: Semantic differential scale(a) (Osgood et al., 1957)

Usually, the position marked 0 is labelled neutral, the 1 positions are labelled slightly, the 2 positions quite and the 3 positions extremely. Today the semantic differential is one of the most widely used scale techniques in the measurement of attitudes. By plotting the results, the researcher can see overall differences and similarities among the attitudes measured. As an example, the questionnaire to measure a future student’s attitude towards the entrance exam registration procedure based on the semantic differential scale is presented in Figure 10.
Bipolar adjective pairs can be used for a wide variety of objects, and as such it is widely considered that this technique is very useful for a person’s attitude measurement. The major disadvantage of semantic differential scaling is a difficulty determining the appropriate bipolar adjectives required to construct the scale as presented in Figure 11.

The Stapel Scale requires a respondent to rate a product, or service, according to a certain characteristic on a scale from +5 to -5, indicating how well the characteristic describes the product or service (DeVellis, 2003). Typically this scale is presented vertically, with one adjective (characteristic) appearing at the midpoint of a scale ranging from +5 to -5. The following is an example of a Stapel Scale question. When you are thinking about Stanford University (USA) do you believe that the words “innovative” and “advanced” precisely and exactly or poorly describe this university? On a scale of +5 to -5 with +5 being “very good description of Stanford University” and -5 being “poor description of Stanford University” how do you rank Stanford University according to the words “innovative” and “advanced”? According to Stapel Scale measurement techniques a respondent is not allowed a
neutral response, as no zero point is offered. There are some confusion and difficulties in the practical application of this technique.

The \textit{Guttman Scale}, named after Louis Guttman (1950), is a subset of survey items (questions) with binary (\textit{yes} or \textit{no}) answers if they can be ranked in some order, so that, for a rational respondent, the response pattern can be captured by a single index on that ordered scale. On a Guttman scale, items are arranged in such a way that a respondent who agrees with a particular item also agrees with items of lower rank order. This means that agreement with any one item implies agreement with lower-order items. This contrasts with topics studied using a Likert scale. One of the first and most productive scaling theories was proposed by L. Thurstone (1928). In reality, he invented three different methods for developing a one-dimensional Thurstone scale, namely the method of equal-appearing intervals, the method of successive intervals and the method of paired comparisons (Edwards, 1952; Thurstone, 1928). The three methods differed in how the scale values for items were constructed, but in all three cases, the resulting scale was rated in the same way by respondents.

All described measurement scaling techniques could be used for the purposes of the Kansei engineering application. However, it was decided to choose technique with strong psychological background. Indeed, the ideological author of Kansei engineering, Mitsuo Nagamachi, believes that for successful Kansei design it is necessary to understand the general psychology and psychological angle of philosophy (Pospelov, 2009). Next section describes detailed the chosen technique.
4.4 Repertory grid technique

Kansei engineering is often associated with sensory engineering or an emotional usability. Kansei engineering deals with psychological phenomena. It fully correlates with today’s marketing trends and even with the philosophical paradigm (considered in detail in sections 2.1 and 2.2). It is a very current and interesting approach for today, but the transdisciplinary nature of Kansei engineering complicates its application. Knowledge and skills from different areas are needed. One of the key points for the application of Kansei engineering in this research was to find an appropriate approach that would enable reflection on the complexity of the educational service concept, and would help to extract needed information about customers’ Kansei and could be used by non-psychologists.

Repertory grid technique, a part of personal construct theory, was chosen as an alternative to Osgood’s semantic differential approach. The next section will present this technique and criteria set for selection.

4.4.1 The appearance of personal construct theory

This research assumes the investigation of the affective quality of educational service at the mental level. The linguistic structure, describing the educational service, is, in fact, a system of stimulus. Reaction to this scheme reconstructs the mental structures
of customers reflecting the affective quality of the educational service. A technique should be developed enabling customers’ mental structures corresponding to the affective quality of the educational service to be displayed. This approach is based upon the classical scheme “stimulus → organismus → response” presented in section 4.2.1. This scheme evolved from behaviorism and is present today in almost all psychological theories.

The initial approach for this research is personal construct psychology (PCP), which was developed by clinical psychologist George Kelly about 60 years ago. PCP is widely used in different research areas: management, psychology, pedagogy etc. The PCP approach is also used in marketing for market and customer behavior research, for example for knowledge acquisition about desired product attributes (Reynolds & Gutmann, 1988). The fundamental idea of PCP upon which the whole theory is built is the statement that a person’s psychological process is channelled by the way this person interprets and reinterprets themselves and their current situation. Kelly (1955) compares the process of an individual’s interpretation with the science approach: “Every man is, in his own particular way, a scientist”. Starting at birth, a person builds their own theories and models about the reality around. With the help of these theories and models the individual interprets and anticipates events. For example, the child who breaks a window interprets the situation based on their own experience as bad. In this case the child expects negative consequences.
PCP was chosen based on its essential characteristics, which allow this theory to be implemented for the purposes of the offered research (Bannister & Fransella, 1971):

- PCP presents a complete, formally stated theory: very unusually for psychology it was put forward in a complete statement by one person, Kelly, at one time (in 1955).
- PCP is stated in very abstract terms and avoids the limitations of a particular time and culture.
- PCP does not have buried philosophical assumptions that widen the application possibilities.
- PCP is not a contradiction of any psychological theory, but an alternative or supplement to them.
- PCP represents a working tool with a massive range of implications.
- PCP does not require special knowledge of psychology that allows the implementation of PCP by researchers from different knowledge fields.

Hence, the main postulate of Kelly’s PCP is that people anticipate events based on their own dependent on experience interpretation of the situation. Within PCP, a set of techniques called “repertory grid methods” have been developed that study the personal system of meaning (Kelly, 1955; Pike, 2003). These methods represent a basis for the development of the KanMar methodology for data collection. RGT
represents a mechanism that enables evaluation of individuals’ personal constructs concerning researched objects (Kelly 1955, 1991).

4.4.2 RGT content

RGT is constituted by three parts (Bannister & Fransella, 1971, 2004; Edwards et al., 2009; Jankowich, 2004; Kelly 1955, 1991):

- Elements (columns).
- Constructs.
- Linkage.

4.4.2.1 Elements

Elements are investigated objects. They represent concrete examples of the interviewer’s research domain and should be generated as a homogenous set so that any construct can be relevant to any element, for example “programme design”, “technical equipment” and others in the case of the educational service. Elements can be either supplied or elicited; both methods are well presented in the literature. The choice of the element-generating method depends on the logic of the research. For example, a researcher is interested in the analysis of some specific aspects and wants to concentrate their attention on them – in this case the method of supplied elements
is preferable. The elicited elements, in their turn, can provide results that are not caused so much by researcher bias.

Element elicitation conforms to the following rules (Hunter, 2000; Tan & Hunter, 2002):

- Elements should be discrete, for example they could be people, activities, objects. Hunter and Tan (Hunter, 2000; Tan & Hunter, 2002), for example, generalize the rule of discreteness as elements should be “nouns and verbs”.
- Elements should be homogenous; they should be chosen in such a way that all further constructs can correlate with all elements.
- Elements should be representative, which means that all elements correspond with the researched area and respondents can relate to all chosen elements.

4.4.2.2 Constructs

Constructs are the ideas, descriptions or associations of respondents or interviewers (type dependent) about elements. With the help of the constructs, individuals construe the elements. The special feature of Kelly’s approach is that constructs are always bipolar and can be interpreted with the help of polar adjectives or descriptions. In the context of this research, these could be, for example, “ideal”/“unacceptable” or “motivates for study”/“demotivates”. In the same way as elements, constructs can also be elicited or supplied. The classical method of construct generation is, however, elicitation and this presupposes the use of triadic comparisons, as described by Kelly. All the elements chosen for the grid should be
written on separate cards. The interviewee takes three cards and answers the classical question: “in what way are two of these elements similar and differ from the third, in terms of …?” The clause “in terms of” is called a qualifier. Qualifiers concentrate the respondent’s attention on the researched area so that elements correspond to it. Likeliness of and difference from this answer represents the bipolar construct. It is the most widely used method for constructs eliciting and is called “minimum context form” (Cho & Wright, 2009). Based on this initial method, Kelly offered some others, altogether six methods of triadic comparisons (Cho & Wright, 2009). They differ from each other in order to fulfil investigation goals. For example, in one of the methods, an interviewee can chose triads from all the offered elements himself, which helps to reveal some researcher independent aspects in the construct eliciting. Kelly’s other methods are aimed at goals that are more appropriate for clinical psychology and not relevant in the context of this research. Besides the methods offered by Kelly, today there are many others offered by other researchers. In analogy with triadic comparisons, Bannister and Fransella (1971, 2004) offered dyadic comparisons. Laddering and pyramid techniques offer, in their turn, a qualitative different approach to construct eliciting. In the laddering technique interviewees should concentrate on one construct and name their preferred pole, explain it in their own words and then naming the opposite pole. Pyramiding is similar to laddering, but aims at a more detailed construct. The interviewee explains existing constructs and names new poles; this process can provide four new constructs from one initial one. Researcher-supplied constructs are another widespread method of construct building. They depart from Kelly’s initial approach as he had preferred to work only with individualized grids. The research logic and some formal requirements (for example the need for further statistical data treatment)
make this method convenient for many cases, especially when they deal with a large
number of objects such as social groups, customer clusters etc.

So, today there are some deviations of Kelly’s initial approach concerning the choice
of elements and constructs. These deviations can be divided into the following
categories (Bannister & Fransella, 2004; Edwards et al., 2009; Pike, 2003):

- Full repertory grid: the elements and constructs identified by individuals
  (respondents). Rich data set that allows deep individual qualitative analysis of
  personal construct, usually used by individual work (for example in clinical
  psychology).

- Partial repertory grid: supplied by researcher elements and identified by
  individuals’ personal constructs. Some comparisons are possible; the
  application of statistical methods is, however, complicated.

- Fixed grid: both the elements and constructs are supplied by the researcher
  (interviewer). Easy to compare and analyse cases, enables quantitative
  statistical analysis.

4.4.2.3 Linkage

Linkage identifies how elements differ in a fundamental way. Basically, it illustrates
how elements can be described and interpreted with the help of constructs. Linkage
can be realized in different forms; the most prevalent in the literature, however, are:
• Rating.
• Ranking.
• Dichotomizing.

Rating is the subjective estimation of the object (elements) against each construct expressed through a score number. In the case of ranking elements they should be ordered according to the extent to which they are correlated by the interviewee with the poles of the construct. In dichotomizing, each element is marked depending on which pole it belongs to.

Analysis of the repertory grid can be presented as the conclusive stage of the repertory grid technique. There are no common rules for this stage; each researcher realizes this stage dependent on the context of the research, research goals and existing limitations (financial, human, limitations caused by the data form etc.). It could be a purely qualitative investigation with one researcher and one interviewee (for example in clinical psychology) or research with numerous interviewees and application of modern information technologies (for example MATLAB). Among today’s most popular methods of grid analysis are cluster analysis, grid comparison, principal component analysis, support vector machines and others.

4.5 Kansei engineering system

As was described earlier, the establishment of the Kansei engineering system is a key element of the Kansei approach. The importance of the system for Kansei-oriented
design is often underlined by researchers of Kansei engineering (Lian-Yin & Zhong, 2009; Nagamachi, 2011). This system supports both product development and consumer purchase decision. As is often underlined in the literature, this step is very ambitious and complicated as it affects the whole organization, both strategic and operative levels and different structural divisions (Lian-Yin & Zhong, 2009).

This challenge is addressed in this research by offering the author’s integrative theoretical approach to the quantitative analysis of educational services KanMar presented in Chapter 5. The system approach is grounded on topical trends and represents the framework for both strategic and operative levels.

The uses of a system approach in scientific research presuppose a clear definition of what is understood by the term “system”. The definition of the term “system” predetermines all further decisions that should be made during the system design. The term “system” is used today in many variations and the sense of this concept can be quite different within the various theories. To avoid any deficiencies, the author’s interpretation of the system approach should be proposed.

In the literature there are quite a lot of approaches to system definition. Definitions of “system” are stated in the works of Bertalanffy, Ackof, Yudin, Averyanov and others (General System Theory, 2002-2015). The concept of “system” is one of the most general and universal definitions. It is used in relation to most existing subjects, phenomena and processes. The concept is not unequivocal or rigid, which makes it
creative and applicable in various areas, from the theatre (the Stanislavsky System) to astronomy (the Sun System). The variety of versions and interpretations of this category creates the need for accurate definition of a system as an initial point in a system design.

L. von Bertalanffy (1968) defined system as a set of interacting components. He underlines that the components interact not only among themselves but also with the environment. This approach has, until now, been the basis for the use of the system concept (General System Theory, 2002-2015). However, the concept of “system” is not limited by this initial structure: there are many characteristics offered by other researchers at different times: Anochin (1970) adds to the system the concept of goal, Yudin (1997) and Ackof (1969) add different characteristics reflecting the concept of observer, Bogdanov (1989) adds a set of concepts characterizing the system evolution.

Some authors believe that the concept of system is an inherent attribute of nature and social reality, or, in other words, it is objective. They include f.e.: Averyanov (1985) and Tjuhtin (1988). Other scientists, e.g. Blauberger and Sadovsky (1973), Yudin (1997), believe that not all objects of reality are systems. There are also unorganized phenomena that do not have the characteristics of a system. In other words, a system is subjective, created or allocated by humans. These dual interpretations have led to the existence of two essentially different approaches to the definition of system: descriptive and constructive.
The descriptive approach is based on a recognition that systems are inherent to the world around us and the universe represents a set of systems. Every system is cognizable and its elements, structure and functions are not occasional. System functioning is caused by a system’s elements and structure. Every object or phenomenon can be interpreted as a system. The descriptive approach is the basis of system analysis.

In system analysis the functions of the system are defined based on its structure and system design and can be described as follows:

- Definition of elements.
- Definition of interrelations between the elements.
- Definition of properties, interactions and relations that create the system.
- The analysis of system functions.

In the constructive approach the sequence occurs in reverse order: the structure of the system is designed based on its functions. In this approach the concept of the goal is often presented. The system corresponds to the goals.

The system design can be roughly described as the following sequence:

- Definition of the system’s goal or purpose.
• Definition of the function or functions of the system aimed at the achievement of the goal.

• Design of the structure that maintains the system functionality.

The system’s goal or purpose arises from a problem situation that can not be solved using available resources. In this case the system is a problem solution tool. Hence, the constructive definition of a system is adopted in this research and can be defined as follows: a system is an end set of functional elements and the relations between them, and is derived from the environment, according to the given purpose within the limits of a certain time interval. As a rule, human-made systems are created and exist for the achievement of a definite goal or purpose (purposes).

There are different views on the number of system design stages. It depends on many factors, e.g. on the character of the system’s functions, the application area, the presence of developed tools and subsystems, etc.

In the context of the KanMar approach it is proposed that system design should be considered as a combination of three main stages:

• Conceptual stage – studying the domain: the definition of the system context, problem area and system objectives, elements and their relations, system requirements and procedure, definition of the system’s object and subject, the system’s content and structure are also defined in this stage.
• Formalization – the development of the system at a logic level, e.g. with the help of mathematical methods or logical schemes; the choice of data representation form.

• Optimization – this stage includes the practical implementation of the formal schemes or algorithms developed in the second stage.

System design starts with the development of the system structure. After that the structure is divided into separate modules. The modules can be developed and implemented as quite separate subsystems and can be realized by different developers or groups. The third stage is realized by the staff of the functional departments under the control of the responsible person, group or department. In the context of the KanMar, the first stage, namely the conceptual development of the system, is provided. One of the modules is separated and developed in the second stage. The third stage is not included, which could be explained by the time, human and organizational resource limits.

During the conceptual stage the following categories that constitute the system’s structure should be defined:

• Problem area.

• System’s context.

• Goal of the system’s existence.

• System’s object.
• System’s subject.

• System’s functions.

• Requirements to the system.

• System’s procedure.

• System’s structure.

• Methodology used.

These tenets were chosen based on the context of the research on the one hand and on the widely used in today’s literature approaches to the system theory on the other. They define the architecture of the offered system, which can be characterized as a constructive human-made open system. The system is open as there are opportunities to modify and develop the system when needed.

4.6 Summary

Chapter 2 (“Background”) gives the reasons for the widespread use of the Kansei engineering approach by addressing different dimensions: from philosophical causes to industrial trends. Chapter 4 in its turn gives an account of this approach in the context of the offered research. The central concept of this approach, Kansei, is presented.
The own research will be conducted in the scope of the Kansei engineering approach presented in this chapter. Firstly, the main ideas and success story of Kansei engineering were introduced. Secondly, the content and different application modes of Kansei engineering were described. Three key points of Kansei engineering, offered by Nagamachi, were identified: how to understand a customer’s Kansei, how to translate a customer’s Kansei and how to create a system supporting Kansei engineering in practice. Based on these focal points, a further methodology was substantiated.

Section 4.1.2 presents the formal structures of the application of the Kansei approach methodology offered by Nagamachi and Schuette and adopted in this dissertation. Section 4.2 deals with the first focal point – “understanding a customer’s Kansei”. As the research is conducted in the marketing context, the excursus in marketing terminology related to the term “Kansei” was presented. This excursus can be divided into two logical parts. Firstly, the place of emotions and affections in actual marketing theory was explained; secondly, the most popular Kansei-related terms were presented. These terms were described and differentiated. Section 4.2 deals with the first focal point of the Kansei engineering approach and investigates how customers’ Kansei can be understood in the context of higher education. Investigations have revealed the correlation of the term “Kansei quality” with the concept of quality accepted in the scope of today’s TQM philosophy. The comparison of service quality to the product quality concept has revealed quality characteristics unique to the service sector. First of all its extreme dependency on customers’ attitude and behavior. Moreover, educational services are classified in
this dissertation as intangible actions directed at people’s minds. The term “Kansei” does not have a monosemantic translation in European languages. There are some terms and concepts that could be interpreted as Kansei, e.g. emotions, attitudes, affects and customer satisfaction. The concept of emotions in marketing was chosen as the starting point for this investigation. The illusiveness of the rational customer from the classical marketing is stated. A position that states the primacy of the emotional dimensions in customers’ psyche prevails in today’s marketing science (but not yet in practice). The classical stimulus-response model is expanded to the stimulus-organismus-response model. Psycho-physiological processes of individual (“organismus”) became the central point. The Triple-C model is presented in this section as a conceptual basis for further substantiation of the role of emotions in marketing. Section 4.2.2.1 and 4.2.2.2 explain further terms related to Kansei: attitudes, affects and customer satisfaction.

Affect is one of the basic concepts in this research. Section 4.2.2.1 distinguishes between affects and emotions: affects differ from emotions, because affects = emotions + feelings. In contrast to pure emotions, affects can influence the decision-making process; they result in actions. That is why it is much more important to concentrate in the offered context on affects rather than on emotions. Section 4.2.2.2 continues the differentiation of terms by addressing the terms “attitude” and “customer satisfaction”. The dual nature of educational services, namely their hedonic and utilitarian dimensions, is recognized in this section. The main conclusion is that it is impossible to consider educational services as purely hedonic or utilitarian. The need for a combined approach that includes the elements
of both variables is emphasized. In this case it would be possible to reflect the complexity of the phenomenon of educational services’ affective quality.

The next two sections, 4.3 and 4.4, deal with the second focal point of Kansei engineering – “how to translate a customer’s Kansei”. At this stage the application of measurement scaling techniques should be carried out. These parts firstly provide analysis of existing methods, as well as the traditional for Kansei semantic differential of Osgood. Secondly, an alternative methodology – repertory grid technique – is provided. Choice explanation and method description are also provided in these sections. Application of this technique includes three of six stages that define the formal consequence of Kansei methodology application: span the semantic space, span the space of properties and synthesis. These stages are in line with the three parts that constitute the RGT: constructs, elements and linkage. This logical intersection has allowed the application of RGT in the context of the Kansei approach and has also served as an additional substantiation for the choice of this technique. Sections 4.4.1, 4.4.2 and 4.4.3 present the three parts of the RGT.

Section 4.5 addresses the third focal point of Kansei engineering – how to create a system and organization for Kansei-oriented design. Customer-oriented product/service design should be systematically supported by the organizational structure. This section describes main components of the system presented in section 5.3.
The last section of this chapter, 4.5, addresses the third focal point of the Kansei engineering approach – “how to create a Kansei-oriented system”. A brief interpretation of the system approach is presented here. This was determined and accepted in the scope of the offered research type, system design stages and categories.

This chapter provides the methodological basis for the Kansei engineering application carried out in the fifth chapter.
Chapter 5 The Application of Kansei Engineering to HE Marketing

According to Nagamachi, there are three key points to Kansei engineering: how to accurately understand customer Kansei; how to reflect and translate the understanding of Kansei into product/service design; how to create a system and organization for Kansei-oriented design. This focal points shape the proposed KanMar approach. This chapter presents the application of all three focal points of Kansei engineering methodology described in the previous chapter. Kansei methodology is interpreted and partly modified for the context of the affective quality analysis of educational services. The interpretation of these three focal points constitutes the author’s approach KanMar to the affective quality of educational services measurement.

Section 5.1 is dedicated to the first focal point and presents author’s understanding of the “customer Kansei” phenomenon. Section 5.2. presents the general framework of the KanMar methodology. Application of the Repertory Grid Technique described in the Section 5.2 addresses the second focal point. Section 5.3 presents the interpretation of the third focal point and is dedicated to the systematical application of the described methodology in the context of the higher educational institution.

This chapter also deals with the development of a questionnaire as a part of KanMar methodology that could be used for market research purposes in the context of the KanMar methodology.
5.1 From Kansei to the affective quality of educational services

As was stated in the Introduction, the subject matter of the offered research is the affective quality of educational services. In the Background and Critical Review of Kansei engineering Chapters of the thesis the terms and concepts related to affective quality were considered (especially in sections 2.2 and 4.2). This section deals with the author’s interpretation and definition of the investigated object based on information provided earlier.

Summarizing the definitions of Kansei presented in section 4.1.2, the following author’s model, which includes the specifics of the offered research, is proposed:

![Figure 12: Kansei model](image)

This model is based on the SOR model (see section 4.2.1). It should be noted that Sigg’s Triple C model, presented in the same section 4.2.1, was also considered in the scheme construction. Sigg proposes for her model the term Triple C as the first letters of the words Content, Condition and Cause. In short, this model can be understood as stimulus (Content), neuronal acceptance of the stimulus (Condition) and its implication for trade (Cause) (Sigg, 2009). So, the first C – emotional differentiation – belongs to the stimulus; emotional reaction (condition) – the second C – describes the psychological condition of the individual; and the last C –
emotional motivation – causes the actions and decisions of the individual. Kansei is understood here as the result of regular psychological human mind processes that build such states as emotions, feelings, affection and intuition. Thereby the dynamic nature of Kansei is emphasized. The cyclicity of the system offered in section 5.3 also reflects this point.

Through the sensory input the world/environment impacts on the organismus (human psyche). The result of the organismus processing of external stimulus is the Kansei. Kansei builds a picture of a customer’s perception with its emotional and affective dimensions. Customer perception, in its turn, triggers humans’ psychological condition and states, which causes actions towards the world/environment. This interaction circle should be considered as a never-ending process. It should, however, be emphasized that this scheme does not represent the whole model of human interaction with the world, but just the model of the Kansei influence on human activity in the marketing context, e.g. purchase decision-making or brand preferences.

The term “Kansei” is substituted in the scope of the offered research by the term “affective quality”. These terms are considered here as synonyms. This is usual for the European languages interpretation of the Kansei used by many researchers from this area. It sounds less exotic and fits the total quality management dimension of this research more appropriately, especially as due to translation difficulties the official term “Kansei engineering” is often referred to as “affective engineering” and “affective design”, e.g. in the USA and Europe. In connection with this fact, the term
“affective quality”, used in this research, should help to avoid any irritation caused by the unusualness of the language. Talking about the affective quality, it should be admitted that it is understood in this research as not the actual, real value or quality, but the mental structure that locates in the customer’s mind and causes their attitude and actions concerning the educational service, as was described earlier.

In this research, Athiyaman’s version of causal relations between attitude and satisfaction, viewed earlier, is accepted (see section 4.2.2.2). In the scope of this approach, attitude is a consequence of satisfaction. But it seems wrong to restrict attitude toward education institutions only to satisfaction. In the case of higher education, customers experience emotions towards the service not only when consuming the service. The services of higher education institutions can be experienced both before the enrolment and long after the studying period. Based on the scheme offered by Athiyaman (1997), the logical chain describing the affective quality model consists of the parts illustrated on the Figure 13. This logical scheme offers the causal connection between affective quality and a customer’s perception assumed in this research. However, it should be noted that the affective quality of educational services is a variable that also depends on the marketing activity of an educational institution. This chain is the basis for the important outcome of the section – the author’s model of the affective quality of educational services. To illustrate this dependency and to show the critical importance of affective quality, the following model, built according to the expectancy-disconfirmation paradigm, can be presented as shown in the Figure 14.
The three dimensions of the affective quality (AQ1, AQ2, AQ3) constitute general customers’ attitude toward the educational institution. It is precisely this general attitude that is, in fact, the main object of educational marketing activities, because this attitude affects all decisions made by customers concerning their relationship with the educational institution. This is illustrated by the Kansei and Affective Quality of Educational Services models presented in this section. Returning to the first focal point of Kansei engineering, namely how to accurately understand the customer’s Kansei, it should be admitted that for marketing purposes all dimensions of affective quality have great importance and should be included in the analysis. That means that affective quality results not only from the core quality, but also from factors that are not directly related to the core quality of educational services. Summarizing this part, the Model of Affective Quality of Educational Services presented in Figure 14 is provided. This model demonstrates the sense of Kansei in

*Figure 12: Affective quality model*
terms of the educational service of higher education institutions adopted in the offered research.

As it was stated earlier, the services of higher education institutions can be experienced both before the enrolment and long after the studying period. That is why three periods are included in this model: pre-enrolment, enrolment and post-enrolment. Each period is characterized by the special emotional reaction to the

*Figure 13: The Model of Affective Quality of Educational Institution Services*
educational institution: needs and moods of the potential customers in pre-enrolment period; reaction caused by employment relationships in post-enrolment period. The strongest emotional reaction exists during the enrolment period and results in (dis)confirmation. (Dis)confirmation results, in its turn, in (dis)satisfaction. However, the pre- and post-enrolment periods could be also characterized by the emotional reaction to the institution. In the first case, customers’ needs and moods shape their expectations towards the institution. In the second case, the experiences receiving in the post-enrolment period also influences the emotional reaction to the institution. To the most important experiences could be adduced the employment process/result. The emotional reaction results in affective quality. It should be emphasized that affective quality is not the real quality, but just the individual’s perception of it. So, there are three dimensions of the affective quality of educational services. Affective quality in this model coincides with attitude point from the Kansei model presented earlier. Due to the Kansei model after this point comes action. Action in Affective Quality Model is a decision made towards further relationships with educational institution. Special attention should be paid to the “Marketing activity of higher education institution”. Educational marketing can not shape the affective quality of educational services directly, but the main tasks of educational marketing are directed to the work with customers’ motivation, perception and communication (see section 5.2.2.2). It means that marketing activity influence the affective quality indirectly through the interaction with the customers.

This model demonstrates the sense of Kansei in terms of the educational service adopted in the offered research and is build based on the author’s Kansei model
presented earlier. It summarizes the first focal point of the Kansei approach as it illustrates what is understood by customers’ Kansei in the context of educational services. This step has revealed among others the relation between affective quality and the concept of the consumer today that was explored in section 2.2.2 by appealing to the emotional dimension of quality perception and giving the central role in service quality estimation to the customers.

5.2 Applying Kansei methodology

While the last section was devoted to the substantiation of the research object, this one deals with the subject of the research. The subject of the research is the quantitative estimation of the affective quality of the educational service. This section concentrates on the context definition and questionnaire design that will be used in Chapter 6 for further statistical data acquisition, measurement and interpretation.

5.2.1 General framework of the KanMar (Kansei Marketing)

KanMar framework correlates with both most known for today application modes of Kansei methodology, namely Simon Schuette’s six-stage Kansei model and Kansei Engineering Type 1 of Mitsuo Nagamachi, which were presented in the previous chapter.
These modes were chosen as the basis for own framework due to the following reasons:

- These are the most precise and formal modes in European language (english) that summarize the existing for today experience of Kansei society.

- These modes are stated in quite abstract terms and avoid the limitations of a particular industry or academic discipline.

- Modes represent completed working tools with a variety of application possibilities.

- It does not require special knowledge of Kansei engineering that allows the implementation by researchers from different knowledge fields.

- The modes could be modified in accordance with the research specificity. This characteristic is very typical for the Kansei engineering: it is not a completed stated theory, but is still evolving.

The application of Kansei methodology will occur in the scope of the author’s interpretation of Kansei methodology. The need of this modification is caused by the following reasons:

- Motivation to create mostly inexpensive in use methodology that does not need significant time and human resources.
• Application of Repertory Grid Technique as a part of KanMar methodology has also influence on its framework (see section 5.2.3).

• Necessity to consider conditions and requirements caused by today’s educational marketing area (see sections 5.2.2.1 and 5.2.2.2).

General framework of KanMar methodology:

• Define the context of the methodology application.
• Determine the grid type and number of iterations.
• Experiment design.
• Questionnaire design.
• Evaluation experiment.
• Results analysis and interpretation.

Stage 1. Define the context of the methodology application.

The first stage corresponds to Schuette’s “choosing the domain”. Due to Schuette (2005) this step assumes the selection of target groups, market niche, restriction of terminology and definition of all interested parties. It contains following steps:

• Problem recognition\(^{21}\), context\(^{22}\) and purpose of methodology application.

  KanMar provides a problem oriented methodology. The definition of the

\(^{21}\) The acknowledgement and definition of an issue that does or may arise during the performance of a process, http://www.businessdictionary.com/definition/problem-recognition.html
problem is an initial point that defines the shape of further methodology application. Context definition enables more careful consideration of the problem area. Purpose definition summarizes and formalizes the reasoning behind the methodology application.

- Define the goal\textsuperscript{23}, subject and objects of methodology application. Goal definition makes the problem solving more formal and suitable for managerial activity, gives an observable and measurable dimensions to this process. Under subject here is understood the end-user of the receiving results (f.e. marketing manager), under object is understood the sample.

- Define all involved parties. Respondent (object) and analyst (subject) groups are two parties that could be also divided in sub-modules. To the analyst group could belong interviewer, researcher, marketing manager, administrative staff. It could be also one person. Possible respondent groups are presented in the section 5.3.1 as the modules of a customer monitoring system.

**Stage 2. Determine the grid type and number of iterations.**

This stage has no analog. Its appearance is caused by use of the Repertory Grid Technique and its application is explained in sections 4.4.2.2, 4.4.2.3 and 5.2.3.1. During this stage following alternatives could be chosen:

- Choose to use existing fixed grid.

\textsuperscript{22} Background, environment, framework, setting, or situation surrounding an event or occurrence, http://www.businessdictionary.com/definition/context.html

\textsuperscript{23} An observable and measurable end result having one or more objectives to be achieved within a more or less fixed timeframe, http://www.businessdictionary.com/definition/goal.html
• Choose to create new fixed grid.
• Special task.

Stage 3. Experiment design

The third stage corresponds to Schuette’s second and third stages: span the semantic space = select the constructs, and span the space of properties = select the elements (see section 4.1.2). Nagamachi presents this stage as identification of product items and categories (see section 4.1.2). This stage is explained in the sections 4.4.2.1 and 4.4.2.2 and presented in the scope of KanMar methodology in the sections 5.2.3.2 and 5.2.3.3. This stage contains two following steps:

• Select the elements.
• Select the constructs.

Stage 4. Questionnaire design.

This stage corresponds to Schuette’s fourth stage “synthesis”. As it was mentioned above, this phase establishes the relationships between the service properties (elements) and semantic space (constructs) – these two spaces will be linked together. The RGT application continues. The scale should be determined depending on the research context (goal, purpose and other). It could be classical RGT questionnaire with Likert scale or some others types if needed, f.e. open questions and others. This stage includes following steps:
• Determine the scale.
• Determine the end number of elements and constructs.
• Add open questions if needed.

Stage 5. Evaluation experiment.

This stage is dedicated to the data gathering based on the questionnaires, samples and interviewer determined at the previous stages. It could be done via face-to-face interviews. In the case of large in number samples it makes sense to use other technologies. In this research, f.e., was used the EvaSys tool created for online interviews (see section 6.1.1). Following alternatives are possible during this stage:

• Face-to-face interviews.
• Other technologies.

Stage 6. Results analysis and interpretation.

In this research the realization of this stage was done by one person with the help of automatic technologies (MatLab), however, other alternative is also possible:

• Manual or automatic.
• In group or by one person.
5.2.2 Choice of domain (first stage)

Domain is the concept behind the investigated phenomenon, in this case – educational services. This step assumes the definition of conditions (e.g. definition of the problem area) and context, definition of target groups, market niche, restriction of terminology, definition of all interested parties, etc.

5.2.2.1 Problem area – the requirements of new quality standards

Bringing the principles of ISO 9001:2000 in to the education sector, which was done by the Bologna Declaration, had a crucial impact on the educational sector (section 2.2.1 and 2.2.2). The quality model in ISO 9001:2000 is quite different from 9001:1994. It is now based upon a process model that any higher educational institution can use (ISO, 2000) (section 2.2.2). The process approach assumes the implementation of a model of continuous improvement, called the PDCA (plan, do, check and act) cycle. The cycle has no end and four stages are repeated again and again (ISO, 2000) (section 2.2.3). Continual improvement is not only the core theme of the ISO standards revision, but also a core value of the Deming and TQM approaches (Sallis, 1996) (section 2.2.3). The new quality standards also refer to the customer’s perceptions of performance (ISO, 2000). The establishment of QMS (quality management system), where customers’ needs, expectations and perceptions become the explicit drivers, is required. “Customer’s Requirements” drives the input and “Customer’s Satisfaction” the output of the whole model (section 2.2.2).
Acceptance of this model requires the development of procedures and instruments for the measurement and analysis of customers’ perceptions and attitudes. Hence, in the context of the typical quality system model in higher education, the logic of the development and implementation of a quality system could be represented as follows:

![Figure 14: The logical scheme of system quality in educational institutions](image)

5.2.2.2 Marketing context

The proposed research occurs in the marketing context. This context demands the answer to the question “How can the phenomenon of the affective quality of the educational service be formalized for further marketing analysis?” This specific context requires terminology restriction and definition of the main categories addressed within the KanMar methodology.
In the context of the proposed research the following definitions are accepted:

- Educational marketing is understood as a process of definition of stakeholders’ expectations and requirements for the services provided by educational institutions and further creation of demand for educational services.

- Stakeholders from outside: state and society in general; school graduates and their families; firms (partners of university and employers).

- Stakeholders from inside: students; all categories of staff and representatives of all functional departments.

The main tasks of marketing departments in educational institutions are based on the definition of educational marketing provided above and include the following activities:

- Investigation and classification of requirements of different stakeholder and customer groups.

- Interaction and communication with stakeholders and customers.

- Estimation and analysis of satisfaction of all interested parties (loyalty, perceived value, future intention).

- Demand creation.

- Providence of public information.

- Image creation.
• Positioning in the market.

• Development of requirements for educational services based on customers’ needs and expectations.

It should be noted that all further research will be conducted exactly in the context of educational marketing, based on its main tasks listed above.

As was announced in the Introduction, the main task of this research is to develop a methodology for quantitative estimation of the affective quality of educational services. It is expected that the availability of a methodology for quantitative estimation of the affective quality of educational services will ensure effective decision-making processes in the marketing departments in higher education institutions.

The specificity of managerial decisions also influences the shape of the offered methodology. In the context of this research, the following definition of decision-making process is adopted24: *the thought process of selecting a logical choice from the available options. When trying to make a good decision, a person must weigh the positives and negatives of each option, and consider all the alternatives. For effective decision-making, a person must be able to forecast the outcome of each*

24http://www.businessdictionary.com/definition/decision-making.html
option as well, and based on all these items, determine which option is the best for that particular situation.

So, the methodology should correspond with the tasks of marketing managers in higher education and support the process of decision-making in these areas. That presupposes a flexible structure, the presence of different objects, objectives, criteria and indications that cover the tasks listed above and allow problems to be ranked, the grounded choices to be made between the alternatives and the decision-maker to be supplied with supplementary information. Substantiation of the term “affective quality” is presented in the first section of this chapter.

Comparison of the concepts of service and education, described above, allows us to define educational services as follows: *Educational service is a creative process of purposeful actions organized by the education institution within a separate educational programme (speciality) that results in the achievement by students of a certain level of knowledge, abilities and competences corresponding to the current societal conditions.*

This definition includes the following ideas described in previous chapters:

- Educational service belongs to the category of intangible actions directed at people’s minds.
- Educational service is understood as a three-dimensional service (with conditions, process and result dimensions).
• Educational service has both a hedonic and utilitarian nature. The hedonic nature results in the underlining of a creative approach to the education process and the absence of a strict framework for this process. This means a certain level of freedom and creativity.

• The utilitarian nature of education results in underlining that the education process occurs within a certain programme, organized by the education institution, and is directed at the achievement of a certain level of knowledge that should also correspond with current societal conditions. So, these limits keep the creative and free educational process within the bounds of stakeholders’ needs.

5.2.3 Applying Repertory Grid Technique (RGT)

5.2.3.1 RGT in the context of Kansei engineering

It is quite an ambitious task to develop a methodology for quantifying affective quality along with its further comparison. Nowadays standard methods for Kansei measurement that help to reflect the customer’s Kansei are based on the interpretation of people’s (Nagamachi, 2008; Nagasawa, 2008; Schuette, 2005):

• Behaviors and actions.
• Words.
• Facial and body expressions and physiological responses.
For the purposes of the offered research the second category, based on words, was chosen. This choice is caused by researched phenomenon characteristics and helps to avoid complications that are unnecessary in this case. To interpret the words the development of a self-questionnaire is proposed. This section presents the questionnaire design stage in the context of Kansei methodology.

Constructing a Kansei engineering questionnaire phase is a bridge between the theoretical descriptive parts (or conceptual) and its further analysis and treatment (or formal part). It reflects the conceptual complexity of the researched phenomenon and, at the same time, corresponds to the formal requirements allowing further mathematical treatment. The repertory grid technique (RGT) was chosen as the solution for the step of constructing a Kansei engineering questionnaire, a part of personal construct theory, which was presented in section 4.4.

The use of only the full repertory grid is inappropriate in the context of the research because of the large number of respondent groups, the need for further mathematical treatment and the strict requirements for the qualification of the interviewer.

The main grid type for affective quality investigation is the fixed repertory grid, because of the following set of factors:

- It enables further mathematical treatment with the help of actual statistical approaches.
• Analysis and interpretation can be seen as more reliable and independent of researcher skills.

• It enables the repertory grid to be fit most appropriately to the purpose of the research by predetermining the essential elements and constructs in the context of the research elements and constructs.

However, the application of the full grid is planned for the first stage of the survey. This first stage of the survey within the relatively small sample will be used for the purpose of questionnaire design. The outcome of this first stage is the instrument (questionnaire) that will be further used for larger samples. For more on this point see the “Experiment design” Section.

A partial grid could also be implemented in the scope of the KanMar methodology. Hence, the use of it is limited by needed resources. It is more time-consuming and requires some special skills from the administrator (marketing manager, teacher etc.). The main goal of partial grid application is to enrich/update the sets of elements and constructs using students’ understanding of the researched phenomenon (educational service). Some new ideas concerning the elements and constructs could be further implemented in the structure of the fixed grid. It requires additional resources (human and time) and special researcher/s qualification. The interpretation is much more dependent on researcher/s qualification, as in the case with the fixed grid.
Hence, considering the grid types in the context of the research, the following strategy concerning the use of different grid types can be summarized:

- In the first stage the full grid will be used. This stage is described in the “Experiment design” section. The outcome of this stage is the fixed grid. Using the Kansei engineering terminology proposed by Schuette (2005), this stage can be defined as the construction of property space and semantic space.
- The main grid type is the fixed grid. This form will be used to reveal the respondent’s attitude to the educational services.
- The fixed grid should/could be periodically supplemented by the partial and the full grids in order to enrich/update/correct the set of elements and constructs or to realize a task-specific investigation. An example of such a specific task is given below.

The application of PGT also allows the realization of many task-specific investigations. It may not occur permanently, but at an appropriate moment (if needed). The example illustrated in Table 10 shows the possible data extraction for the following task solution: what learning process orientation is preferable at the current time, practical or fundamental? The arguments that describe “fundamental orientation” include: the presence of scientific schools in an educational institution and their representatives among teaching staff, an active student’s scientific life and the opportunity for PhD study. For “applied orientation”, for example: close contacts with firms, teaching on practical cases, practice during education. Thus, three arguments for each parameter have been chosen. This number results from the
character of human perception: more than three arguments for each parameter make perception complications unnecessary in our case.

*Table 10: Example of task-specific questionnaire*

<table>
<thead>
<tr>
<th>Scientific schools and theirs representatives</th>
<th>Opportunity of Ph.D. study</th>
<th>Close contacts with firms</th>
<th>Teaching on practical cases</th>
<th>Practice during education</th>
<th>Active student's scientific life</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note:* This table represents quantitative estimations of arguments given by a virtual respondent. He/she had to rank the importance of arguments from 6 (most important) up to 1 (least important).

The following basic idea from repertory grid methods should be emphasized: the respondent did not know about two researched parameters (“fundamental research orientation” and “applied orientation”). In this case our virtual respondent obviously tends to the applied orientation. He/she makes a parameter estimation based on arguments (three for each parameter) and does not distort his/her own attitude to the parameter, as often happens with direct questions.
Kansei engineering utilizes certain stimuli (in our case a set of elements describing the educational service) that are fed into the system (educational service). It is a classical for Kansei engineering step to record the output from the system (information or rating/ranking given by respondents) in a questionnaire form. This data constitute in fact a representation of respondents’ Kansei to the service. The completed repertory grid introduced in Table 11 is used to investigate stakeholders’ attitude/Kansei to the educational services’ elements. At this stage the full grid approach is used. With this approach both the elements and constructs should be elicited. So, the second stage of the KanMar methodology, namely “Determine the grid type and number of iterations”, is completed in this step.

5.2.3.2 Elements selection – span the space of properties

For the offered example the method of group element elicitation often mentioned in the PCP literature was chosen (Hunter, 2000; Stewart et al., 1981). This method supposes the involvement of research participants in the process of element selection. Together with the researcher they gather the set of elements in a form of workshop. The research participants in this case are the audience of the PhD Seminar offered by Darmstadt University of Applied Science.

The sample size of 21 people meets the following research requirements:

- Sample size lies between 15 and 25. This range is, according to the literature (Hunter, 2000; Tan & Hunter, 2005), the optimum for the elicitation of the
elements. Within such a group sufficient elements and construct sets can be produced. Smaller sample sizes do not provide enough sets of elements and constructs and no new constructs and elements normally added by larger constructs (Hunter, 2000).

- The sample size enables the group discussion and workshop form.
- The research participant group is representative, interested in the research results and can provide relevant sets of elements and constructs. The sample consists of people involved in the higher education sector, such as scientists, lecturers and researchers. They mostly work in the educational sector.

The following initial information was provided to the participant group:

- The research specificity was explained: the aim was to explore the affective (or Kansei) dimension of the educational service’s quality.
- The research perspectives, design and possible findings were briefly explained.

After this introduction the following question was asked: “What are the major criteria in your opinion that should be used to access the quality of educational services in higher education?” The following discussion revealed the set of criteria, or in terms of this research, elements. The full set is: transparency of administration, planning the learning process in the future, accessible published information, response/reaction time of teaching staff and administration, sustaining the process, available learning methods, knowledge of lecturers, motivating capacity of lecturers, comprehensiveness of provided knowledge, applicability of provided knowledge,
personal contact to lecturers, competence of lecturers, contacts with other students, learning infrastructure, level of refinement, fundamental requirements, IT service, lecture rooms/halls/campus, education/degree of lecturer, additional information, preparedness for life, soft skills, technical equipment, design of the building and rooms/halls, prestige of institution, interdisciplinary teaching, number of fellow students, learning atmosphere, relationships with teaching staff, relationships with other students, teaching staff, comfortable learning place, organization of study, supportive financing opportunities, accommodation service, website, personality of lecturers, equipment, cooperation with firms, foreign languages offer, look and feel, customization possibilities, aesthetics, environment, practical experience, fundamental knowledge, snacks and drinks, material resources, methodical materials, information materials, additional services, sport facilities, used information technologies, used pedagogical technologies, innovative teaching, programme compliance with students’ expectations and priorities – altogether 56 elements. This step is identical to the Nagamachi’s stage collection of Kansei words presented in section 4.1.2. The result of the 56 elements is very close to the usual 40 elements result, mentioned by Nagamachi.

This set of elements was analysed and converted into an end set of nine elements. To illustrate this point the more proper following criteria and conversion process steps can be listed:

- The initial set of elements was divided into three groups reflecting the three-dimensional nature of the service, namely: conditions, process and result. The three-dimensional scheme of the service is assumed in today’s marketing
(Kotler & Fox, 1985) and defines the service in the same way as the physical implementation defines the product (Edvardsson, 2005; Kotler & Fox, 1985; Trajnev et al., 2007).

- The educational service was considered to have a dual nature in terms of study orientation, namely a fundamental and applied orientation.

- The marketing context of the research was considered. The elements grouped in an end set are manageable and lie within the sphere of the interest and responsibility of higher education marketing management that was defined at the “choice of domain” stage presented in section 5.2.1.

- The requirements were considered of the used methodology, grid technique, which was implemented in the fulfilment of the requirements listed in the previous section.

- Finally, the overlapping concepts were excluded and elements that the author thought were lacking were added.

The end set includes nine elements reflecting all three dimensions (see section 2.4.3) of the service:

- Conditions: A. learning infrastructure, B. teaching staff, C. programme design, D. additional services.

- Process: E. students’ practical activities, F. students’ research activity, G. organization of studies (lectures, in laboratory time, seminars, individual projects, ...).
• Results: H. level of received theoretical knowledge, I. programme compliance with labor market.

The end number of nine elements aggregates the initial 56-numbered set. All the elements logically converge to these nine elements, as some synonyms and overlapping concepts were offered. The elements of the end set cover all the aspects that were offered and discussed with the participants during the workshop. Every element represents a different unique aspect of the educational service’s quality. The number of nine elements lies within the range of seven to 15 that is accepted today in the literature as the most appropriate for the set of elements (Stewart et al., 1981). Moreover, Cho and Wright note that nine is the standard number of elements used in managerial applications (Cho & Wright, 2009).

The first part, “Elements selection”, of the third stage, “Experiment design”, is completed now.

5.2.3.3 Construct elicitation – span the semantic space

Minimum context form was chosen as the basic construct elicitation technique for this example. This classical and popular (Hunter, 2003; Tan & Hunter, 2002) technique is presented in section 4.4.2.2. In the context of this research the technique was, however, supplemented with an alternative approach such as group construct elicitation. The latter differs from the minimum context form in the way that
construct elicitation occurs collectively and all research participants agree on the elements and constructs. In the case of classical minimum context form each respondent answers the questions individually and independently of others and the researcher.

The group form was chosen for this research for the following reasons (Hunter, 2003; Tan & Hunter, 2002):

- The collective form enables the interpretations to be discussed; participants can see different viewpoints and the problem understanding can be more precise and accurate.
- The second important reason is that the collective form is the most economical and time-consuming form of data collection for RepGrid.

As Reger notes, based on previous researches, seven to ten triads are sufficient to elicit the constructs in most domains (Hunter 2003; Reger, 1990). For the offered research a variation of minimum context form was chosen, namely sequential form. This variation differs from the classical random selection of triads in the way that the triads are substituted by the researcher. We have nine elements: A, B, C, D, E, F, G, H, I. In this example the triads are substituted in the following way, described by Hunter (Hunter, 2003; Tan & Hunter, 2002): ABC, BCD, CDE, DEF, EFG, FGH, GHI, HIA, IAB. Using this mode we achieve the number of nine triads, which lies in the recommended range from seven to ten. At the same time all the elements are presented in the triads and distributed regularly and uniformly.
Each triad was offered with Kelly’s classical questions: “In what way are any two elements similar to each other, in terms of how they influence the affective value of educational services perceived by stakeholders?” and “In what way does the third element differ from the other two, in terms of how it influences the affective value of educational services perceived by stakeholders?” The answers to these questions constitute the opposite poles of bipolar constructs.

During this step and further discussion the following initial set of constructs was revealed: modern – outdated, ideal – unacceptable, exceed expectations – do not match expectations at all, fulfil requirements of the labor market – do not fulfil requirements of the labor market, the factor of high priority – the factor of low priority, motivates for study – dis-motivates, applicable – not applicable, good – bad, developed – undeveloped, strong – weak, appropriate – not appropriate, structured – unstructured, available – not available, sufficient – not sufficient, inspired – clamming, important – not important, boring – exciting, sufficient – insufficient, friendly – indifferent, traditional – non-traditional.

The initial set of constructs was transformed into the end set using the following criteria:

- Constructs should as far as possible be relevant to all elements of the elements’ end set.
• Dual nature of the educational service in terms of philosophical discussion was considered, namely its hedonistic and utilitarian dimensions (for more on this point see section 4.2.2.2).

• Number limitation: the large in number end set complicates further data gathering. The number of five to seven constructs is assumed and grounded in the literature as the appropriate number for further statistical data gathering (Hunter, 2003; Tan & Hunter, 2002).

The construct end set: exceeds expectations – does not match expectations at all, modern – outdated, ideal – unacceptable, the factor of high priority – the factor of low priority, motivates for study – dismotivates, boring – exciting, well organized – badly organized.

In this case the elements were chosen based on the nature of the educational service and include manageable elements from the conditions, process and result parts of the whole service. It is, however, assumed that the set of elements and constructs could, and even should, be periodically proofed, supplemented and corrected based on experts’ opinion, changed goals and students’ feedback. The latter could be received with the help of a partial repertory grid, as was mentioned above.

The second and last part, “Select the constructs”, of the third stage, “Experiment design”, of the KanMar methodology is completed.
5.2.3.4 Synthesis – linkage

There is a lot of debate regarding the length of scales. Kelly originally used a two-point scale, but today some researchers even use 16-point scales (Edwards et al., 2009). Among the most popular can be counted the five-point Likert scale and seven-point semantic differential scale, which are seen as classical for the Kansei engineering approach today (Schuette, 2005). Section 4.3 of the thesis provides a detailed analysis of these and some other techniques. Stewart argues that it is difficult to use scales beyond five points and the seven-point scale represents the limit of people’s discriminative abilities (Edwards et al., 2009; Miles & Huberman, 1994; Stewart et al., 1981).

For the purposes of the offered research a six-point scale was chosen. Firstly, this lies within the mentioned limits between five and seven points; secondly it helps to ensure that respondents demonstrate their preferences for one of the opposite poles. Six corresponds to the construct, 1 to its opposite, and 0 means that the construct is not appropriate for the element. Here: Learn Infrastructure is the element number 1; Teaching staff – 2; Programme design – 3; Additional services – 4; Students research activity – 5; Students practical activity – 6; Study’s organization – 7; Level of received theoretical knowledge – 8; Programme compliance with labor market – 9. Thus, the grid appears in our case as follows.
Table 11: The resulting grid

<table>
<thead>
<tr>
<th>Construct</th>
<th>Element Nr. 1</th>
<th>Element Nr. 2</th>
<th>Element Nr. 3</th>
<th>Element Nr. 4</th>
<th>Element Nr. 5</th>
<th>Element Nr. 6</th>
<th>Element Nr. 7</th>
<th>Element Nr. 8</th>
<th>Element Nr. 9</th>
<th>Opposite</th>
</tr>
</thead>
<tbody>
<tr>
<td>ideal</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>unscept.</td>
</tr>
<tr>
<td>exciting</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>boring</td>
</tr>
<tr>
<td>modern</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>outdated</td>
</tr>
<tr>
<td>organized</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>bad</td>
</tr>
<tr>
<td>motivates</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>motivates</td>
</tr>
<tr>
<td>excel the</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>doesn’t</td>
</tr>
<tr>
<td>expectations</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>match the</td>
</tr>
<tr>
<td>high priority</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>low priority</td>
</tr>
<tr>
<td>low priority</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: It should be underlined that Kansei engineering, in the context of which the RGT is used, can not reflect the true Kansei of the respondent. The picture received by the application of RGT is formal, static, flattering and less contrasted than the true Kansei. However, it provides essential information that can be used for managerial decisions. A better representation of Kansei could be achieved by increasing the number of respondents (Schuette, 2005). The second focal point of Kansei
engineering is addressed by the implementation of RGT, which helps to reflect the customer’s Kansei, or, in the context of the offered research, the affective quality of educational services. To translate the customer’s Kansei the formal methods that allow the qualitative descriptions to be transformed into quantitative metrics and indicators should be used. The experimental part presented in the next chapter addresses this point. As was mentioned above, the Kansei approach presupposes the presence of an organizational structure that maintains the implementation of Kansei engineering principles. Before the concentration on the translating of Kansei (made in the mentioned experimental part), the question of Kansei-oriented organizational structure will be addressed. By addressing this subject the third focal point of Kansei engineering will be highlighted and the conceptual basis for further formal realization will be provided. With this step the fourth stage, “Questionnaire Design”, of the KanMar methodology is completed. The two last stages will be presented in the sixth chapter.

5.3 The concept of the Kansei-oriented system – CMoS

This section deals with the third focal point of Kansei engineering and introduces the concept of the system supporting affective design in higher educational institutions. The need for permanent customer monitoring was substantiated in sections 2.2 and 2.4 of the thesis. The purpose of this section is to provide the broader context of the affective quality of educational services measurement and to explain its place in the customer monitoring system. The section includes a presentation of the main system parameters and an explanation of the system functionality in the context of KanMar.
5.3.1 System parameters

According to the Kansei engineering methodology, customers’ perceptions and attitudes toward the educational service are investigated. On the basis of the investigation, the subjective perceptions are transferred into the concrete elements of the educational service or their correction.

It is proposed to join the following six elements (presented earlier in section 4.5) under the umbrella term “concept of Kansei-oriented system”: system’s goal, objects, subjects, functions, requirements and procedure. These elements define the shape of the offered solution, namely its structure. On the other hand the concept is caused itself by the definition of the problem area and the system’s context.

Taking into account all previously mentioned reasons and the logic of the educational sector’s evolution, the main task of the offered solution can be defined as the constant tracking of factors defining customers’ perception of the affective quality of educational services in the form of a customer monitoring system.

A CMoS is not only understood as a constant factor analysis, but also results in a comparison between requirements and expectations. A CMoS deals with the revealing of tendencies, unknown dependencies and customers’ moods and finally constitutes the basis for decision-making or problem-solving processes. This system is intended to support the activities of the marketing manager, but can also be useful
for teaching and administrative staff at all levels. It provides an essential, logical complete part of the quality management system of an educational institution and meets the requirements of the process approach introduced by new ISO standards and is firmly in line with today’s trends in society, marketing and education (see Chapter 2, “Backgrounds”).

The second element of the customer satisfaction monitoring system concept is the objects. As the system’s objects the main group from the above-mentioned stakeholder groups from the area of the interests of educational marketing is proposed. In other words, the different categories of students, employers and staff members have been identified.

The third element is the subject. The integrated marketing management department of an educational institution is chosen as the system’s subject. This choice is caused by the context of the research.

The fourth element is functions. The concept of monitoring is considered a wider category including, in addition to control, the functions of analytics, diagnostics, prognosis and correction of the educational service. These functions are dictated by the requirements of the ISO standards and tendencies in educational marketing. For example, the merger of marketing and strategic management makes it important to include the prognosis, and the cyclical TQM system needs permanent control and correction possibilities.
Complex problems can be formalized. That means that the difference between an actual and desirable state of an object should be defined. The available resources are often limited, which creates the need to rank problems. The importance, rank or weight should be defined to select/rate the problems depending on their actuality, risk and significance.

Any decision could be seen as representing a certain type of information. For the difficult strategic decisions it is recommended to also include in its structure the descriptive (describing) information. The descriptive information could be given in the form of a preamble that provides an objective analysis of a situation and the state of the decisions subject. The descriptive information can be given in the form of supplementary information or attachments.

The next elements, namely requirements and procedure, need more detailed explanation. Thus, requirements for the system are understood as the set of conditions that enable the system’s effectiveness. The most important in our case are:

- **System openness**: the results of monitoring should be open to all staff members, who can use these results for their activities; possibilities for modifications should exist.
- **Availability** – the results should be presented in a form that is easy to understand and to use for all interested parties.
- **System efficiency**: the system should include methods and technologies that can minimize time, labour and costs.
• Multi-viewing: by monitoring the customer’s quality perception the maximum possible number of factors should be analysed.

• Operative character: both technical and managerial, which means that not only should the information analysis be made operative, but also the managerial decisions.

As emphasized before, the structure of the complex approach to the estimation of a customer’s perception of the quality of educational services should have both quantitative and qualitative dimensions. Only in this case can a balance between a grounded theoretical base and opportunities given by empirical investigation be achieved.

This dualism is also reflected in the system’s procedure, which includes the following steps:

• Systematization of the main factors influencing the quality of the educational service (McDougall & Levesque, 2000).

• Coordination of the factors with the particular customer’s groups; the development of methods and techniques that enable the estimation of a customer’s quality perception.

• Analysis of customers’ quality perception; the input data for the analysis is the customer’s feedback, the output – the enhancement of educational quality.
The next element of the CMoS, namely its structure, assumes an understanding of the relationship between customer mood and affective quality provided in section 5.1. and summarized in Figure 14, “The Model of Affective Quality of Educational Institution Services”. The last element of the CMoS, the methodology, is appropriately considered in Chapters 4 and 5 dedicated to the Kansei approach and repertory grid technique.

5.3.2 System structure and content

According to Athiyaman (1997), perceived quality is explained in terms of satisfaction with a manageable set of university characteristics. Both services and service characteristics include: an emphasis on teaching students well; the availability of staff for student consultations; library services; computing facilities; recreational facilities; class sizes; level and difficulty of subject content; student workload. These characteristics are used to obtain a measurement of pre-consumption attitude and disconfirmation. This measurement reflects exactly the perceived quality of educational services. Athiyaman notes, however, that it is an easy approach and deals with stimulating further research in educational service quality dimensions.

The basic ideas of Athiyaman’s approach are implemented in this research, but the developed approach offers a wider explanation of students’ attitudes towards educational services. Instead of eight characteristics, a structured set of criteria and indicators is offered. Affective quality experienced in service (pre/post)consumption
can also have a non-quality dimension. As mentioned above, the phenomenon of educational services has a dual nature: they are both utilitarian and hedonic services. To analyse affective quality, it is not only characteristics directly related to core quality that should be taken into account. Some intangible characteristics, for example an emotional spirit, created by a teacher, or a successful image offered by a marketer, can hugely increase the level of perceived value of educational services. This specificity is also reflected in the offered structure.

The marketing context of the research requires the analysis of all stakeholder groups that are important for marketers: students, graduates, staff members and employers. The interaction of these groups and their attitudes toward educational services (or their affective quality) define the position of educational institutions in the market. These stakeholder groups are the object of CMoS, which was mentioned in the concept, and is incorporated in the structure.

The most important, so-called, end customers are, of course, students (Kotler & Fox, 1985). This is not a homogeneous group; in this structure, segmentation depending on consumption stage is implemented: first-year student, student, graduate, former graduate. As the next step, parameters could also be cross-tabulated with demographic, lucrative or other variables, such as gender or purchasing capacity, in order to understand differences in perceptions, if any, among the different student segments and make the most interesting offer to the segment that was chosen as being the most strategically important.
The structure of a CMoS is defined based on the main objects of the research. These objects represent the main stakeholder groups defined above. Overall it is possible to allocate seven main components that constitute the CMoS: first-year students, second- to fifth-year students (system dependent), graduates, former graduates, staff, teaching staff and employers. For each stakeholder group, different objectives of analysis, different sets of criteria and indicators of estimation and different methods are planned. This distinction is caused by the inhomogeneity of the stakeholder groups and their goals, interests and requirements regarding higher educational institutions on the one hand, and were chosen based on the main tasks of marketing management, listed in section 5.2.2.2 of this thesis, on the other.

Hence, the structure of a CMoS could be defined more appropriately as a set of seven modules based on the seven main components listed above:

**Module 1 –: first-year students**

Research objectives:

- Define students’ requirements and expectations.
- Estimate the university image.

Criteria and indicators of estimation:

- Motives for receiving higher education.
Motives for speciality and university choice.

Expectations and priorities.

Proposals concerning university image and offered public information.

**Module 2 – second- to fifth-year students**

Research objectives:

- Estimate satisfaction with the quality of educational services.
- Estimate satisfaction with the pedagogical activity of teaching staff.
- Estimate satisfaction with the work of chairs (subfaculty, department).

Criteria and indicators of estimation:

- Change of students’ opinions concerning the chosen speciality/university.
- Quality of the educational services offered by a university: quality of conditions; quality of educational process; quality of results of educational process.
- Proposals concerning educational services.

**Module 3 – graduates**

Research objectives:

- Estimate satisfaction with the quality of educational services.
• Estimate the compliance of education with market requirements.

Criteria and indicators of estimation:

• Quality of the educational services offered by a university: quality of conditions, quality of educational process; quality of results of educational process.

• Satisfaction with educational institution and chosen speciality.

• University’s strengths and weaknesses.

• Own estimation of career and employment perspectives.

Module 4 – alumni

Research objectives:

• Estimate satisfaction with the quality of educational services.

• Estimate the compliance of education with market requirements.

Criteria and indicators of estimation:

• Image of university.

• Professional activity after university.

• Compliance of education level with current position.

• University’s strengths and weaknesses.

• Proposals for improvement.
Module 5 – teaching staff

Research objectives:

- Estimate satisfaction with work at university.
- Estimate the perceived quality of offered educational and additional services.

Criteria and indicators of estimation:

- Satisfaction with: work of department, motivation system, psychological climate.
- Knowledge about university’s strategy, mission, administration activity, dean’s office, etc.
- Quality of working conditions.
- Quality of offered educational services.
- Strengths and weaknesses of university’s organizational culture.
- University’s image.
- Strengths and weaknesses of university.
- Expectations and worries about the work.
- Proposals on improvement of university’s activity.

Module 6 – staff

Research objectives:

- Estimate satisfaction with work at university.
- Estimate the perceived quality of the offered educational and additional services.
Criteria and indicators of estimation:

- Satisfaction with: work of department, motivation system, psychological climate.
- Knowledge about university’s strategy, mission, activity of administration, dean’s office, etc.
- Quality of working conditions.
- Strengths and weaknesses of university.
- Proposals on improvement of university’s activity.

**Module 7 – employers**

Research objectives:

- Estimate the professional competence of graduates.
- Clarify the requirements of the labor market.

Criteria and indicators of estimation:

- Quality of graduates’ preparedness: compliance of preparedness with market requirements, compliance of notes with knowledge and abilities of graduates.
- Kinds of professional abilities that should be provided.
- Personal qualities of the professionals of the given speciality/sphere.
- Wishful additional skills and knowledge.

Each module can be divided into sub-modules depending on the criteria and indicators of estimation. For each concrete group of stakeholders their own methods
of investigation should be developed. The type of output should also correspond to the research objectives. The type of question – open, closed or half-closed – should be defined based on research group specificity and investigation goals.

In the focus of the offered research lies the second module. At this stage the affective quality of educational services is investigated. So, for the second module, “second- to fifth-year students”, the most complicated questionnaire is needed to investigate the perception of the core quality of educational services: a scaled questionnaire based on theory of personal construct psychology, offered by Kelly in the 50s, and with closed questions (for more on this point see Chapter 4). The dual nature of educational services should be reflected especially in this element. It is one of the most important elements of a CMoS and requires complicated methods and instruments. In contrast, a question to an employer about the kinds of professional abilities that should be provided by graduates in addition to their diploma is a simple example of an open question that does not require any instruments, just a short answer in their own words. The answer will be used as an additional information source for, for example, programme updating. The data could be obtained through a Web-based survey at different times.

The CMoS should function continually, only in this case the obtained information can be used for further correction of educational services, programme updating, informal rating of chairs, segment analysis and other activities. The periodicity and sampling need strong definition (Berry & Parasurama, 1991). Data analysis and
interpretation techniques complete the research and represent the most complicated and largest part of it. It should also be emphasized that the existence of measurable metrics and quantitative estimation techniques in a quality system meets the requirements of the new standards in education that were mentioned above. It should also be noted that criteria and estimation indicators are not the questionnaire itself, they just orient further questionnaires by providing sense and orientation.

Description of CMoS together with the general methodology framework made in section 5.2.1 could be used as a recommendation or protocol for further practical implementation of the KanMar approach. The proposed KanMar methodology coordinates with the second module of the CMoS provided above.

5.4 Summary

The author’s part starts with the fifth chapter. The novelty, findings and KanMar approach are presented and described in the fifth and sixth chapters of the offered research.

The fifth chapter starts with the author’s interpretation of the Kansei phenomenon. Among the most prevailing of today’s interpretations of Kansei, the author’s interpretation explains this phenomenon in a way that fits the context of the research more precisely. Related to the “Kansei” terms and their interdependencies were
analysed and the terminology have been restricted. To avoid linguistic misunderstanding, the term “Kansei” was substituted by the term “affective”, which is understood as a synonym for “Kansei”. The affective quality sense in the marketing context was described using a logical chain.

Section 4.4 presents the repertory grid technique – part of personal construct theory – which was chosen as an alternative to Osgood’s semantic differential approach. This part addresses the second focal point of Kansei engineering -- how to reflect customers’ Kansei. The outcome of the application of RGT is the Kansei engineering questionnaire. This questionnaire can be seen as a bridge between the theoretical part and further data analysis and treatment.

Both Kansei engineering and repertory grid technique are flexible enough and allow questionnaires to be created with elements supplied by the researcher. In this case, however, the method of collective questionnaire design was chosen. This allowed us to create a questionnaire with reduced researcher bias and to consider the opinion of the interested audience. This questionnaire was used for further statistical data gathering. The conclusive stages were realized in the experiment and described in section 6.

The chapter ends with the concept of the Kansei-oriented system – a customer monitoring system (CMoS) for use in higher education. It gives a broader context to
the KanMar methodology and explains its place in the quality management systems of higher educational institutions.

Section 5.4 investigates how to create a system for Kansei-oriented design in the higher education area. The system approach to the cyclical customer satisfaction monitoring system addresses this question. During the development of the CMoS concept the conditions and requirements of the current societal situation and political initiatives influencing the higher education area described in the introductory part and in the overview were considered. The concept of CMoS is presented in section 5.4. Before the concept of a Kansei-oriented System was described, the context of the system design was summarized in section 5.2. The summary of this section described the above requirements for new quality standards and marketing specificity and links them with the context of the described system.
Chapter 6 Experimental Validation

As was described in section 5.2.1 of the previous chapter, the KanMar methodology consists of six phases. The first phase is “Define the context of the decision process”. In this stage should be defined the goal; the purpose, subject and objects of the decision; all involved parties (respondent group, interviewer, analyst).

The definition of these categories in the context of the validation experiment is as follows:

- The goal of the experiment is to receive the data that could validate the KanMar methodology.

- The main purpose of this investigation is to illustrate the functionality of the KanMar methodology; for this purpose an analysis of the whole circle of students’ responses will be carried out, including the questionnaire design stage, data gathering and presentation, and results analysis and interpretation.

- The object of the experiment is the second module of the Kansei-oriented system presented in section 5.3.2. The second module is the second- to fifth-year students of the Darmstadt University of Applied Sciences.

- The research subject is the students’ estimation of the affective quality of educational services.

- Among the involved parties can be adduced: the researcher and the respondents (second module – second- to fifth-year students).
For the purposes of the validation experiment the outcomes of the second (“Determine the grid type and number of iterations”), third (“Experiment design” (select elements and constructs)) and fourth (“Questionnaire design” (determine the scale, end number of elements and constructs)) stages of the KanMar methodology were taken, which were presented in section 5.2.1. For the purposes of the validation experiment, two iterations with the fixed grid creation using a full grid with the help of repertory grid technique were chosen, which was described in detail in section 5.2.2.

This chapter deals with the last two phases: the fifth “Evaluation experiment” and sixth “Results analysis and interpretation”. The fifth phase was carried out using MatLab and the sixth was carried out by one person using the visualization capabilities of the MatLab tool. To show the KanMar methodology in practice by applying the KanMar methodology as a topic for further investigation the affective quality of the higher educational service has been chosen. During all the stages of data collection and analysis by the corresponding KanMar methodology this issue has to be thoroughly investigated.
6.1 Data collection and presentation – evaluation experiment

6.1.1 Online data collection

As was mentioned in section 5.3.2, for the next step, namely the statistical data gathering, the fixed grid will be used. The grid is constructed based on the designed nine elements and seven constructs and was thoroughly tested and validated during the research seminars at the Darmstadt University of Applied Science. As elements the following categories of higher education institutions are used: 1. Lehrinfrastruktur (Learning infrastructure); 2. Angebotene Studienfächer (Programme design); 3. Studentische Praxis-Aktivitäten (Students‘ practical activities); 4. Studentische Forschungs-Aktivitäten (Students‘ research activities); 5. Zusätzlichen Dienstleistungen (Additional services); 6. Organisation des Studiums (Study’s organization); 7. Das Niveau der erworbenen theoretischen Kenntnisse (Level of received theoretical knowledge); 8. Die Übereinstimmung des Studienprogrammes mit den Anforderungen des Arbeitsmarktes (Programme compliance with labour market); 9. Lehrende (Teaching staff). All nine elements in the same row were rated according to their proximity to either the left or right pole of the construct based on how matters are currently happening. The constructs used in the data gathering procedure are the following: 1. Bedeutender Faktor – Unbedeutender Faktor (factor of high priority – factor of low priority); 2. Anregend – Langweilig (Exciting – Boring); 3. Modern – Veraltet (Modern – Outdated); 4. Gut organisiert – Schlecht organisiert (Well organized – badly organized); 5. Entspricht den Erwartungen – Entspricht nicht den Erwartungen (Exceed expectations – Does not match
expectations); 6. Ideal – Unakzeptabel (Ideal – Unacceptable); 7. Motiviert für das Studium – Motiviert nicht (Motivates for study – Dismotivates).

The output of the experiment described above is classical for the PCP fixed grid. However, it was decided to adapt this grid for further implementation. The reason for this decision was to simplify the classical grid form for better understanding. During the expert group discussion at the research seminars, mentioned above, the matrix form of the questionnaire was assessed as being “too complicated for the students” and “irritating”.

For the survey the evaluation software tool for education EvaSys was chosen, allowing online survey design and its further implementation (EvaSys, 2014). This tool is actively used at many German higher education institutions, as well as at the Darmstadt University of Applied Sciences for learning purposes. EvaSys maintains different questionnaire types, including the matrix form that also matches the obtained during the experiment grid. Nevertheless, as was explained above, the matrix form was adopted and simplified. The matrix questionnaire was divided into the nine question blocks as illustrated in Figure 16 for the first block.
Figure 15: First question block

Note: This block corresponds to the first element, namely *Learning infrastructure*. The element is explained here: learning infrastructure include IT services and technical equipment; buildings’ accessibility and architecture; rooms and campus; website; library. This element will be estimated using construct end set: exceeds expectations – does not match expectations at all, modern – outdated, ideal – unacceptable, the factor of high priority – the factor of low priority, motivates for study – dismotivates, boring – exciting, well organized – badly organized. As the survey took place at a German higher education institution, it was decided to use German as the survey language. The translation into English is also attached. The
survey was started on 28.03.2012 and finished on 04.04.2012. The survey was carried out anonymously and freewill (with willing participants). The number of fully and correctly completed questionnaires was 123, approximately 15% of the total number of the students asked. This quote is usual for similar surveys, as was pointed out by the expert in the evaluation department of the Darmstadt University of Applied Sciences. The respondents for this survey have all been the Bachelor (except for first-year students) and Master students of the Informatics Department at Darmstadt University of Applied Science. These respondents agreed with module 2 of the offered CMoS that was chosen for the formalization stage of CMoS development. The questionnaire and survey results are presented in electronic Appendix B. As an example, the resulting data obtained from one anonymous student is presented in Table 12. Section 5.2.3.4 “Synthesis-Linkage” gave a proper explanation to the content of this Grid.
Table 42: Example of grid – evaluation of educational service by anonymous respondent

<table>
<thead>
<tr>
<th></th>
<th>Elements</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructs</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
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<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

The following Table 13 is the resulting data set from interviewing the students in Darmstadt University of Applied Science by the EvaSys system (see electronic Appendix B). The process of rating the elements based on the bipolar constructs, according to Kelly, is putting numbers to words, which would help evaluate the nine elements in a quantitative way (Kelly, 1991). The highest construct rating has a value of 6 and the lowest rating is 1: for example, in the case of construct 6 (Ideal − Unacceptable), ideal has the rating 6, and unacceptable = 1.
Table 53: Example of Grid – Evaluating Educational Service

<table>
<thead>
<tr>
<th>Constructs</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.07</td>
<td>1.74</td>
<td>2.05</td>
<td>2.97</td>
<td>1.86</td>
<td>2.20</td>
<td>1.71</td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.03</td>
<td>2.84</td>
<td>2.64</td>
<td>3.08</td>
<td>3.40</td>
<td>2.65</td>
<td>2.93</td>
<td>2.58</td>
<td>2.68</td>
</tr>
<tr>
<td>3</td>
<td>2.64</td>
<td>2.72</td>
<td>2.75</td>
<td>2.77</td>
<td>3.37</td>
<td>2.52</td>
<td>2.76</td>
<td>2.77</td>
<td>2.86</td>
</tr>
<tr>
<td>4</td>
<td>2.60</td>
<td>2.63</td>
<td>2.72</td>
<td>3.28</td>
<td>3.50</td>
<td>2.47</td>
<td>2.68</td>
<td>2.88</td>
<td>2.57</td>
</tr>
<tr>
<td>5</td>
<td>2.48</td>
<td>2.78</td>
<td>2.79</td>
<td>3.34</td>
<td>3.57</td>
<td>2.53</td>
<td>2.75</td>
<td>2.87</td>
<td>2.61</td>
</tr>
<tr>
<td>6</td>
<td>2.79</td>
<td>2.88</td>
<td>2.80</td>
<td>3.33</td>
<td>3.56</td>
<td>2.63</td>
<td>2.84</td>
<td>2.99</td>
<td>2.69</td>
</tr>
<tr>
<td>7</td>
<td>3.13</td>
<td>2.93</td>
<td>2.62</td>
<td>2.97</td>
<td>3.66</td>
<td>2.76</td>
<td>3.02</td>
<td>2.68</td>
<td>2.64</td>
</tr>
</tbody>
</table>

All numerical values gathered by the above-mentioned system as seen in the Table 13 presented in Figure 17 for the first construct value 2.07 of the first element.

Figure 16: The average value of Construct 1 for Element 1

Note: “Die Lehrinfrastruktur in ihrem Hause ist fuer Sie:” means “The Learning infrastructure in your institution is for you: …”. This element is estimated here using one construct – “… the factor of high priority (bedeutender Faktor) – “… the factor of low priority (unbedeutender Factor)”. It should be emphasized that all numerical
values in Table 13 were obtained as the answer for the chosen topic under investigation as an assessment of the educational offer at the particular higher educational institution, namely at Darmstadt University. This data can be regarded as average values obtained from one of the respondent’s domain. In this case the respondent’s domain is the students from the Computer Science Department in Darmstadt University of Applied Siences.

According to the structure of the grid, the affective value of the higher education service is represented as the most appropriate parameters (elements) of the higher educational service. The estimates of each element have an implication on the entire level of the educational service value. In this interpretation the elements can be regarded as sample data $X_i = \{x_{i1}, x_{i2}, \ldots, x_{i7}\}$, where $i \in \{1,2,\ldots,9\}$ with seven arguments (constructs). As the main data set the grid, presented in 7.2, is chosen for the following statistical data analysis. Further, this data will be used for its analysis based on different statistical approaches and tools, which are supported by KanMar.

### 6.1.2 Pilot test

According to the KanMar methodology at the beginning of the data analysis the pilot test or so-called pretest should be provided. This test accomplishes the following main functions. First of all it serves as an initial test of the obtained data and more importantly it is the last step in finalizing the proposed questions and form. The pretest offers feedback on whether the wording and clarity of the questions are apparent to all respondents and whether all the questions mean the same thing to all respondents.
The three basic goals of the pre-test are:

- Evaluation of the competency of the questionnaire.
- Estimation of the length of the survey or average respondent time to take the survey.
- Determination of the quality of the respondent’s domain.

The main purpose of pilot testing within the KanMar methodology of data collection is to catch potential problems to avoid costly mistakes. The KanMar pilot test is used if the data collection is being used for the first time with a particular respondent’s domain. As a result, KanMar provides information on how long the data collection can be expected to take and a preview of how difficult items will be to complete.

At the first stage, according to the KanMar pilot test, the validity as an evaluation of the competency of the proposed draft questionnaire has to be established. A common conceptual definition of data validity is the extent to which the data measurement provides an accurate representation of what is being measured without systematic and variable error. In the case of KanMar, a high level of validity is ensured by the Kansei engineering approach, in the context of which the RGT questionnaire is constructed (see Chapter 4).

At the second stage, according to the KanMar methodology, the validity of the proposed questionnaire example should be established using a panel of experts.
during a so-called *field* test. In the presented questionnaire example the field test was carried out by the research participants of the PhD Seminar offered by Darmstadt University of Applied Science. The research participants in this case are an audience of 21 people, mostly working in the educational sector (scientists, researchers, lecturers). The following questions for the questionnaire validation in the field test have been addressed (Radhakrishna, 2007): *Is the questionnaire measuring what it intended to measure? Does it represent the content? Is it appropriate for the respondent’s domain? Is the questionnaire comprehensive enough to collect all the information needed to address the purpose and goals of the study? Does the instrument look like a questionnaire?* The final version of the above-described questionnaire was a result of the field test.

As the numerical validity estimation, KanMar implementation assumes the calculation of the *response rate* \((R_r)\) as the percentage of respondents who respond to the questionnaire. A high number of responses help to ensure that the results are representative and the data validity is high. The response rate is calculated using the following simple equation:

\[
R_r = \frac{N}{N_t} 100.
\]

where \(N\) is number of responses and \(N_t\) is the total number of the sample. In this case the number \(N\) of respondent responses is comparatively high and is equal to 123 out of the entire number of respondents \(N_t = 1000\) (the number of all students at the Computer Science Department of Darmstadt University, with the exception of first-year students). Thus \(R_r \approx 12.3\%\).
In this final step of the pilot test, the reliability of the questionnaire using the KanMar methodology is evaluated. Reliability refers to random error in measurement during the data collection. Generally the reliability indicates the accuracy or precision of the measuring instrument and the term “data reliability” is used to refer to the degree of variable error in a data measurement. To measure reliability the standardized Cronbach’s α characteristic is assumed as a part of the KanMar facilities. The standardized Cronbach’s alpha is defined as

\[
(6.1) \quad \alpha_s = \frac{N\mu}{1+(N-1)\mu}
\]

where \(N\) is, as above, the number of respondent responses and \(\mu\) the mean of the \(N(N-1)/2\) non-redundant correlation coefficients (i.e. the mean of an upper triangular or lower triangular of correlation matrix). The correlation matrix of \(m\) variables \(X_1, \ldots, X_N\) is the \(N \times N\) matrix whose \(i,j \in \{1,2,\ldots,N\}\) entry is the correlation coefficient \(C_{X_i X_j}\). The correlation coefficient \(C_{X_i X_j}\) is computed using the sample data \(X_i = \{x_{i1}, x_{i2}, \ldots, x_{in}\}\) and \(X_j = \{x_{j1}, x_{j2}, \ldots, x_{jn}\}\) and the formula below:

\[
(6.2) \quad C_{X_i X_j} = \frac{\sum_{k=1}^{n}(x_{ik}-\bar{x}_i)(x_{jk}-\bar{x}_j)}{\sqrt{\sum_{k=1}^{n}(x_{ik}-\bar{x}_i)^2} \sqrt{\sum_{k=1}^{n}(x_{jk}-\bar{x}_j)^2}}
\]

The Cronbach’s \(\alpha\) has been calculated for all nine elements represented as \(N = 123\) measurements \(X_1, X_2, \ldots, X_N\), where \(X_i = \{x_{i1}, x_{i2}, \ldots, x_{i7}\}, i \in \{1, 2, \ldots, 123\}\) and \(x_{i1}, x_{i2}, \ldots, x_{i7}\) are the construct values for the chosen element. As an example, the Cronbach’s \(\alpha\) value for the first element, \textit{Learning infrastructure}, is 0.8567. The reliability coefficient (Cronbach’s \(\alpha\)) can range from 0 to 1, with 0 representing an instrument full of error and 1 representing total absence of error. The Cronbach’s \(\alpha\) reliability coefficients for the data gathered by the online survey based on EvaSys are
higher than 0.8, which allows us to consider the measurement results presented in Table 13 as acceptably reliable.

### 6.1.3 Data visualization

For more detailed analysis, first of all the different kinds of histogram and average values can be generated, which is very convenient for visualizing the data presented in Table 13. As a first example the distribution of construct values for all elements is presented in Figure 17 [MATLAB Stats Toolbox].

![Histogram of the construct values](image)

*Figure 17: Histogram of the construct values*

Some very general information about the students’ answers concerning all elements influencing the level of higher educational service based on this histogram shown in Figure 18 can be acquired. The following very simple and obvious conclusions can be formulated. The minimal average respondent’s score is 1.71, which is far from the
minimal value of 1, and the highest score of 3.66 is sufficiently lower than the maximal value, which is equal to 6. The average value is very close to 3 and equals 2.7624. These results allow the conclusion to be drawn that the affective quality of the higher educational service at the Darmstadt University of Applied Science has been estimated at a quite moderate level by the students of the Informatics Department. Element number 5 (Additional services) has got the maximal construct average score of 3.4014, while element number 6 (Study organization) has been estimated with the lowest average score of 2.4886. The rest of the elements have an average construct score very close to 2.6. This data allows it to be pointed out that additional services are organized at a moderate level and there are probably some problems with study organization at this particular university.

Every construct can be interpreted as an estimation of a certain affective quality’s dimension. That is why construct number 1 (The factor of high priority – The factor of low priority) has the lowest average score of 2.1189, which means that it can be inferred that the quality of the higher educational service for the students of Darmstadt University is a factor of low priority rather than a factor of high priority. Construct number 6 (Ideal – Unacceptable) has the highest average value of 2.9456. From this data it can be inferred that the quality of the higher educational service for the students of Darmstadt University is ideal rather than unacceptable.

The histograms with superimposed normal density are presented in Figure 19 [MATLAB Stats Toolbox].
To generate this figure the MATLAB functions of \textit{histfit(data)} were used, which generated the distribution for element 6 (Figure 19, a) and for construct 3 (Figure 19, b), allowing the statistical data distribution to be compared with normal distribution.

Also, for visualization of the data set a \textit{box plot} can be applied. In descriptive statistics, a \textit{box plot} or \textit{box plot} (also known as a \textit{box-and-whisker diagram} or \textit{plot}) is a convenient way of graphically depicting groups of numerical data through their
five-number summaries; namely, there are the smallest observation (sample minimum), lower quartile, median, upper quartile and largest observation (sample maximum). A box plot may also indicate which observations, if any, might be considered outliers. Box plots display differences between populations without making any assumptions about the underlying statistical distribution: they are non-parametric. The spacing between the different parts of the box helps indicate the degree of dispersion (spread) and skewness in the data, and identifies outliers. For our data, which are shown in Table 13, this visualization has the following form [MATLAB Stats Toolbox].
This is a graphical interpretation of all the elements depending on seven constructs and constructs that are the function of nine variables (elements). For example, in the case of the first element (Figure 20, a), the median value, which is the 50th percentile of the sample, equals 2.6771. The largest observation equals 3.13 and the smallest is 2.07.
6.1.4 Data descriptive statistics

As a first step let us apply descriptive statistics to try to understand the main tendency which in the case of this respondent is an average estimation of some of the respondent’s domain expressed by the grid presented in Table 13. Generally descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries of a few of the characteristics of the sample and the measures. These characteristics contain most of the relevant information about the data under investigation. Together with simple graphic analysis, they form the basis of virtually every quantitative analysis of data. With descriptive statistics a simple description of what the data is or shows can be obtained [MATLAB Stats Toolbox].

The first simple characteristics are Central Tendency measures. The purpose of these measures is to locate data value on the number line. The central tendency of the data distribution is an estimate of the “centre” of a distribution of data values. There are four major types of central tendency characteristics available under KanMar. The Mean ($\mu$) or average (arithmetic mean) is the most commonly used approach for describing the central tendency of the sample data $X = \{x_1, x_2, \ldots, x_n\}$, which is computed based on the following formula.

\[
\mu = \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}.
\]

To compute the mean, the sum of all values is divided by the number of values. The remaining central tendency characteristics include median, trimmed mean, harmonic mean and geometric mean. The first two characteristics are two measures that are robust to outliers. The trimmed mean ($\mu_{TM}$) is calculated by discarding a certain percentage of the lowest and the highest scores and then computing the mean
according to (7.3) the remaining scores. For example, a mean trimmed 50% is computed by discarding the lower and higher 25% of the scores and taking the mean \( \mu \) of the remaining scores. The median (\( \mu_{MD} \)) is the mean (7.3) trimmed 100% and the arithmetic mean is the (7.3) mean trimmed 0%. The harmonic mean (\( \mu_{HM} \)) and geometric mean (\( \mu_{GM} \)) are calculated according to the following equations:

\[
(6.4) \quad \mu_{HM} = n \times \left( \frac{1}{\sum_{i=1}^{n} x_i} \right)^{-1}; \quad (7.5) \quad \mu_{GM} = \left( \prod_{i=1}^{n} x_i \right)^{\frac{1}{n}}.
\]

The geometric mean \( \mu_{GM} \) is useful when the sample is distributed lognormally or heavily skewed and not robust because it is not robust to outliers. Figure 21 shows the average value \( \mu \) (Mean) for all the nine elements and seven constructs under investigation.
Figure 20: The average values for all nine elements (a) and for seven constructs (b)

Element number 5, *Additional services*, has the maximal average value of around 3.4 points, and element number 6, *Study organization*, has the lowest average score (see Figure 21a). This information is quite valuable for a researcher in drawing the right marketing and management conclusions for improving service quality. It should be mentioned that due to some average values, such as $\mu_{HM}$, being not robust to outliers, these estimations are not applicable for some data sets.
To find out how spread-out the data values are on the number line, various standard functions can be used. *Dispersion measures* refer to the spread of the values around the central tendency. There are two common measures of dispersion, the *range* and the *standard deviation* (*σ*). The range is simply the highest value minus the lowest value. The standard deviation *σ* can be obtained based on *variance* (*σ*²) described by the formula.

\[
(6.6) \quad \text{var}(X) = \sigma^2 = \frac{\sum_{i=1}^{n}(x_i-\mu)^2}{n}.
\]

The KanMar tools based on MatLab facilities can generate five dispersion measures, namely *standard deviation*, *interquartile*, *mean absolute deviation*, *range* and *variance*. There are two common measures of dispersion, the *range* and the *standard deviation* (*σ*).
According to above-presented data (Figure 22), element 4 has practically constant scores without any deviations, as does construct 3. In the case of the two sets of data $X_i = \{x_{i1}, x_{i2}, \ldots, x_{in}\}$ and $X_j = \{x_{j1}, x_{j2}, \ldots, x_{jn}\}$ the deviation can be measured by the value of covariance $\text{cov}(X_i, X_j)$.

\begin{equation}
\text{cov}(X_i, X_j) = \frac{\sum_{k=1}^{n}(x_{ik} - \bar{x}_i)(x_{jk} - \bar{x}_j)}{n-1}
\end{equation}
The value of covariance $cov(X_i, X_j)$ as well as the correlation coefficient (7.2) will allow the answer to be obtained to how two variables (sets of samples) $X_i$ and $X_j$ are associated. The value of $C_{XIXj}$ ranges from $-1$ to $+1$ and indicates how accurately one variable can be predicted from another. A correlation coefficient of $C_{XIXj} = 0$ means that one variable cannot be predicted from the other. When the value of $C_{XIXj}$ is 1.00 (or -1.00) then one variable can be predicted from another with perfect accuracy. The more the two sets of data are the same, the higher the correlation will be and consequently the better the reliability. For example, to assume a test is reliable, the correlation needs to be at least 0.8 and it is better if the correlation is 0.9 or higher. CMoS uses the MATLAB function $corrcoef(data)$, which returns a matrix of correlation coefficient (7.2) calculated from an input matrix data set whose rows are observations and whose columns are variables. For the above-presented data set (Table 13), the matrix of correlation coefficients for all nine elements is shown in Table 14.

**Table 64: Correlation coefficients CXiXj for the elements**

<table>
<thead>
<tr>
<th>CXiXj</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
<th>X7</th>
<th>X8</th>
<th>X9</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>1.0000</td>
<td>0.8495</td>
<td>0.5852</td>
<td>-0.0215</td>
<td>0.7561</td>
<td>0.9096</td>
<td>0.9483</td>
<td>0.5781</td>
<td>0.7323</td>
</tr>
<tr>
<td>X2</td>
<td>0.8495</td>
<td>1.0000</td>
<td>0.9147</td>
<td>0.2516</td>
<td>0.9565</td>
<td>0.9907</td>
<td>0.9677</td>
<td>0.9000</td>
<td>0.9410</td>
</tr>
<tr>
<td>X3</td>
<td>0.5852</td>
<td>0.9147</td>
<td>1.0000</td>
<td>0.3806</td>
<td>0.9062</td>
<td>0.8564</td>
<td>0.7868</td>
<td>0.9875</td>
<td>0.9438</td>
</tr>
<tr>
<td>X4</td>
<td>-0.0215</td>
<td>0.2516</td>
<td>0.3806</td>
<td>1.0000</td>
<td>0.3919</td>
<td>0.1870</td>
<td>0.1097</td>
<td>0.4470</td>
<td>0.0860</td>
</tr>
<tr>
<td>X5</td>
<td>0.7561</td>
<td>0.9565</td>
<td>0.9062</td>
<td>0.3919</td>
<td>1.0000</td>
<td>0.9434</td>
<td>0.9002</td>
<td>0.9256</td>
<td>0.8650</td>
</tr>
<tr>
<td>X6</td>
<td>0.9096</td>
<td>0.9907</td>
<td>0.8564</td>
<td>0.1870</td>
<td>0.9434</td>
<td>1.0000</td>
<td>0.9912</td>
<td>0.8461</td>
<td>0.9118</td>
</tr>
<tr>
<td>X7</td>
<td>0.9483</td>
<td>0.9677</td>
<td>0.7868</td>
<td>0.1097</td>
<td>0.9002</td>
<td>0.9912</td>
<td>1.0000</td>
<td>0.7689</td>
<td>0.8752</td>
</tr>
<tr>
<td>X8</td>
<td>0.5781</td>
<td>0.9000</td>
<td>0.9875</td>
<td>0.4470</td>
<td>0.9256</td>
<td>0.8461</td>
<td>0.7689</td>
<td>1.0000</td>
<td>0.9067</td>
</tr>
<tr>
<td>X9</td>
<td>0.7323</td>
<td>0.9410</td>
<td>0.9438</td>
<td>0.0860</td>
<td>0.8650</td>
<td>0.9118</td>
<td>0.8752</td>
<td>0.9067</td>
<td>1.0000</td>
</tr>
</tbody>
</table>
In this example, $X_i$ represents element number $i$ where $i \in \{1, 2, \ldots, 9\}$ from Table 13. As can be seen, element 1 cannot be completely predicted based on element 4 ($C_{X1X4} = -0.0215$), and at the same time can be predicted with a high level of accuracy based on element 7 due to the high level of correlation ($C_{X1X7} = 0.9483$). These numerical values can be interpreted as follows: the element Learning infrastructure does not depend on Students’ research activities, and is very closely related to the element Level of received theoretical knowledge. The value $C_{X2X6} = 0.9907$ indicates that the element Programme design is very closely correlated with the element Study organization.

6.1.5 Summary

The data presented in electronic Appendix B has been collected as the responses from the Bachelor (except for the first-year students) and Master students of the Informatics Department of the Darmstadt University of Applied Sciences based on the questionnaire shown in the final questionnaire. For further data analysis a different compact presentation of the survey results is presented and validated. These data can be regarded as an evaluation of the educational service at this particular department of Darmstadt University. The first obvious finding concerning the affective quality of the service at this higher education institution can be formulated as the higher levels of Students’ research activities (element 4) and Additional services (element 5) proposed to the students at the Department of Informatics. The rest of the service quality elements were estimated at approximately the same level. As the second finding, the very low rate of construct 1 is equal to 2.1189 (The factor of high priority − The factor of low priority) compared to the average rate. This
result can be interpreted as meaning that all the elements describing the service quality are a factor of low priority rather than high priority for all respondents. At the same time, construct 6 (*Ideal − Unacceptable*) has the highest average value at 2.9456. These results can be interpreted as meaning that the service quality elements, generally, are a factor of low priority among the students of this department and at the same time, particularly in this department, they are ideal rather than unacceptable.

6.2 Results analysis and interpretation

Descriptive statistics give general information about measurements (observation), namely what the average and median values are, what the observed errors are and what the distribution of experimental data is. Descriptive statistics results are very useful for presenting collected measurement data for further data analysis. Based on the collected experimental data shown in the previous chapter the following data analyses will be discussed.

6.2.1 Cluster analysis

*Cluster analysis*, also known as segmentation analysis or taxonomy, is a way of grouping objects of a similar kind into respective categories. A general question facing researchers in many areas of inquiry is how to organize observed data into meaningful structures, that is, to develop taxonomies. In other words, cluster analysis is an exploratory data analysis tool aimed at sorting different objects into groups in
such a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. Cluster analysis can be performed on many different types of data sets, including those based on different methodologies. The most commonly used method in practice for data clustering is the \( k \)-mean method (Berry & Linoff, 1997). In the first step of this method, the number \( k \) of clusters should be chosen along with the \( k \) data points (initial centroids) as the seeds for the clusters. Each point is then assigned to the closest centroid, and each collection of points assigned to a centroid is a cluster. The centroid of each cluster is then updated based on the points assigned to the cluster. Then the assignment procedure should be repeated on the basis of the new value of the centroids. This procedure is repeated until no point changes cluster, or until the centroids remain the same (Berry & Linoff, 1997).

The crucial element of the above-described clustering approach is the proximity measure that quantifies the notation of the closest point (data) for the specific data under consideration. As the numerical values for these purposes the different types of distance between the data represented as points can be used. It is an \( m \) by \( n \) matrix \( X \), which is treated as \( m \) row vectors \( X_1, X_2, \ldots, X_m \), where \( X_i = \{x_{i1}, x_{i2}, x_{i3}, \ldots, x_{in}\} \). There are various types of distances between the vectors \( X_i = \{x_{i1}, x_{i2}, x_{i3}, \ldots, x_{in}\} \) and \( X_j = \{x_{j1}, x_{j2}, x_{j3}, \ldots, x_{jn}\} \), which are defined as follows (Berry & Linoff, 1997). Euclidean distance (\( D_E \)) between points \( X_i \) and \( X_j \) is the length of the line segment connecting them. In Cartesian coordinates, if \( X_i = \{x_{i1}, x_{i2}, x_{i3}, \ldots, x_{in}\} \) and \( X_j = \{x_{j1}, x_{j2}, x_{j3}, \ldots, x_{jn}\} \) are two points in Euclidean \( n \)-dimensional space (in Cartesian coordinates), then the distance from \( X_i \) to \( X_j \), or from \( X_j \) to \( X_i \) is given by the formula:

\[
(6.8) \quad D_E(X_i, X_j) = \sqrt{\sum_{k=1}^{n} (x_{ik} - x_{jk})^2}.
\]
There are some modifications of the Euclidean distance such as *Standardized Euclidean distance* and *Mahalanobis distance* ([Berry & Linoff, 1997; MATLAB Stats Toolbox]). *City block distance* ($D_{CB}$), *Manhattan distance* or *Manhattan length*, which is also widely used for data clustering, is calculated as

$$D_{CB}(X_i, X_j) = \sum_{k=1}^{n} |x_{ik} - x_{jk}|.$$

The *Minkowski distance* ($D_M$) of order $p$ between two points $X_i$ and $X_j$ is

$$D_M(X_i, X_j) = \sqrt[p]{\sum_{k=1}^{n} |x_{ik} - x_{jk}|^p}.$$

Minkowski distance is typically used with $p$ being 1 or 2. The latter is the Euclidean distance, while the former is known as the Manhattan distance. In the limiting case of $p$ reaching infinity we obtain the Chebyshev distance.

*Hierarchical clustering* techniques are the second most important category of clustering methods. These approaches are relatively old compared to many clustering algorithms, but they are still widely used for different applications. There are two basic approaches for hierarchical clustering implementation: *Agglomerative* and *Divisive*. Divisive clustering starts with one, all-inclusive cluster and at each step a cluster splits until only singleton clusters, all including one point, remain. Agglomerative clustering starts with the points as individual clusters and, at each step, the closest pair of clusters merge. Agglomerative hierarchical clustering techniques are by far the most common, and that is why we will focus exclusively on these methods. A hierarchical clustering is often displayed graphically using a tree-like diagram called a *dendrogram*. The dendrogram (tree) is not a single set of clusters, but rather a multilevel hierarchy, where clusters at one level are joined by clusters at the next higher level. This generally allows a user to decide what level,
scale or complexity of clustering is most appropriate in a particular application (Berry & Linoff, 1997).

To perform hierarchical cluster analysis on a data set using CMoS, which is based on the MATLAB Statistics Toolbox functions, the following procedure should be performed [MATLAB Stats Toolbox].

**Step 1.** For every pair of objects \( X_i \) and \( X_j \) in the data set (elements) the similarity or dissimilarity metrics should be obtained. Technically the distance between objects has to be calculated. The resulting Table 15 with the standardized Euclidian distances is shown below.

### Table 15: Euclidian distance or elements presented in Table 13

<table>
<thead>
<tr>
<th>Elements</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
<th>X7</th>
<th>X8</th>
<th>X9</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>0</td>
<td>1.5084</td>
<td>2.3667</td>
<td>4.1066</td>
<td>6.1379</td>
<td>2.0457</td>
<td>1.1019</td>
<td>2.7983</td>
<td>2.3759</td>
</tr>
<tr>
<td>X2</td>
<td>1.5084</td>
<td>0</td>
<td>1.4373</td>
<td>4.0052</td>
<td>6.1307</td>
<td>1.7026</td>
<td>1.1282</td>
<td>1.5079</td>
<td>1.4580</td>
</tr>
<tr>
<td>X3</td>
<td>2.3667</td>
<td>1.4373</td>
<td>0</td>
<td>3.9617</td>
<td>6.5619</td>
<td>1.6224</td>
<td>1.6784</td>
<td>1.1334</td>
<td>1.1483</td>
</tr>
<tr>
<td>X4</td>
<td>4.1066</td>
<td>4.0052</td>
<td>3.9617</td>
<td>0</td>
<td>3.7339</td>
<td>5.0461</td>
<td>3.3565</td>
<td>4.0039</td>
<td>4.8279</td>
</tr>
<tr>
<td>X6</td>
<td>2.0457</td>
<td>1.7026</td>
<td>1.6224</td>
<td>5.0461</td>
<td>7.6235</td>
<td>0</td>
<td>2.1214</td>
<td>2.2306</td>
<td>1.5776</td>
</tr>
<tr>
<td>X7</td>
<td>1.1019</td>
<td>1.1282</td>
<td>1.6784</td>
<td>3.3565</td>
<td>5.5740</td>
<td>2.1214</td>
<td>0</td>
<td>2.1462</td>
<td>1.9964</td>
</tr>
<tr>
<td>X8</td>
<td>2.7983</td>
<td>1.5079</td>
<td>1.1334</td>
<td>4.0039</td>
<td>6.3424</td>
<td>2.2306</td>
<td>2.1462</td>
<td>0</td>
<td>1.5960</td>
</tr>
<tr>
<td>X9</td>
<td>2.3759</td>
<td>1.4580</td>
<td>1.1483</td>
<td>4.8279</td>
<td>6.9774</td>
<td>1.5776</td>
<td>1.9964</td>
<td>1.5960</td>
<td>0</td>
</tr>
</tbody>
</table>

**Step 2.** All objects are grouped into a binary, hierarchical cluster tree dendrogram. In this step, you link pairs of objects that are in close proximity using the linkage function, which is the main function for implementing the hierarchical clustering
method. The linkage function uses the distance information generated in step 1 to determine the proximity of objects to each other. In our example shown in Table 15 the distance between elements 1 and 7 ($X_1$ and $X_7$) is the smallest one (1.1019), which allows us to predict that two of these elements 1 and 7 must have a lot of common features to be in the same cluster. At the same time elements 5 and 6 ($X_5$ and $X_6$) are very different in terms of Euclidian distance (7.6235). As objects are paired into binary clusters, the newly formed clusters are grouped into larger clusters until a hierarchical tree is formed. The result of the hierarchical clustering procedure for all nine elements presented in Table 13 is the binary tree (dendrogram) shown in Figure 23.

![Dendrogram for elements (Euclidian distance)](image)

*Figure 22: Dendrogram for elements (Euclidian distance)*

A dendrogram can be created based on different distance measures. The next two plots show the results of dendrogram building for the two metrics available under the MATLAB toolbox.
As can be seen from the above-presented figures, there are at least two separate groups (clusters) of elements. The first cluster includes elements 4, — Students’ research activities, and 5, Additional services, and the second cluster can be created
from the rest of the elements. There is another way of separating elements into three clusters, whereby elements 4 and 5 form the first cluster, and elements 1, *Programme design*, and 7, *Level of received theoretical knowledge*, make up the second one, and the rest of the elements are organized into the third group (see Figures 23, 24 and 25). Finally, further investigation of two clusters of elements can be carried out. The first cluster, including elements 4, *Students’ research activities*, and 5, *Additional services*, have probably appeared due to the fact that these two elements are very common in nature for the students of Darmstadt University of Applied Science, as it is traditionally very close to industry, unlike the classical universities that orient toward theoretical science much more. It is not surprising that research activities can be perceived by these students as additional service. The cluster including elements 1, *Programme design*, and 7, *Level of received theoretical knowledge*, probably appeared because the level of received knowledge corresponds to the level of the programme design.

*Step 3.* The hierarchical tree is cut into clusters. In this step, you use the cluster function to prune branches off the bottom of the hierarchical tree, and assign all the objects below each cut to a single cluster. This creates a partitioning of the data. The cluster function can create these clusters by detecting natural groupings in the hierarchical tree or by cutting off the hierarchical tree at an arbitrary point. For the validation of the cluster information the value of the *Cophenetic correlation coefficient* (c) is used. If the clustering is valid, linking the data into cluster three should have a strong correlation with distances between data in the distance vector. The cophenetic correlation coefficient is the validation indicator. The high value of this coefficient is the better clustering solution. This coefficient can be used to
compare the results of clustering the same data with different distance metrics. The values of \( c \) for the above-presented results are shown in Table 16.

### Table 16: Cophenetic correlation coefficient for different Distance metrics

<table>
<thead>
<tr>
<th>Distance</th>
<th>Euclidian</th>
<th>Standardized Euclidian</th>
<th>Mahalanobis</th>
<th>City Block</th>
<th>Minkowski (p=3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( c )</td>
<td>0.9327</td>
<td>0.9204</td>
<td>0.4625</td>
<td>0.8855</td>
<td>0.9525</td>
</tr>
</tbody>
</table>

The numerical values of \( c \) show that the clustering based on Mahalanobis distance is the worst clustering solution, which can be omitted from further investigation. Another possibility for determining how properly cluster division in a data set has been carried out is to compare the length of each link in the cluster tree with lengths of neighbouring links below it in the tree. If a link is approximately the same length as neighbouring links, it indicates that there are similarities between the data joined at this level of the hierarchy. These links are said to exhibit a high level of consistency. To express and quantify the relative consistency of each link in a cluster tree the inconsistency coefficient (IC) is used. The value of this coefficient compares the length of a link in a cluster hierarchy with the average length of neighbouring links. If the object is consistent with those around it, it will have a low inconsistency coefficient. As an example, all values of inconsistency coefficients for cluster trees shown in Figures 23, 24 and 25 are presented in Table 17.
Table 17: Inconsistency coefficients for set of clusters

<table>
<thead>
<tr>
<th>Cluster Tree</th>
<th>Inconsistency coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 23</td>
<td>0.0 0.0 0.7071 0.7071 0.7071 0.8730 0.0 0.7907</td>
</tr>
<tr>
<td>Figure 24</td>
<td>0.0 0.7071 0.0 0.0 0.9492 0.8207 0.0 0.6557</td>
</tr>
<tr>
<td>Figure 25</td>
<td>0.0 0.0 0.7071 0.7071 0.7071 0.9618 0.0 0.8054</td>
</tr>
</tbody>
</table>

As can be seen from Table 17, in all cases the inconsistency coefficients have low values, which allows us to conclude that the clustering was performed at a moderate level. The next two dendrograms have been obtained as a result of construct clustering.

![Dendrogram for constructs (Euclidian distance)](image-url)

Figure 25: Dendrogram for constructs (Euclidian distance)
As can be seen from the above-presented figures, there are at least two separate groups (clusters) of constructs. The first cluster includes construct 1 (The factor of high priority – The factor of low priority) and the rest of the constructs are in the second cluster. A sufficiently large distance between construct 1 and all others constructs allows the conclusion to be drawn that this construct probably expresses the personal attitude toward all elements using affective value of higher educational service estimations in general, rather than estimations of service at a particular educational institution.

6.2.2 Factor analysis

Factor analysis is a statistical approach used to uncover the relationships among many variables. One such approach is principal component analysis (PCA). This
contrasts with general factor analysis methods as PCA components are simply geometrical abstractions that may not map easily onto real-world phenomena. Given a data table of two or more variables, PCA generates a new table with the same number of variables, called the principal components. Each principal component is a linear representation of the entire original data set. The coefficients of the principal components are calculated so that the first principal component contains the maximum variance, which can be regarded as the variable with the maximum information. The second principal component is calculated to have the second most variance and it is uncorrelated with the first principal component. Further principal components, if any, exhibit decreasing variance and are uncorrelated with all other principal components. The number of principal components is less than or equal to the number of original variables.

PCA was invented in 1901 by Karl Pearson (Baily & Thompson, 1990), and, depending on the field of application, it is also known as the discrete Karhunen-Loève transform (KLT), the Hotelling transform or proper orthogonal decomposition (POD). PCA consists of the following steps.

Step 1. In the first step the data under consideration have to be defined. Let it be the general case that the data is given as $m$ by $n$ matrix $X$, which is treated as $m$ row vectors $X_1, X_2, \ldots, X_m$, where $X_i = \{x_{i1}, x_{i2}, x_{i3}, \ldots, x_{in}\}$.

Step 2. Most often, the second step in PCA is to standardize the data. Standardization means subtracting the sample mean $\bar{X}_i$ from each of the data dimensions $i \in \{1, 2, \ldots, m\}$. 
\( m \), then dividing by the sample standard deviation \( \sigma(X_i) \). This centres and scales the data.

**Step 3.** Calculate the covariance matrix. Since the data is \( m \) dimensional, the covariance matrix will be \( m \times m \).

**Step 4.** Calculate the **eigenvectors** and **eigenvalues** of the covariance matrix. According to the definition, the **eigenvectors** of a square matrix are the non-zero vectors that, after being multiplied by the matrix, remain proportional to the original vector or become zero. For each eigenvector, the corresponding eigenvalue is the factor by which the eigenvector changes when multiplied by the matrix. The eigenvectors and eigenvalues are sometimes also called **characteristic vectors** and **characteristic values**. One of the very important properties of eigenvectors is that they are perpendicular to each other and that is why they can provide us with information about the patterns in the data. The first eigenvector goes through the middle of the data (points in \( n \)-dimensional space) like drawing a line of best fit. The second eigenvector also goes through the middle of the data but is perpendicular to the previous one. According to this process of taking the eigenvectors of the covariance matrix, the orthogonal lines in \( m \)-dimensional space that characterize the data are extracted. The eigenvalues for all eigenvectors are quite different values. It turns out that the eigenvector with the highest eigenvalue is the principal component of the data set.
Step 5. The next step is to order eigenvectors by eigenvalue, highest to lowest. This gives the components in order of significance. At this point the decision to ignore some of the components of lesser significance can be made. As a result of this decision some information will be lost, but if the eigenvalues are small not much will be lost. If some components leave, the final data set will have fewer dimensions than the original.

To find principal components the *princomp* function was used [MATLAB Stats Toolbox]. The first values *pcs* of the output of the *princomp* contain the principal components as the linear combinations of the data presented in Table 13. Five components are shown in Table 18.

### Table 18: Principal component vectors

<table>
<thead>
<tr>
<th>pcs1</th>
<th>pcs2</th>
<th>pcs3</th>
<th>pcs4</th>
<th>pcs5</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.3094</td>
<td>0.3771</td>
<td>0.5045</td>
<td>-0.2891</td>
<td>0.5562</td>
</tr>
<tr>
<td>-0.3715</td>
<td>0.0395</td>
<td>0.0345</td>
<td>-0.0554</td>
<td>-0.3882</td>
</tr>
<tr>
<td>-0.3477</td>
<td>-0.2045</td>
<td>-0.3957</td>
<td>-0.1789</td>
<td>-0.1073</td>
</tr>
<tr>
<td>-0.1053</td>
<td>-0.8129</td>
<td>0.4680</td>
<td>-0.2725</td>
<td>-0.0618</td>
</tr>
<tr>
<td>-0.3608</td>
<td>-0.1147</td>
<td>0.0827</td>
<td>0.8067</td>
<td>0.0441</td>
</tr>
<tr>
<td>-0.3668</td>
<td>0.1260</td>
<td>0.1546</td>
<td>0.0540</td>
<td>-0.1538</td>
</tr>
<tr>
<td>-0.3551</td>
<td>0.2186</td>
<td>0.2515</td>
<td>-0.0138</td>
<td>-0.3722</td>
</tr>
<tr>
<td>-0.3454</td>
<td>-0.2607</td>
<td>-0.3152</td>
<td>0.0857</td>
<td>0.5981</td>
</tr>
<tr>
<td>-0.3524</td>
<td>0.0937</td>
<td>-0.4188</td>
<td>-0.3819</td>
<td>-0.0512</td>
</tr>
</tbody>
</table>
Note: The largest contribution in the first principal component is made by the second (-0.3715) and sixth (-0.3668) elements, namely *Programme design* and *Study organization*, from the data under investigations. The first principal component is constructed as the linear combination of all elements practically with the same contributions except for the fourth element *Students’ research activities* (-0.1053).

The next *Pareto* plots, presented in Figure 28, show per cent variability by each principal component for the case of variables represented by the elements and constructs for the original data set (Table 13).

*Figure 27: Pareto plot of principal components for: a) elements, b) constructs*
As can be seen from the above plots, in both cases there are three principal components and the first one explains more than 80% of the total variability. The last output of the **princomp** function is a statistical measure $t^2$ of the multivariate distance of each element from the centre of the data set. It enables the most extreme points (elements) in the data set to be found. In our case there is no extreme element as the multivariate distance of each element from the data set is similar.

### 6.2.3 Regression analysis

Regression analysis is one of the most commonly used statistical techniques in social and behavioral sciences, as well as in other sciences. Its main objective is to explore the relationship between a dependent variable and one or more independent variables, which are also called “predictor” or “explanatory” variables. Linear regression explores relationships that can be readily described by straight lines or their generalization to many dimensions. Mathematically, the regression model is represented by the following equation:

$$(6.11) Y = X\beta + \epsilon,$$

where $Y$ is an $m$-by-1 vector of the dependent variable; $X$ is the $m$-by-$n$ matrix determined by the independent variables; $\beta$ is an $n$-by-1 vector of parameters; and $\epsilon$ is an $m$-by-1 vector of random disturbances, independent of each other and usually having a normal distribution. A large number of problems can be solved by linear regression, and even more by means of transformation of the original variables, which results in linear relationships among the transformed variables. There are a
number of functions for fitting various types of linear models, e.g. one-way analysis of variance (ANOVA). The one-way ANOVA is used to find out whether data from several groups have a common mean. That is, to determine whether the groups are actually different in the measured characteristic. One-way ANOVA is a simple special case of a linear model:

\[(6.12) Y_{ij} = \mu_j + \varepsilon_{ij},\]

where \(Y_{ij}\) is a matrix of observations in which each column represents a different group; \(\mu_j\) is a matrix whose columns are the group means (\(\mu_j\) is the same for all \(i\)); and \(\varepsilon_{ij}\) is a matrix of random disturbances. This model posits that the columns of \(Y\) are a constant (\(\mu_j\)) plus a random disturbance (\(\varepsilon_{ij}\)).

The data set under investigation is presented in Table 13. The \(n=9\) columns of Table 13 represent parameters (elements of the higher educational service). The \(m=7\) rows are estimates (constructs) of elements that have an implication for the entire level of the educational service quality. The question is: do some elements have a higher influence on education service quality than others? The resulting data obtained by ANOVA contain the sum of squares (SS), degree of freedom (df), \(F\) statistic, and \(p\)-value, as shown in Table 19.
Table 19: One-way ANOVA results

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sums of Squares (SS)</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Prob&gt;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columns</td>
<td>4.9472</td>
<td>8</td>
<td>0.6184</td>
<td>5.6407</td>
<td>3.2918e-005</td>
</tr>
<tr>
<td>Error</td>
<td>5.9201</td>
<td>54</td>
<td>0.1096</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10.8673</td>
<td>62</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In fact, the ANOVA is comparing the means of nine columns of data in the matrix shown in Table 19, where each column represents an independent observation (element). Generally, if \( p \) is near zero, it casts doubt on the null hypothesis and suggests that at least one sample (element) mean is significantly different to the other sample means. This is exactly our case as element 5 (Additional services) has a different mean to the other elements, as can be seen in the box plot for elements shown in Figure 28, a. Common significance levels are 0.05 or 0.01. In this case the \( p \)-value is 3.2918e-005, which is sufficiently lower than the indicated significance levels. This is a strong indication that elements’ estimations are not the same. The low \( p \)-value indicates that there are differences between the elements’ means presented in the columns in Table 13. This allows the conclusion to be drawn that the nine elements presented in Table 19 make different contributions to the estimation of the affective value of the higher educational service at the Computer Science Department of Darmstadt University.

Sometimes it is important to determine specifically which pairs of means are significantly different. For this purpose a series of \( t \) tests (paired \( t \) test) for each pair
of means should be performed. In a \( t \) test a \( t \) statistic is computed and compared to a critical value. The critical value is chosen so that when the means are really the same, the probability that the \( t \) statistic will exceed the critical value is small, equal to 5%. When the means are different, the probability that the statistic will exceed the critical value is larger.

In the offered example there are nine means, so there are 36 pairs of means to compare. Based on the MATLAB Statistics Toolbox the procedure known as multiple comparison procedure can be performed [MATLAB Stats Toolbox]. The first output from the MATLAB `multcompare` procedure has one row for each pair of groups, with estimates of the difference in group means and confidence interval for that group. In our example the 27th row out of 36 rows has the values shown below:

| 5.0000 | 6.0000 | 0.3411 | 0.9129 | 1.4846 |

These data indicate that the mean of element 5 minus the mean of element 6 is estimated as -0.9129 and the confidence interval for this difference is 95% [0.3411, 1.4846]. In this example the difference is significant at the 0.05 level as the confidence interval does not contain a 0.0 value. Within the same example elements 8 and 9 have the values:

| 8.0000 | 9.0000 | -0.4704 | 0.1014 | 0.6732 |

This indicates that the means of elements 8 and 9 are not different. It is possible to analyse the difference between elements’ means by using the graph produced by the `multcompare` procedure. Examples of the analysis based on this graph are shown below for the case of the elements shown in Table 13.
Figure 28: The resulting graph for multcompare procedure for elements

This graph indicates that there are two elements, namely 4, Students’ research activities, and 5, Additional services, with means significantly different from the means of the rest of the elements. The second graph presents the same result for constructs.

Figure 29: The resulting graph for multcompare procedure for constructs
The last graph strongly indicates that the first construct (The factor of high priority – The factor of low priority) has a significantly different mean compared with the other constructs. This can be interpreted as the first construct not being appropriate for quality of higher educational service assessment.

6.2.4 Summary of experimental findings

In this chapter the data analysis procedure supported by the KanMar methodology was provided and the main outcomes were presented. Assessment of service quality requires a robust instrument capable of measuring various aspects of service delivered by an organization. Service quality measurement procedures are not only used for facilitating system design and implementing quality planning but also give guidelines for improving some quality elements to fulfil customers’ expectations. The proposed KanMar approach deals with the development of an affective quality measurement methodology and tools. As has been pointed out in this research, in the education industry there is a lack of physical evidence of service and a persistence of intangibility, which makes the perception of service quality a complex composition. Moreover, due to the different types of stakeholder with different backgrounds and varied behavioral patterns the analysis of service quality is a difficult issue.

For the purposes of experimental validation of the KanMar methodology an experimental investigation was carried out. To show the proposed methodology in practice by applying the KanMar methodology as the topic for investigation the affective quality of the higher educational service was chosen. As the stakeholders
for this experimental investigation, Bachelor (except for first-year students) and Master students of the Informatics Department of the Darmstadt University of Applied Science were chosen. The responses were collected through a questionnaire survey containing nine higher education service quality elements that are relevant to the education service at higher education institutions. All these elements were rated by the respondents according to a Likert scale using the RGT fixed grid. For the survey the evaluation software for education tool EvaSys was chosen, enabling online survey design and its further implementation. This tool is actively used at many German higher education institutions, including Darmstadt University of Applied Science, for learning purposes. EvaSys maintains different questionnaire types, including the matrix form, which matches the used during the experiment grid.

To perform data analysis based on CMoS and an input data set presented as the grid, the following procedure implemented using MATLAB Statistics Toolbox functions was chosen. First of all, data reorganization, presentation, pilot testing and simple data analyses based on descriptive statistics were carried out. More complicated analyses such as cluster analyses, factor analyses and regression analyses were conducted. Based on the results of the data analyses the following statement can be formulated: a methodology and measuring instrument for the service quality at higher educational institutions have been proposed and used for service quality assessment. Seven constructs under nine elements constitute relevant variables for the proposed measurement instrument.

Due to restricted statistical data consisting of one respondent’s domain survey only at this point can the following findings be formulated with respect to one particular
institution providing its educational service. The survey data can be regarded as the educational service evaluation at this particular department of Darmstadt University.

The first obvious finding concerning the service quality at this higher institution can be formulated as the higher levels of *Students’ research activities* (element 4) and *Additional services* (element 5) proposed to the students at the Department of Informatics. The remaining service quality elements were estimated at approximately the same level.

As the second finding, the very low rate equals 2.1189 for construct 1 (*The factor of high priority – The factor of low priority*) compared to the average rate. This result can be interpreted as meaning that all the elements describing the service quality are a factor of low priority rather than high priority to all respondents. At the same time, construct 6 (*Ideal – Unacceptable*) has the highest average value of 2.9456. These results can be interpreted as meaning that the service quality elements, generally, are a factor of low priority to the students of this department and, at the same time, particularly at this department, are ideal rather than unacceptable.

In this chapter the data analysis procedure supported by the CMoS was provided and the main outcomes were presented. As can be seen from the above-presented cluster analyses, there are at least two separate groups (clusters) of elements. The first cluster includes elements 4, *Students’ research activities*, and 5, *Additional services*, and the second cluster can be created from the rest of the elements. This cluster probably appeared due to the fact that these two elements are very common in nature for the students of Darmstadt University of Applied Science, as it is traditionally
very close to industry, unlike the classical universities that orient toward theoretical science much more. It is not surprising that research activities can be interpreted by these students as additional services. There is another possibility for element separation into three clusters, whereby elements 4 and 5 constitute the first cluster, elements 1, Programme design, and 7, Level of received theoretical knowledge, make up the second one, and the rest of the elements are organized into the third group.

As can be seen from the above-presented results, there are at least two separate groups of constructs. The first cluster includes construct 1 (The factor of high priority – The factor of low priority), and the rest of the constructs are in the second cluster. A sufficiently large distance between construct 1 and all other constructs allows the conclusion to be drawn that this construct probably expresses personal attitude to all elements using affective quality of higher educational service estimations in general, rather than estimations of service at a particular educational institution. More precise analyses of the results concerning the constructs allow a strong correlation to be emphasized between constructs 4 (Well organized – Badly organized) and 5 (Exceeds expectations – Does not match the expectations). Both constructs are within the same cluster, which can be extended to three constructs including construct 6 (Ideal – Unacceptable). Selecting a representative set of constructs is a matter for further investigation.
Chapter 7 Evaluation of the KanMar by research interviews

The main task of this research is to develop a methodology for quantitative measurement of the affective quality of educational services. The author’s integrative theoretical approach with its focus on the affective dimension of quality aimed at the marketing analysis of customers’ response to offered services KanMar has been proposed. Despite the promising validation results described in Chapter 6 of the thesis, there is a need for additional qualitative evaluation.

Among the main points that could benefit from additional qualitative evaluation can be adduced:

- Attractiveness of the KanMar approach.
- Focus on affective dimension.
- Interest in methodology and readiness of higher education management staff to apply this methodology in their work.
- Research relevance to the current situation in all involved areas.
- The relevance of the used methodology to the topic.
- Research novelty.

The main reasons for additional qualitative evaluation can be summarized as follows:
• Transdisciplinary nature of the research. It has parts from philosophy, marketing, psychology, informatics and design.

• Research addresses current trends from different areas.

• Research includes all three dimensions of the novelty: theoretical, practical and methodological.

• Some parts cannot be tested in the scope of the validation experiment.

To evaluate all dimensions of the KanMar, people with experience and a knowledge background in different areas are needed. These areas are: Kansei engineering approach, educational management, marketing, information technologies and philosophy. People with an academic background are preferable because of the educational context of the research and the opportunity to receive feedback that is adequate for PhD research. However, the viewpoint of marketing practitioners is also very interesting due to the context of the research and its practical orientation. That is why marketing practitioners have been included also in the group of experts. There are ten experts in this group. Literature overview revealed the ranges usually include up to ten persons for the qualitative evaluation of research: 6 persons (Creswell, 2007), 6-8 persons (Kuzel, 1999) and 6-10 persons (Morse, 2000).

7.1 Interviewees

Ten experts were interviewed to evaluate the concept. The experts’ group is heterogeneous; it consists of specialists from different areas and includes both academicians and practitioners. Different points of view from experts with different
backgrounds and experiences help to cover all dimensions of the offered transdisciplinary research. Almost all interviewees have a research background. An exception was made for two marketing practitioners because the marketing dimension of the KanMar approach has a practical orientation. Other experts represent the academic area. They are all lecturers, which is also important in the scope of the educational context of this research. Experts represent the main scientific areas and practical themes that were included in the offered research: marketing, information technologies, educational marketing management and the Kansei engineering approach.

The following list of the complete experts’ group provides more details about their experiences and research focuses:

- **Area: Kansei engineering.** Mr. Schuette, Phd. Currently, he holds the position of Associate Professor in the area of product development at Linköping University, Sweden. In 2005, he received his PhD degree in the area of human-systems engineering and continued as a postdoctoral fellow in the same area. The topic of his research was mainly Kansei engineering and affective aspects of product development. In 2008, he moved to the division of machine design where he was close to the Concept Realization Lab (CRL) and continued his research into product development methods and in particular affective aspects of product development.  

• Area: Kansei engineering. Mr. Lévy, PhD. Pierre (P.D.) Lévy is assistant professor at Eindhoven University of Technology, Eindhoven, the Netherlands. He gained a PhD with honours in Kansei Science at the University of Tsukuba, Japan (2006). After a postdoctoral position at the Laboratory of Kansei Information Science at the Graduate School of Comprehensive Human Science at the University of Tsukuba, he was researcher and lecturer at Chiba University as well as lecturer at the University of Tsukuba. He has been an active member of the Japan Society of Kansei Engineering (JSKE), and is currently an international counsellor of JSKE, member of the Editorial Board of the Kansei Engineering International Journal, and co-organizer of the International Conference of Kansei Engineering and Emotion Research International 2010 in Paris, France. He explores opportunities for applying Kansei science and Kansei philosophy in product and interaction design.  

• Areas: Educational marketing management and information technologies. Prof. Dr. Serge Demidenko. Currently, he is Associate Head of the School of Engineering and Advanced Technology at Massey University, New Zealand. Previously he was Chair of Electronic Engineering and Associate Head of the Institute of Information Sciences and Technology at Massey University. Areas of current research and academic interest for Professor Demidenko include Electronic Design and Testing, Fault Tolerance, and Digital Signal Generation and Processing. In 2010, Professor Demidenko joined RMIT International University Vietnam as Head of the Centre of Technology and was later

http://dqi.id.tue.nl/web/#pierre-levy

http://www.massey.ac.nz/massey/learning/colleges/college-of-sciences/staff-profile.cfm?stref=601530
concurrently appointed as Vice-President (Academic). In his role as Vice-President (Academic), Professor Demidenko is responsible for overseeing the continued growth of the research capability of RMIT Vietnam, and ensuring that teaching and learning standards and support are consistently maintained at the highest level of quality. As the Head of the Centre of Technology, Professor Demidenko provides leadership for the Centre to deliver the best-quality programmes that are appropriate to the Vietnamese context.

- Area: Information Technologies. Doc. Ing. Vitaly Levashenko, PhD. He is currently Associate Professor at the University of Zilina, Department of Informatics, Faculty of Management Science and Informatics, Slovakia. He is Editorial Board Member of Computer Science and Engineering. His main research areas are: data mining, multiple-valued and fuzzy logics, and Information Healthcare System.

- Area: Information Technologies. German Sorokin, PhD. Currently, he is Associate Professor and Chair of the Electronic Systems and Devices Department at the Technical University of Moldova, Faculty of Engineering and Management in Electronics and Telecommunications, Moldova.

- Area: Information Technologies. Prof. Dr. Alexander A. Ivaniuk. Head of the Computer Science Department, Belarusian State University of Informatics and Radioelectronics, Minsk, Republic of Belarus. He is a well-known researcher in the field of digital system testing. His main publications deal with the testing and diagnosing of different digital systems to ensure a higher level of system quality and reliability. Some of his papers present results for system quality assessment. As the head of the “Informatika” department he is responsible for the quality of the educational service at this department.
Area: Educational Marketing Management. Ryszard Szczebiot, PhD, Ing. Deputy Director of the Institute of Computer Science and Automatics. The State Higher School of Computer Science & Business Administration in Łomża, Poland. Author of didactics materials and computer science lecturer.

Area: Educational Marketing Management. Dr. Ing. Andrzej Chmielewski. Vice-Dekan, responsible for Students and Didactics at the Belostok Technical University, lecturer and Associate Professor in the Faculty of Informatics, Belostok Technical University, Poland.

Area: Marketing. Mr. Fernando Lopez Cisneros. Currently, he is marketing development manager at Dyvi Live SA/NV, Belgium. He has over 40 years of experience in the marketing and market development in the companies like Bosch, Thomson, Grassvalley.

Area: Marketing. Mr. Wolfgang Krueger. He has worked for 48 years at Merck. The main milestones of his career are: 3 years salesman, 6 years Reg. Manager Balkan, 3 years Iran Marketing Director, 5 years UK Sales Manager/Board of Directors, 15 years France PDG – President Director General, 9 years Darmstadt, Germany Vice President Marketing Services + Cosmetic Business.

7.2 Preparation of Interviews

The interview design stage included the following steps:

- Definition of number of interviewees.
- Definition of interviewees’ areas of expertise.
- Number of interviewees from each expertise area.

- Interviewee search and selection.

- Questionnaire design for each expertise area.

The interviewees group was divided into four subgroups depending on the areas of expertise: Kansei Engineering (2 people), Higher Education Marketing Management (3), Information Technologies (3–4), Marketing (2). Prof. Dr. Demidenko from Massey University was interviewed both as an IT and educational marketing management expert, which explains the double number 3–4. The number of experts in each group was defined based on the area’s relevance to the research. There is one exception here, namely the Kansei area. Initially it was decided to include three people in this group. Unfortunately only two of the people asked, Mr. Schuette, PhD and Mr. Lévy, PhD, had responded to the interview request. However, Mr. Schuette and Mr. Lévy are two of the leading specialists in Kansei engineering in Europe and their responses are very important for the qualitative evaluation.

After defining the number of interviewees for each area of expertise the search for the interviewees began. In fact, this was the most complicated part of the qualitative evaluation stage because of the low response rate of experts, which was only about 10%. The search process of the experts was realized via the internet as follows:

- Members of committees thematically related to the research area of scientific conferences.
• Authors of work thematically related to research articles in scientific journals.

• Scientists from related fields working also as lecturers and/or as administrative staff members in educational marketing management.

• Marketing practitioners in the field of marketing management.

The questions were asked as paper-based in the case of interviews in written form or were used as golden thread in the case of face-to-face/Skype interviews.

The main challenge during the questionnaire design stage was to find a balance between the evaluation goals of the interview and an easy and quick to understand/answer format. That is why it was decided to include in the questionnaire only the most important qualitative evaluation questions for the PhD project and to develop clear and not overloaded questionnaires.

As was mentioned above, for each area of expertise a self-evaluation questionnaire that included some questions specific to the area in question was designed. However, the questionnaire structure was the same for all areas.

The questionnaire structure included the following three parts:

• Quantitative measurements in intangible areas.

• Quantitative measurements in the context of the offered research.
• Novelty of the research.

The questionnaire includes six questions divided into these three parts. Every part has some specificity for each area of expertise. Every questionnaire ends with the closing question: “Are there any notes or comments that you would like to add?”

**Kansei engineering area of expertise**

Kansei engineering can be characterized as the umbrella approach for this research, because the research was done fully in its context. That is why it was decided to include specialists from the Kansei society in the experts’ group. For this area an exception was made, because for Kansei engineering measurements in intangible areas are routine and the main aspect of this approach. As this methodology is not widely used in Europe today, the first section was aimed at introducing the relevance of Kansei engineering to the offered research.

The first part of the questionnaire is called “Current application of Kansei engineering” and includes two questions:

• Is a Kansei engineering approach today purely practice oriented or is it also used in the academic domain?

• How often is the Kansei engineering approach used currently for services (rather than products)?
These questions gather information about the experts’ viewpoint on slightly unusual applications of the Kansei engineering approach in the academic domain for the service analysis.

The second part of the questionnaire, namely “Quantitative measurements in the context of the offered research”, is the same as in other questionnaires and contains two questions:

- Is the research topic relevant to the application of Kansei engineering?
- Would you consider the choice of Kansei engineering in the offered research appropriate?

These questions have the goal of substantiating the choice of Kansei engineering methodology as the main methodology in which context the whole research was carried out.

The third part of the questionnaire is dedicated to the novelty of the research and also includes two questions:

- Could the application of Kansei engineering for educational services be characterized as novel? Is it interesting for the development of Kansei engineering?
- In the offered research, semantic differentiation was replaced by the grid technique. How often are the alternatives of semantic differentiation used? Is
the usage of the grid technique novel and valuable for the development of Kansei engineering?

As was stated in the introduction, this research claims also on methodological novelty, because the initial Kansei engineering methodology was developed to fit the research purposes more appropriately. The third section of the questionnaire gathers experts’ opinion on this aspect.

**Information technologies area of expertise**

The offered research was aimed at quantifying intangible categories for their further formal analysis using IT technologies. The expert opinion of the specialists with IT background was included in the qualitative evaluation process. The questionnaire has a standard structure for this research of three sections with two questions in each section.

The first section, “Quantitative measurements in intangible areas”, includes the following questions:

- Would you characterize quantitative research as widely used in such areas as marketing, education and psychology?
- How often are quantitative measurements used today to measure things that have often been considered immeasurable (e.g. emotions or affections)?
The main idea of the research can be formulated in one sentence as “how to measure the immeasurable”. It is expected that the answers to these questions will show the relevance and topicality of this idea.

The second section, “Quantitative measurements in the context of the offered research”, includes the following questions:

- Is the research topic relevant to the application of a methodology and tools for quantitative measurement?
- Would you say that the application of MatLab Statistics Toolbox is appropriate in the context of the offered research?

The questions gather experts’ opinions on the research topic’s relevance to the quantitative measurements in general and to the chosen MatLab Statistics Toolbox instrument in particular.

The third section, “Novelty of the research”, aims to confirm the novelty and includes the following questions:

- Could the offered research be interesting for the development of quantitative measurement approaches in immeasurable contexts?
- Does the offered research have practical and/or academic novelty?

**Educational marketing management area of expertise**

The main user group of the methodology developed in this research is educational marketing managers. Three different abstraction levels of educational marketing
management have been included in this research: philosophical, political and practical. The opinion of the experts in this area is very important in the context of the proposed research. The questionnaire for this expert group was developed in analogue with the previous one.

The first section, “Quantitative measurements in educational management”, includes two questions:

- Do you use any methods/applications for quantitative estimation of students’ feedback? If yes, please give some details. If no, would you say that it was needed? Would you characterize quantitative research as being widely used in such areas as educational management?

- Do you use any methods or applications for quantitative estimation?

It is expected that the answers to these questions provide details about the research topicality and existing demand for such instruments and methodologies as proposed in this research.

The second section, “Quantitative measurements in the context of the offered research”, includes the following two questions:

- Is the research topic relevant to the application of a methodology and tools for quantitative measurement?

- Would you say that the accent on emotional (affective) aspects was appropriate in the context of the offered research?
As in previous interviews the second section was aimed at linking the research topic to the research methodology.

The third section, “Novelty of the research”, also aims to confirm the novelty and includes the following questions:

- Could the offered research be interesting for the development of educational management?
- Does the offered research have practical and/or academic novelty?

**Marketing management area of expertise**

Experts in this group are marketing practitioners with significant working experience in administrative or managerial positions. It is expected that persons with wide experience in practical marketing activity have observed the marketing trends that have occurred in the last few decades. The managerial position of respondents, in its turn, will ensure that these experts can answer from a decision-maker’s point of view.

The first section, “Quantitative measurements”, includes the following two questions:

- Do you use any tools for the quantitative estimation of customers’ feedback in your practice? If yes, how often, what kind and for what purposes?
• Do you have any experience with the quantitative measurement tools in marketing that are used to measure things that have often been considered as immeasurable (e.g. emotions or affections)?

By analogy with other expert areas, it is expected that the answers to these questions provide details about research topicality and existing demand for instruments and methodologies that could be used for quantitative measurements in marketing practice.

The second section, “Emotional context in today’s marketing practice”, includes the following two questions:

• How important is the consideration of the emotional/affective aspects in today’s marketing?
• Is there any practical potential or interest in applying a methodology/tools for the quantitative measurement of emotional or affective aspects?

The answers to these questions should help to substantiate the emotional dimension as a central point in modern marketing. As in previous areas of expertise, the third section, “Novelty of the research”, also aims to confirm the novelty and includes the following questions:

• Could the offered research be interesting for the development of marketing practice?
• Would you say that the offered approach provided a novel concept?
After the questionnaire design stage, a list of the potential experts and interviews was created and sent to them together with a presentation about the research. Experts could get insightful information about the offered concept, its authoring aspects, its novelty and main benefits. The presentation started as a slide presentation with an audio podcast. All the information that was in audio format was also provided in written form as a commentary to each slide. Some requests were not answered, some of the experts gave their answers to the questionnaires in written form (electronic Appendix C) and some experts agreed to give face-to-face/Skype interviews (electronic Appendix D).

7.3 Outcomes of the interviews

This section is dedicated to the outcomes of the interviews. The experts’ answers are presented and discussed here. All main research topics are included in this discussion and highlighted from different points of view.

It was preferable to conduct face-to-face interviews, because they often enable more detailed and personal conversation. However, most experts agreed to a formal written interview format, which also has some advantages, such as, clearer, more formal and more concentrated answers to the questions and greater ease of interview processing and storage. There were eight interviews in written form, one via Skype and one face-to-face. The interview with Mr. Schuette via Skype was recorded using a notebook. This interview was transcribed afterwards (see Appendix “Interviews”). All interviews were conducted in English to avoid translation bias. Interview
abstracts are in square brackets. The expert’s initials are listed first, followed by a colon and then the line number of the quote.

The list of initials is as follows:

- AAI: Alexander A. Ivaniuk.
- ACh: Andrzej Chmielewski.
- FL: Fernando Lopez.
- GS: German Sorokin.
- PL: Pierre Lévy.
- RS: Ryszard Szczebiot.
- SD: Serge Demidenko.
- SS: Simon Schuette.
- VL: Vitaly Levashenko.
- WK: Wolfgang Krueger.

7.3.1 Offered research in the context of Kansei engineering approach

This part is based on the interviews with Mr. Schuette and Mr. Lévy, the leading specialists in Kansei engineering in Europe. The results of the interviews have confirmed some important points for this research:
Relevance of the choice of the Kansei engineering concept as the methodology for the educational services area analysis. There were some similar attempts made by the Kansei research group based at Linköping University to apply Kansei methodology to teaching experience and course presentation in Internet analysis [SS: 25]. The results were not published [SS: 26]. Despite the fact that Kansei engineering was originally offered for tangible products, it is also used sometimes for complex services, such as in health care or education [SS: 35-38]. The appliance of Kansei methodology for complex services is a strong growth area [SS: 39]. So, the offered research is fully in line with Kansei society development. Mr. Lévy also believes this choice is relevant [PL: 38-42, 77]. He argues that “understanding the aspects of education that affect all stakeholders is important to improve education activities and the quality of the educational institution” [PL: 40]. This notion finds confirmation in the everyday activity of Mr. Lévy “as an educator for design students” [PL: 39].

Relevance of the choice of the Kansei engineering concept for academic research. Kansei engineering can be used in different contexts, including academic research; however, it is more rare today in academic research than in industry [SS: 20-25]. Because of the relative rarity of the appliance of Kansei engineering methodology in the academic domain, the offered research is more topical and can provide some new directions for further research. In his turn, Mr. Lévy is quite convinced in his belief when he notes that “there is vast academic research in the field of Kansei engineering” [PL: 8].

Chosen methodology is relevant to the research topic. The choice of the Kansei approach in the context of the offered research was considered by Mr. Schuette
to be an interesting idea and the offered approach was a good approach [SS: 78-80]. He underlines that a lot of work has been done by the Kansei society and it is interesting to see how methods could be modified to fit different purposes [SS: 79]. Mr. Lévy believes it as “worth a try” [PL: 46].

- The Kansei engineering methodology modifications made in the scope of this research are relevant. The Kansei society is growing dynamically; it is quite a new research field with huge scientific and practical potential [SS: 39, 92-94, 97]. New ideas and directions are welcomed. Even the definition of the domains are sought for today [SS: 52]. The Kansei society is not homogenous; there are different parties in it: engineers, designers, artists, etc. [SS: 155-160]. Different backgrounds and opinions exist in different approaches within the Kansei society [SS: 161, 162]. It gives very good opportunities for new ideas and modifications. The fact that the traditional method of Kansei engineering semantic differentiation was replaced in this research by repertory grid technique was noted by Mr. Schuette as having good potential and being interesting in terms of the development of the Kansei society [SS: 121, 122, 127]. Mr. Lévy was quite careful in his comments about the author’s modification (substitution of the semantic differential approach by repertory grid technique), because he considers RGT to be “... very powerful, but needs to be used with delicacy” [PL: 70]. He admits, however, that “if you can manage well an RGT-based research, ... you will find many relevant results for the educational context” [PL: 73,74]. He explains this viewpoint using the following argumentation: “that is because, although education is something massive in all societies, experiences (and paths, and opportunities, and life-
changing encounters) are always very individual and personal. RGT will help you to understand better and explore these valuable experiences” [PL: 77].

- Research idea is novel and interesting for the development of the Kansei society. Kansei engineering was noted as being applicable in the context of the offered research, namely for the analysis of educational services [SS: 77, 86]. The author’s idea to analyse the affective quality of educational services was considered as being a very new direction that can even enable an impact to be made on the development of the Kansei society [SS: 91-93]. Mr. Lévy also thinks that “KE to education can be considered as novel” [PL: 59]. He says: “I do not know much work there has been around this, nothing that has had great impact at least. And yet it is interesting to KE (and even Kansei research in general) because your research might provide a new perspective on Kansei research and Kansei challenges” [PL: 61, 62].

- Research made in the scope of the Kansei approach can be characterized as having additional social value. The main reason for this is the fact that it helps to achieve a deeper emotional state for the same group [SS: 145]. It also helps to satisfy the emotional demands of the people [SS: 133].

7.3.2 Quantitative measurements in intangible areas in general and in educational management in particular

Interviews with experts revealed the following main outcomes concerning this point:
Quantitative research is widely used today in such areas as marketing, education and psychology [AAI: 9-11, 15-17; FL: 8, 9; GS: 8,9; SD: 8, 26, 27; VL: 8-12; WK: 8]. Quantitative research can be seen today as an integral part of humanities as well [GS: 10, 11]. The popularity of quantitative research in marketing can be explained by better immediate customer satisfaction [SD: 8-10]. It is often used for measuring the market [VL: 8-10], consumer opinion regarding products or services [AAI: 9] and the lifestyle of consumers [AAI: 9-10]. Mr. Ivaniuk also gave examples for the child psychology and education sectors [AAI: 13-17]. Quantitative estimation and visualization methods are widely used in modern marketing … almost every day it is necessary to use numbers to plan, analyse, forecast and report [FL: 9, 10]. Mr. Krueger admits that in business we constantly analyse customer satisfaction reports, market analysis documents, different surveys, competition analysis, etc. made in a quantitative form … I am quite sure that education and psychology use it as well … Hong Kong University demonstrates excellent understanding of students’ needs and emotions and offers, besides the educational service itself, a wide range of additional services at the highest level, e.g. housing, food, sport and leisure [WK: 10-14].

Despite the wide popularity of quantitative research in these areas, it is still growing area and has good research potential [AAI: 15-17; ACh: 8, 9; FL: 34, 35; GS: 8, 9; VL: 19-21;]. The availability of new specific methods in daily activity could help, for example, to make the educational process more formalized and predictable [ACh: 10, 11]. It can be stated, even in the case of these three areas, that research in the field of quantitative measurements is highly relevant and in demand [AAI: 15-17]. Due to the continuous development and broad application of information technologies in practice,
the value of quantitative researches is constantly increasing [GS: 9]. Mr. Lopez notes that in his daily activity, in terms of tools only an ordinary SAP is used [FL: 10]; at the same time he admits that tools like this that can save time and other resources have high potential [FL: 38, 39].

- Quantitative research in education is widely used [AAI: 11-12; RS: 10-13; SD: 8]. It is widely used by the vast majority of the world's leading tertiary education institutions [SD: 13-17]; quantitative measurements in education use such indicators as performance, satisfaction of trainees and their parents with the educational process, etc. [AAI: 11-12]. Quantitative research is used in the educational area and this trend is growing [RS: 10-14].

- There is, however, a need for practical instruments that could be used in the everyday routine activity of an educational institution [ACh: 11, 16, 17; RS: 11-13]. Quantitative analysis is not widely used in the day-to-day functioning of educational institutions; the main reason is the lack of appropriate tools and methods that fit the usual activities [ACh: 9, 10]. Mr. Szczebiot also notes that despite the known qualitative methods for assessing the effectiveness of education used, for example by accreditation commissions of the European Union, including, for example, the Polish Accreditation Committee [RS: 23, 24], there is still a need for standard instruments for quantitative measurement that should conform to the policy and standards brought into education by the Bologna Process [RS: 9, 10]

- Quantitative research in intangible areas such as emotions or affections is not widely used today. There is a strong interest in the formalization of intangible areas, however [AAI: 24-28; FL: 34, 35; GS: 52-54; SD: 85-87; VL: 49, 50; WK: 49-51]. Quantitative measurements are not currently widely used in such
domains as human emotions, preferences, affections, attractions, etc. [SD: 85-87]. Mr. Levashenko admits, however, that quantitative research can be used to measure customers’ attitudes, satisfaction, feelings and other data useful for marketing and education [VL: 28-29]. There are some areas where attempts to do so have been carried out with various levels of success: the application of polygraphs; emotion detection based on facial image capture; suspicious behavior detection based on visual information and its interpretation by applying artificial intelligence [SD: 34]; and systems for recognizing human emotions from digital images [AAI: 23-24]. The current evolution of information technologies and their application opportunities makes it possible to apply quantitative methods in almost any area of human knowledge [GS: 19]. Mr. Sorochin even adds: it is possible to say that today essentially non-mathematical disciplines do not exist at all [GS: 21, 22]. Mr. Lopez admits that quantitative measurement tools in marketing that are used to measure immeasurable things exist, but he does not use them in his daily activity and can not give many details on this theme [FL: 16-18]. Mr. Krueger gives examples of the work with affections being done at Merck: “We, at Merck, work with affections, for example by producing colour pigments. Colour scout Filip Roscam analyses all current trends in society, politics, culture, TV events, sport events, films, behavior, weather, etc. to predict customers’ preferences for colours in two or even three years ... In the cosmetics industry we have used it for many years, but, of course, the work with customers’ affections is extremely important not only for the cosmetic industry” [WK: 23-24]. However, he underlines that it is very important for qualitative evaluation in
current research: “Important here is the fact that we use it not in a quantitative, but in a qualitative and analytical form” [WK: 26-27].

- Quantitative research in intangible areas is a growing sector [GS: 20, 21; VL: 20-21]. Mr. Levashenko notes that despite some notions about the emotional connection of consumers with products, a scale to measure the strength of consumers’ emotional attitude to products or services has yet to be devised [VL: 29-31]. Quantitative methods in immeasurable contexts … gained development in the last decades [GS: 20, 21]. Mr. Lopez notes that quantitative measurement of emotional or affective aspects has high potential [FL: 34, 35]. However, while he admits that such a tool should help to save time and resources, only in this case it would be widespread [FL: 36, 37].

- Quantitative research in education was connected by some experts with quality [SD: 13-17; VL: 29-30; WK: 8-15]. Quantitative research in education is used primarily in educational institutions’ ongoing efforts to improve the quality of education [SD: 15]. The application of quantitative research for service quality assessment can be regarded as a novel approach … for educational … service assessment [VL: 20-23]. Mr. Krueger binds quantitative research with marketing positioning goals and refers in this context to Hong Kong University [WK: 10-14].

### 7.3.3 Relevance of the chosen methodology to the research topic

Most of the experts stated that the chosen methodology was relevant to the research topic [AAI: 34, 35; ACh: 26; GS: 28, 29; RS: 33-35, 54-60; SS: 78, 80, 86; VL: 45, 46; WK: 33]. They stated this from different points of view:
Some experts underline the interdisciplinary nature of the methodology [AAI: 37, 38; GS: 58-60; VL: 58-62].

Mr. Chmielevski admits the generic nature of the KanMar methodology and supposes that it could also be used as a generic tool for marketing research [ACh: 27-29].

Mr. Schuette has the closest research experience and commented on the choice of the methodology as being new and interesting for Kansei society development [SS: 92-94, 97].

Mr. Krueger notes that it is relevant and it would be very useful to find out its prospects for being sold as a result of the study [WK: 33-35].

Mr. Demidenko did not directly consider the chosen methodology to be relevant; however, he gave some hints regarding his understanding of relevant methodology: it should be based on large databanks obtained by engaging a significant population as research subjects, and applying statistical data [SD: 48]. This could be interpreted as indirect confirmation of its partial relevance, because in the proposed research a lot of attention was paid to conducting a validation experiment with large sample sets and further statistical result proceedings (see Chapter 6).
7.3.4 Topicality of the KanMar concept

Some experts have especially underlined the topicality of the proposed KanMar concept and its relevance to the trends in their areas [ACh: 17-20; FL: 34, 35, 45; GS: 33-35; RS: 22-24]:

- Mr. Szczebiot underlined the relevance of the research topic to the trend of today’s educational policy in Europe that is characterized by increased attention to interaction with students and at the same time the need for formal reporting and quality control [RS: 32, 33]. A. Chmielevski who represents the same area of expertise – educational marketing management – expressed similar thoughts: educational management needs to react to the needs and interests of the students, and at the same time it is important to represent them numerically [ACh: 43, 44].

- Mr. Schuette admitted that the application of Kansei methodology for such complex services as educational services is a new and rapidly growing area [SS: 39] and the KanMar concept could be interesting for the development of the Kansei society [SS: 97].

- Mathematization of immeasurable contexts is a relatively new phenomenon with huge potential, for example in those areas of science in which the objects of the research are difficult and often not directly measurable objects: in economy, art, linguistics, medicine, education, etc. [GS: 49-52].

- Mr. Lopez admits that the offered research could be interesting for the development of marketing practice: “it would be especially interesting for small and mid-sized companies to try to use such a new methodology, which
would help to make offer for the customer taking in to account emotional aspect … using such approaches could give a competitive advantage” [FL: 51].

7.3.5 Accent on affective aspect

Despite the unusualness of this angle for some experts [ACh: 34; RS: 40], almost all of those who were asked about this aspect expressed an interest and gave positive views on the accent on the affective aspect [ACh: 35-37; FL: 24-28; RS: 41, 42; WK: 43, 44]. The interest in this dimension was explained from different points of view:

- Marketization of education. This is a promising direction because of the growing marketization of higher education [RS: 42, 43].
- It is relevant because of the possibility of gaining a deeper understanding of the processes in educational institutions [ACh: 34-36].
- For Kansei engineering expert Mr. Schuette, the accent on emotional aspects is a routine research activity (see details on his research in section 4.1.2).
- Mr. Lopez believes that taking emotions into consideration in today’s marketing practice is extremely important for survival in today’s business environment [FL: 24, 25]. He even adds that marketing strategies without any emotion management do not work [FL: 25, 26]. His feedback is very close to the ideas described in section 2.2 of this research. He also gives the example of successful giants (Nike, Coca-Cola) who have worked “on an emotional level already for several decades” [FL: 26, 27]. Mr. Lopez also underlines how important it is to find out what drives customers [FL: 27, 28]; this notion is
very close to the author’s reasoning (see Introduction) that underlies the offered research.

- Mr. Krueger finds the accent on the affective dimension “relevant to the current situation in marketing with its trends and needs” [WK: 43, 44].

However, Mr. Demidenko had some doubts concerning the accent on the affective aspect. He argues that in the field of higher education, rational aspects (employability, salary levels upon graduation, physical facilities offered by a particular educational institution, and so on) can play a predominant role in the decision-making of parents and students [SD: 57-60]. It is a strong argument; however, this point was addressed in the proposed research in section 4.2.2.2 by introducing the dual nature of educational services, by the explanation of the difference between emotions and affections in section 4.2.2.1, by the analysis of today’s postmodern consumer in section 2.2.2, by the explanation of the interaction model change from the S-R model to the S-O-R model in section 4.2.1 and also by the definition of the research marketing context made in the Introduction. Mr. Szczebiot, in contrast to Mr. Demidenko, not only believes that the accent on the emotional/affective aspect is interesting and trendy [RS: 40-42], he also admits that consideration of the emotional component is not new for the education sector [RS: 44-48]. There are a lot of disciplines that also study the emotional aspects in education, for example educational psychology and pedagogy … Scientific results from these areas could also be interesting in a management context [RS: 47, 48].
7.3.6 Application of MatLab

All the experts who were asked about the application of MatLab in this research responded positively [AAI: 46-47; GS: 40; SD: 65-67; VL: 66, 67]. MatLab Statistics Toolbox was characterized as well-established and well-regarded software for statistical data processing [SD: 65-67]. The sufficient functionality [AAI: 47-49; GS: 41; VL: 61-64] of MatLab and the opportunity to visualize results with its help [AAI: 48, 49; GS: 42] were also underlined. It has no potential deficiencies in the context of the proposed research [SD: 65-67]. Based on the Statistics Toolbox™ further investigations are possible in the context of the offered research [VL: 67, 68].

7.3.7 Research novelty

Experts expressed positive views concerning the presence of both practical and academic novelty in the proposed research [AAI: 64; ACh: 44-46; FL: 57, 58; GS: 58-62; RS: 64-68; SD: 74-77, 85-87, 91-94, 99; VL: 90; WK: 56-59]:

- Many admitted its practical value and good potential for application in different areas: if successful, the proposed research will certainly have practical value and a variety of applications [SD: 91-93]; practical tools could be created [ACh: 53, 54]; practical novelty could be interesting for higher education institution management, administration and design using Kansei methodology [GS: 60-62]; conducted versatile data analysis showed the consistency of the proposed methodology in practice [AAI: 67, 68]; application of the [KanMar] methodology … for the purpose of service quality assessment has sufficient
practical impact and can be applied not only for higher educational service quality assessments [VL: 102-104]. Mr. Lopez also underlines that small companies need to use their limited resources effectively to move their product to the market, starting from the product idea, which is why the information acquired using the described KanMar approach could be useful both for product development and marketing strategy improvement [FL: 50]. Mr. Lopez believes the practical novelty of this research is “definitely present” [FL: 34] and tools are described in the author’s presentation as “modern and long-awaited” [FL: 64, 65]. Mr. Krueger considers the quantitative angle in the offered context to be novel [WK: 59]. He explains his opinion as follows: “it has practical novelty due to the fact that it tries to measure intangible things and analyse the affective dimension in quantitative form ... on the one hand, today’s marketing works with affections and emotions actively; on the other, this work is usually limited by qualitative or analytical approaches” [WK: 58, 59].

- Another common point for many experts underlies the transdisciplinary nature of the research in the context of its novelty: first of all this concerns Kansei engineering, which has been used for the purpose of assessing the quality of higher educational services [VL: 90-92]; the proposed research is rather novel, particularly since it intersects with several research subject fields [SD: 103-106]; this work demonstrates a novel approach based on Kansei engineering applied for educational marketing management, which could be interesting from the methodological point of view [ACh: 52]; the declared combination of disciplines reflects the high scientific potential of this research [RS: 65].
• Academic novelty was also admitted: this work presents academic novelty in such areas as quantitative measurements in immeasurable contexts, Kansei engineering methodology application and development, marketing and educational marketing [GS: 59-60]; academic novelty is undoubtedly present [AAI: 64]; the main result of this research is the proposed methodology for measuring the quality of educational services based on the use of a Likert scale, expert RGT elements and structures [AAI: 65-67]; achievement of the digitizing of emotional aspects could be very interesting from the academic point of view [ACH: 53].

• The application of the repertory grid technique was considered novel [PL: 73, 74; SS: 121, 122; VL: 92-96].

• Some other points were noted in the context of the research novelty: the accent on the emotional aspect, consideration of the Kansei engineering approach, the attempt to address today’s European educational policy, the attempt to formalize informal components [RS: 68]

7.3.8 Author’s contribution

The author’s contribution was considered in interviews in four dimensions:

• The author’s contribution in the context of educational management [ACH: 50-54; RS: 54, 55, 59, 60]. The results of the offered research seem to be useful in different educational settings, testing organizations, government or consulting areas [RS: 54, 55]; the presented approach could help in different tasks, for
example in the evaluation of educational achievement, programme planning or survey implementation [RS: 55-57].

- Measuring intangible things [AAI: 22-28; ACh: 44, 45; GS: 20-21; SD: 85-87; VL: 80-81; WK: 56, 57]. The results of the present research should be of interest to professionals working in the field of quantitative measurement of the unmeasurable [AAI: 55, 56]; any new and valid scientific results in this area will provide interest for the development of quantitative measurements in non-measurable contexts [GS: 53-54]; the proposed research is very interesting for developing quantitative measurement approaches in immeasurable contexts [VL: 80-81]; the results of this work could potentially give the formalization of … intangible objects … that is why I think it can be interesting [ACh: 46]; any objective results of the measurement and interpretation of behavior and emotional substances that have been previously considered as immeasurable would be of great value and interest [SD: 85-87]. Mr. Krueger considers the author’s concept to be an interesting and promising attempt for marketing theory to develop an approach that could help to transform collected data from intangible fields into a measurable form (e.g. into a set of indicators) [WK: 50-51].

- Appliance of the proposed methodology in other fields [AAI: 56-58; SD: 103-106; VL: 84-86, 104]. The results obtained for the measurement of the quality of educational services can be applied in other areas, such as marketing and psychology [AAI: 57, 58]; with some modifications concerning the constructs and elements of the repertory grid technique (RGT) the proposed research can be applied for quality assessment of the health-care service [VL: 21-23]; the results of the proposed research would be of value and interest to specialists in
the marketing of a variety of product groups and services, including marketing of higher education … I would see its value in application to the international higher education export market … Another field that could potentially benefit from the research results is the area of international education provider branding [SD: 94].

- The author’s contribution in the context of the Kansei society can be summarized as follows: the object and subject of the research are new for the Kansei methodology [SS: 92]; elaboration of services, not products’ affective quality analysis [SS: 39]; the Kansei methodology modification made in the offered research is new and interesting for the development of Kansei engineering [SS: 92, 94, 121, 122].

- Author’s contribution regarding new opportunities for small and mid-size companies. Mr. Lopez underlines that despite the attention to the emotional aspects in marketing in recent decades, emotional marketing and neuromarketing were available only for companies with large budgets [FL: 45-49]. The offered research brings them closer to small and mid-size companies with limited resources [FL: 45-49].

7.3.9 Others

The interviews also revealed some thoughts that could not be included in the previous sections. In this section these thoughts will be presented and discussed:

- Some experts expressed thoughts about wider approbation of the offered methodology [AAI: 72-74; SD: 46-49]. For example, direct expression of
approbation of the research methodology in other universities [AAI: 72-74], or indirect expression of the need for large databanks obtained by engaging a significant population as research subjects [SD: 47, 48]. These notions make sense; however, the wider approbation of the proposed methodology was limited by a range of objective factors: a) increasing researchers’, industries’, etc. interest in statistical data gathering has resulted in today’s strong personal data security policies, and it was difficult to get permission for data gathering even at alma mater – Darmstadt University of Applied Sciences, and then only from one faculty; b) another result of the increasing number of different university questionnaires and surveys is the fact that students perceive them as spam and the answer rate is very low; c) researchers are now also limited by the ethical committee. Quantitative investigation is impossible today without the permission of this committee. Limitations of formal restriction, communication, respondents’ rejection and time-prohibit the respondent population from being expanded in the proposed research.

- It is necessary to understand that practical application of the offered approach depends on how user-friendly it is when formalized [FL: 35, 36; GS: 62-64]. This notion seems to be correct. The application mode of the offered methodology was separately presented in Chapter 5, section 5.4, both in text and graphically. During the work on this section special attention was paid to short, simple and clear formulations.

- It would also be interesting to see and compare the research results for different socio-economic groups and for different geographical/anthropological populations [SD: 103-106]. Of course, the research angles proposed by Mr. Demidenko are very interesting and the KanMar methodology could be used
for such an investigation. However, it seems to be impossible to include these aspects in the offered research because of the ethical, formal restriction, communication, respondents’ rejection and time limitations explained above.

- I see an unusual combination of disciplines in this work. [ACH: 58] However, it would be very interesting to try a tool that will use Kansei engineering in processing students’ feedback … I am curious if it can lead to non-obvious results [ACH: 18, 19]. This is a very valuable comment, because one of the author’s goals was to find mostly uninvestigated and new research angles that at the same time are fully in line with today’s social, practical and scientific trends.

- Almost all known approaches and techniques for quality measurement are based on the SERVQUAL methodology … the conceptual bases of SERVQUAL are still under consideration and discussion [VL: 38-39]. There is a need for such an instrument. However, it should conform to the policy and standards brought into education by the Bologna Process [RS: 9, 10, 21, 22]. These two different comments have the same significant value for the author of the KanMar: they have highlighted points that are very important in the offered context in the author’s opinion that have found proper consideration in this research (see section 2.4).

7.4 Summary

This chapter presents the qualitative evaluation made by experts in the main areas included in this trans-disciplinary research. The main reasons for this evaluation, as
well as its benefits, were presented at the beginning of this chapter, after which was provided a complete list of the experts with details on their research areas.

The preparation stage was described in detail in the second section of this chapter. The third, conclusive section is the main part of this chapter; it provides the outcomes of the expert interviews. The interview outcomes can be considered generally to be positive, constructive and valuable.

The main results of this section can be summarized as follows:

- The choice of methodology and tools used in the proposed research was thought to be appropriate and relevant to the research topic.
- The umbrella methodology – Kansei engineering – was considered interesting, trendy and applicable in the context of the offered research.
- The research context itself, namely educational marketing management and the attempt to measure intangible categories, was considered interesting and as having research potential.
- Some experts have especially underlined the topicality of the KanMar approach and its relevance to the trends in their areas.
- Experts were positive about the presence of novelty in the proposed research, and different dimensions of this novelty were underlined: academic, practical and methodological.
- The author’s contribution was also greeted with positive comments about its different dimensions: in the scope of Kansei engineering, educational
marketing management, the measurement of intangible things and in other fields.

The last point of the third section discusses other comments made by the experts that were not included in other sections.
Chapter 8 Conclusions

8.1 KanMar approach in the scope of today’s conditions

The offered research investigates how to measure things that have often been considered “immeasurable”. An integrative approach to measuring intangibles is offered, along with adapted and developed methods for particular tasks. The study takes place in a marketing context and concentrates on the phenomenon of educational marketing and its central problem, which was defined as follows: how to introduce the educational service as a set of attributes that are clear, attractive and important for the customer. The concept of affective quality came to the fore. Affective quality is, in fact, an intangible category that cannot be measured directly.

Offered study presents the author’s analysis of current processes in society and gives reasons for the offered problem statement. The chosen theme is substantiated in several aspects: social-philosophical; managerial economics; level of political initiatives and trends in the evolution of higher education. In terms of substantiation among the listed aspects the dissertation addresses both the theoretical and practical dimensions of the offered problem area.

The dissertation begins with the assertion that the educational sector reflects the current conditions in society. This assertion is corroborated in the second Chapter, which associates the appearance of the phenomenon of educational marketing with a
corresponding social-philosophical paradigm in society. The phenomenon of postmodernism is presented. The given interpretation of postmodernism justifies the KanMar approach and chosen methodology by providing the main conditions that influence the current society and the scientific area as well. These conditions establish a linkage between all parts of the dissertation and chosen methodology. In this way the increased attention to the customer’s role in designing the product or service, accepted in the offered dissertation, can be referred to the reversal of production and consumption and logically causes a further choice of methodology. So, Kansei approach addresses the problem of integrating into products or services the customer’s beliefs about them. The application of repertory grid technique enables the indirect extraction of customers’ opinion about the educational service. Such conditions as fragmentation and juxtaposition of opposites anticipate the differential approach to the educational service as it is divided into several elements that could be changed or corrected at any time. Moreover, the system offered in Chapter 5 enabling the application of the Kansei approach in higher educational institutions covered different interested parties and has a flexible structure that could be adapted to concrete tasks. The system is based on different fragments united by a common goal rather than a fixed single construction. The next condition, decentring of the subject, supposes that individuality is historically and culturally constructed. This point was addressed by the implementation of repertory grid technique, which is based on the same proposition and was used in the offered dissertation for personal construct analysis. Finally, the condition of hyper reality is reflected in this research by the use of statistical methods for the purpose of data analysis and prognosis. Based on computer simulation, hyper reality provides opportunities for the analysis of intangible objects, as was demonstrated in this dissertation.
Postmodern conditions also influence the scientific area. Among the mentioned computer simulation the following signs refer to this influence: trans-disciplinary approach and reorientation of the science from the subject to the problem. Indeed, the offered dissertation represents a trans-disciplinary research involving marketing management, and psychological and mathematical methods and techniques. The starting point of this research is a revealed problem area in educational marketing. All further research was driven by this problem. Thus, the postmodern conditions not only substantiate the chosen structure, theme and methodology, but also anticipate the appearance of such problem-oriented trans-disciplinary researches as offered.

The adoption of TQM philosophy and methodology in the context of higher education can be seen as a logical and consistent phase of the educational sector’s evolution. The definition of TQM philosophy adopted in this dissertation has much in common with marketing philosophy. So, the questions of continuous improvement and meeting customers’ needs and wants are also addressed. TQM philosophy is closely related to today’s educational sector through the ISO quality standards 9001:2000, stated by the Bologna Process as a basis for the quality principles for higher education. The offered research considers these conditions by addressing the key points of the ISO 9001:2000 standards, provided in section 2.2.2.

So, the offered integrated approach aimed at measuring customers’ feedback includes the following key points:

- Customers’ perception of performance is accentuated.
• Customers’ needs and wants are considered.
• The need for continual improvement is emphasized.
• The approach to decision-making is based on statistical data analysis.

As an answer to the previously mentioned postmodern conditions and quality standard requirements, some approaches exist that address the problem of quality measurement in the educational sector. For example, the SERVQUAL and its more complicated modifications, considered in Chapter 3, have been recognized as new service quality measurement instruments. Some conceptual problems and problem areas of existing service quality measuring instruments were presented in section 3.9 of the offered thesis. Based on the limitations outlined in section 3.9, new directions for future studies were defined and points for further particular consideration were chosen (see next section).

8.2 Differentiation among other measurement tools in higher education

KanMar approach enables to overcome some important limitations of other tools that are popular today (considered in Chapter 3):
• For the different customer groups CMoS supposes differentiated approaches, and questionnaires. At the same time students are considered as the primary customers.
• More consistent substantiation of the criteria for educational service quality measurement was provided.
• The concept of the quality that should be measured was appropriately considered and has a monosemantic definition. This helps to avoid uncertainty of the measured concept and problems of results interpretation.

• The measurement methodology reflects the specificity of the higher education sector.

• Both academic and non-academic aspects are admitted.

• This new measurement scale incorporates the marketing principle, which suggests that corporate strategy should flow from consumer needs.

• Measurement items do not only include positively worded statements.

8.3 Achievements

The main outcome of the offered research is the fact that a fundamental contradiction underlying the offered research was resolved, namely the contradiction between the need for quantitative measurement and analysis in educational marketing and the presence of intangible categories and a large number of subjects in them. This research offered a KanMar approach to measuring things often considered immeasurable in the context of higher education. The author’s solution KanMar to the research problem of the quantitative measurement of educational services’ affective quality has been offered.

This is a significant contribution to the solving of the central educational marketing problem, namely how to introduce educational services as a set of clear, attractive
and important attributes for the customer; because KanMar enables the formalization of the affective quality of educational services for its further marketing analysis: comparison, prediction, control, etc. The results of such an analysis help to position their own services in the market more effectively.

Regarding the research hypothesis, this has been partially confirmed. The hypothesis was formulated as follows: availability of a methodology for quantitative estimation of the affective quality of educational services provides additional important information that ensures an effective decision-making process in the marketing department in higher education institutions. On the one hand, interviewed experts in educational management admitted the existing need for such an approach as offered and expressed their interest to it; experimental validation showed promising results. On the other hand, some limitations (see section 8.4) mean that the hypothesis cannot be fully confirmed.

The main task of this research (as was formulated in the Introduction) is to develop a methodology for quantitative measurement of the affective quality of educational services. During the research investigation all research objectives that were formulated in accordance with the main task and research hypothesis were solved. So:

- The economical, philosophical and political background for the offered methodology was provided.
- The processes in marketing, education and quality areas that cause and influence the KanMar methodology were revealed.
• The concept of quality in the educational sector was analysed and its affective dimension was substantiated.

• The current higher education measurement tools were analysed. Their limitations were defined.

• A conceptual framework of KanMar methodology that overcomes the limitations of existing higher education measurement tools was created.

• The methodological foundation for KanMar approach was substantiated.

• A methodology for the gathering of information about customers’ attitude to the educational service was created.

• A pilot survey illustrating the validity of the methodology was provided.

• The results were discussed.

• The potential of KanMar methodology for optimization and further development was defined.

To the research novelties could be adduced:

• Implementation and author’s interpretation of Kansei engineering approach for the service sector.

• Implementation and author’s interpretation of Kansei engineering approach for the higher education sector.

• Implementation and author’s interpretation of repertory grid technique (a part of personal construct theory) in the context of Kansei engineering.

• Elaboration of the affective dimension of the quality in the educational sector.
• Development of the author’s model of affective quality of the educational service.

• Development and substantiation of a new improved criteria set for the estimation of educational services.

• Development of the KanMar methodology allowing quantitative estimation of the affective quality of educational services.

• Development of the integrative theoretical approach KanMar aimed at marketing analysis of customers’ response to offered services.

Thus, the novelty of the offered research includes all three dimensions of research novelty:

Theoretical novelty:

• New research problem, new research task, new subject matter and matter of research are offered.

• New criteria set for educational services education estimation is substantiated.

• Author’s model of affective quality is elaborated.

• New theoretical generalizations are made.
Methodological novelty:

- New application mode and author’s interpretation of known methods and approaches are provided.
- KanMar methodology is developed.

Practical novelty:

- New statistical results are received and commented on.
- KanMar approach aimed at marketing analysis of customers’ response is offered.
- Recommendations for the practical implementation of the KanMar approach are made.

Summarizing the overview of the research achievements, the following benefits of the KanMar approach for both theorists and practitioners can be specified:

- Possibility of implementing an innovative methodology based on latest marketing trends focused on emotional dimensions and new Kansei engineering approach.
- Using the benefits of quantitative analysis in such an intangible area as affective quality.
- Improvement of marketing activities through permanent feedback analysis.
• Improvement of stakeholders’ satisfaction through a focused reaction based on statistical data.

• Opportunity to develop their own quality policy in line with today’s societal and political demands.

• More success in institutional mission.

8.4 Limitations and scope for further research

The following limitations of this research are worth mentioning:

• A survey at the Informatics Department of the Darmstadt University of Applied Science was carried out with a statistically significant response rate, but it is not enough to generalize the results.

• The experimental investigations of KanMar methodology were carried out based on only one group of stakeholders. Other domains of stakeholders may evaluate the same service quality differently.

• The study can be extended to a large sample with emphasis on the weights of each construct of the resulting grid and the relative importance of elements.

• Benchmarking of higher educational institutions can be extended to not only technical universities, which will lead to redesigning the KanMar methodology and corresponding tolls for evaluating educational services.
As with any research concerning the issue of quality in service, it is necessary to extend the consideration of the limitations of the study. Some of these are where further research is required to be carried out to tackle the limitations of the KanMar.

The following further research directions can be proposed:

- A large number of samples (surveys) from different stakeholder domains may be collected to provide a better understanding of the elements and corresponding constructs to represent the service quality more adequately and precisely.

- Applying the same KanMar methodologies effectively in other sectors such as health care, tourism, hotels and restaurants, banks and financial institutions, transportation facilities, repair and maintenance shops and information services may extend this research.

- Further data analysis steps are required to gain a more precise picture of the service quality at higher education institutions and today’s data mining technologies should be applied.
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## List of Publications


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29 A.V. Shevchenko is a russian version of the name H.V. Shauchenka

List of electronic Appendicies

Electronic Appendix A:

1. Ethical approval
2. List of participants
3. Drafts of feedback

Electronic Appendix B:

1. EvaSys evaluation report
2. Table of results

Electronic Appendix C:

1. E-mail responses
2. Scans of interviews

Electronic Appendix D:

Skype Interview with Mr. S. Schuette
Appendix – Interviews

Part 1 – Mr. Simon Schuette, PhD.

Initials: Simon Schuette: SS, Hanna Shauchenka: HS

HS: I would like to start with the first block of my questions “Current application of Kansei Engineering”. My first question is: “Is a Kansei Engineering approach today purely practice oriented or is it also used in the academic domain?” May be in similar with my researchs or in science? Is it scientific method?

SS: Well … Look, term of Kansei Engineering was originally … in 1970s. It was a psychology Professor Mitsuo Nagamachi, you may be aware. It has been a lot of things having been added. So, today it is society on Kansei research. Not necessary on Kansei Engineering research only. The word, the expression of “kansei” is used in several meanings, in several contexts and so on. If we go back to what originally was Kansei Engineering, it was mostly how to get feelings of the product, how to quantify feelings in some way. For this there are not many new methods, originally at least. It was a collection of known methods something like semantic space or semantic differential theory of Osgood or some of psychological validating methods how to measure feelings and impressions in some way. In the recent years we can see that new methods being added. In 2004 couple of colleges and mine came up with the model of Kansei, were we could identify areas which had to be enhanced with
new methods. Back to your question. Is it purely for industry or it could be used in academic? Well, we use it a lot in the academical research. We use it a lot even in service products. Something like teaching experience or the presentation of our courses in the internet. Yes, it can be used in different contexts. However, more rare.

HS: The next question is: How often is the Kansei Engineering approach used at the moment for the services (rather than products)?

SS: In number? I can't give you a number, sorry. The original idea was to use Kansei Engineering for tangible products. But what you can see that last may be ten years or so more and more products become combination of services and tangible products. For example mobile telephone. It is always my example tat I give to the students. Buy mobile telephone is useless without contract, provider, services around. Of course, Kansei Engineering is heavily used in services nowadays. That is also a division in Kansei Research which is focusing purely on pure services. I don't mean haircutting, but for example postal services or health care and so on. More complex services, I mean. Of course, it is used. I can't give you a figure how much it is, but from my personal feeling I can say that it is a growing area. Strongly growing area.

HS: What do you think is poorly understood in this area or unresolved? Are there any conflicts or directions that are not quite good developed for the moment.
SS: Yes, there are a lot of blank fields. This area is relative new. I mean it is 40 years old what is quiet new for the research field. There are a lot of blanks in it. I am not sure that you are aware of the Kansei Engineering Model which we proposed?

HS: Yes, I have used it in my research.

SS: Good. Than you can see space of application something which is not really much have been done there. The research is on its way now, but it takes some time before it results in validated methods. The definition of the domains is often. It is difficult to do. If you have a look on traditional marketing you will find that they can't identify people and products. But in Kansei for example we work with electrolux vacuum cleaners. They wanted to found out what and what they already knew was that vacuum cleaner is not a vacuum cleaner. You have a low range and high range. And people buying low staff are very different and give very different expertations on the product. Product doing the same thing, vacuum cleaner actually clean your flour. But it's a very different products. The needs and requests from the customers are very different in that area. So, some research here has to be done. If you put mathematics methods it is most strongly growing area. You can find that a lot of people make statistical and mathematical research trying to find new methods. What we have doing initially was linear approximation models. We knew from the beginning that such model are not 100% accurate but they gave us a hint how product should look like. Now you have rush model, you have different types of adaptive linear regression analysis So, there is still a lot of work to do before we can say: “well, we get something and can move to the other area”.
HS: Te next section is: Quantitative measurement in the context of offered research. Could you estimate the choice of Kansei Engineering in offered research as appropriate? … I mean in the area of the educational services, measurement of affective quality. You are familiar with my goals with the context of my research?

SS: Yes.

HS: Could you estimate it as appropriate?

SS: I do think it's applicable. If it appropriate … Appropriate is some in afterwards. I mean I can't really tell you how will it work … I do think it's a good idea. You probably see that you have to modify a lot of the methods to fit your purposes. Anyway, I think it's a good approach.

HS: Is the research topic relevant to the application of Kansei Engineering? I mean Kansei Engineering is applicable in the service area and is applicable in academic domain.

SS: Yes, it is applicable.
HS: To the novelty some words. Could the application of Kansei Engineering for educational services be characterized as a novel?

SS: ... How long is it novel ... We have done that somewhere, there are few publications. Anyway, it is very new, that is for sure. You could probably make impact, put your name on a map focusing and publishing in that area. We have however done a couple of experiments about our students' experience, our courses. We have not published it. If you would be interested in writing the paper. I am absolutely ready to cooperate with you. ... You can make yourself known by becoming an expert in this area. But don't put all the eggs in this bucket. Have it as one of your areas. It's up to you how you use it.

HS: Ok... In my research the Semantic Differentiation was replaced by the Grid Technique. How often are the alternatives of Semantic Differentiation used?

SS: It is something where I can't give you a figure. But it's one of the most stable methods which have been used. It was one of the oldest methods to bring the feelings in a quantitative form. That is why it is frequently used. There is, however couple of more [methods]. I mean the method was developed in 1940s. It is old. If you have a look in a psychological research you see that this method is not a state of the art any more. May be it's surprising. But it's a very useful method for kansei engineering. There are a lot of concerns, [f.e.] you can think about the validity of robustness. You collect ordinary data put it to the method which officially not used for ordinary data.
You have the scales (5 point scales), you put it into the scale and say factor analysis is required. It is in some way mathematically questions sometimes. On the other hand it gives the results in a quite good manner. That's why we using it. In most cases when I am at the conference say that I use semantic differentials I get always the first question: is it a valid method? It's not, but it works well. You have to be aware where are the limitations of this method.

HS: Ok. Is usage of the Grid Technique novel and value for the Kansei Engineering development?

SS: Yes. Yes, I do think so. I am not sure if you get better results, but the fact has a potential.

HS: May be I can present it in some publications, my results and my methodology. So, it's interesting for the development?

SS: Yes.

HS: … Could be the research made in the scope of kansei engineering be interpreted as having additional societal value? Because it's targets on study of customers expectations and moods.
SS: Yes, absolutely. If you can satisfy emotional demands, as well, I do think people do feel better. For example we had worked in health care. We have studied the waiting room design, for example, reducing anxiety. I don't want to make it too big, but if you have less pressure and so refraining going to doctor, of course it is other aspect. We had another test about acceptance of “Bayer Power”. There are a lot of wind power plants in Sweden. It was a question how do people accept them. Probably somewhere in countryside you want to have calm and suddenly big thing pop up, but they would like to have them outside. This is something that we can evaluate. I don't think that this method can help in developing, improving or saving the world. But it is more certainly method that you can use to improve society. What we definitely get is information how customer think about products or about services and this reflects some picture of the society which people give you being not aware of it. You get a deeper inside on emotion state of the sample group.

HS: Are there any conflicts among those who work in this area? I mean conflicts in approaches, may be interpretations or directions of the development? Develops this society without any conflicts?

SS: There are always conflicts. If there are not I'll be very-very … because if everybody agree with others there is no development. I don't think conflicts in turn that people fighting with each other.
We have fractions. I am doing Kansei Engineering, which is more product development. We have psychological approaches, we have artists in our society. Of course, there are different approaches. One of the most common which I mean in everyday use is designers here. They have different approach on situation making intuitive product designs. While we break it down into small-small molecules and tell them it should be that color and that form and so on. They really hate it strongly … probably they do not like it. So different approaches in this area of course. It's about different backgrounds and different opinions. We are learning from each other.

HS: Could you describe your professional experience. I mean how did you find it, because in English you are the first person to contact to speak about Kansei Engineering. So, how did you find this area?

SS: I was test engineer, so my task was to take care about e-box which came back to the company from the field from real tracks. They were not working, but many of them was actually working. But what you could find out is that force to shift between first and second gear was different, very different sometimes. In order how people experience too heavy force. It was not just technical force, but the feel that they did it right. I came to the contact with one Professor in Kure University. I wrote a lot of papers with him. He had contact to Prof. Nagamachi and said that may be Kansei Engineering could help there. So, I moved and started to do research on that. I didn't continue works on gear box. Then was the study with big track industry, with Toyota. They wanted to improve drivers feelings. To introduce good drivers feelings
into the big tracks. Finding this concept was the very first thing we have to do. Since then I've being in this area.

HS: As I understood in Asia, in Japan, Korea, Kansei Engineering is much better developed. I mean literature, examples, much more information as in English.

SS: Yes. That's for sure. ... “Kansei Engineering Internationa” is a journal that we have quarterly. There are more publications in Japanese. But there some in English. Japanese Society of Kansei Engineering is publishing this magazine. It's not complete, because if they write in English, it's very rare. We have also a Kure conference here. It's a biggest conference in area of Kansei. We have probably about at least two hundred people. Something around those.

HS: The center of the Kansei Engineering in Europe is Sweden, your University as I've understood?

SS: We are the first one. There are more Universities, of course. We are working a lot with other Universities, for example in mechanical engineering, tactile experiences. We working together with Barcelona, we have a very strong fraction in Paris [...] It's probably the biggest institutions which I work together. There are also groups in Germany, in Italy. There are a lot of the people working in this area.
HS: It were my questions for my qualitative evaluation and I stop to record our conversation at this moment [6:16]
Part 2 – Mr. Wolfgang Krueger.

I. Quantitative measurements in marketing

15. Could you characterize quantitative research as widely used in such areas as marketing, education, psychology?

Of course, quantitative research is used in these areas. So, f.e. in business we analyze constantly customer satisfaction reports, market analysis documents, different surveys, competition analysis, etc. made in quantitative form. I am quite sure that education and psychology use it as well. So, Hong Kong University demonstrates the excellent understanding students' needs and motions and offers besides the educational service itself a wide range of additional services on the highest level, f.e. housing, food, sport and leisure organization. Thanks to the attention to the students' comfortable feeling, it is one of the best universities of the world for today.

16. How often quantitative measurements are used in today's marketing to measure things that often have considered as immeasurable (f.e. emotions, attitudes or affections)?

We, on Merck, work with affections f.e. by producing color pigments. Colorscout Filip Roscam analyzes all current trends in society, politics, culture, TV-events, sport events, films, behavior, weather, etc. to predict customers' preferences in colors in two or even three years. In cosmetics industry we use it many years, but, of course, the work with customers' affections is extremely important not only for the cosmetic industry. So, automobile industry, clothing, food industry and others use affective dimension actively.
Important here is the fact, that we use it not in quantitative, but in qualitative and analytical form.

II. Quantitative measurements in the context of offered research

17. Is the research topic relevant to the application of some methodology and tools for quantitative measurement?

It is relevant. It could be very useful to find out the prospects to sell as results of study. These prospects could be found out via surveys in quantitative form. It is possible to translate the prospects to the customer with the help of promises build in educational services' market positioning. In this context the “all inclusive” or “cocooning” concepts are of special interest. As it was mentioned above, very good example of such strategies is a Hong Kong University with it's “all inclusive” offer.

4. Could you estimate the accent on emotional (affective) aspects as appropriate in the context of offered research?

Yes, I find this accent relevant to the current situation in marketing with it's trends and needs. It is always important to measure.

III. Novelty of research

5. Could the offered research be interesting for the development of marketing theory?
Yes, it is an interesting and promising attempt for the marketing theory to develop the approach that could help to transform collected data from intangible field into the measurable form (f.e. into the set of indicators). However, such an approach should have a practical orientation. It should be directed to the concrete target: To solve the problem.

6. Does the offered research have practical and/or academic novelty?

Evidently, it has practical novelty due to the fact that it tries to measure intangibles things and analyze affective dimension in quantitative form. From one side today's marketing works with affections and emotions actively, from the other this work is usually limited by qualitative or analytical approaches. Quantitative angle in offered context is novel.

Are there any notes or comments that you would like to add?

No, it is fine.
Part 3 – Mr. Serge Demidenko, Prof. Dr.

I. Quantitative measurements in intangible areas

18. Could you characterize quantitative research as widely used in such areas as marketing, education, psychology?

I have come across the use of quantity research methods and tools in marketing area. Since the recent decade it has been gaining wider popularity and popularity. I suspect its attractiveness is based on better immediate customer satisfaction: in addition to some (often sensible) marketing findings, it also creates the perception of an objective foundation of the declared marketing research results.

Application of quantitative research in education has been around for quite a long time already and form my point of view it is used widely by the absolute majority of world’s leading tertiary education institutions primarily in their on-going efforts to monitor and improve quality of education: teaching performance, student satisfaction level, program and course composition and assessments, workload and so on.

Unfortunately I am not in a position to comment on the quantitative research application in the field of psychology as it is well outside the sphere of my professional and personal activities and interests.

19. How often quantitative measurements are used today to measure things that often
have considered as immeasurable (i.e., emotions or affections)?

I do not think quantitative measurements are used at present any widely in such domains as human emotions, preferences, affections, attractions, etc.

There are some areas where attempts to do so have been carried out with various levels of success to employ technology for detecting and measuring behavior of emotional factors associated with a human being (for example, application of a polygraph in suspects interrogation or personnel screening; emotion detection based on facial image capture, processing and recognition; suspicious behavior detection based on visual information and its interpretation by applying artificial intelligence, and so on). However, these are quite narrowly focused fields where very specific systems and tools are employed.

II. Quantitative measurements in the context of offered research

20. Is the research topic relevant to the application of some methodology and tools for quantitative measurement?

Obviously any objective research associated with quantitative measurements is to be based on credible methodology and application of relevant tools. The key problem is to choose right and effective methodologies and tools that enabling to support or otherwise proposed hypnotizes. Since the proposed research is associated with evaluation of some factors that are rather subjective to an individual person, the need
of large data banks obtained through engaging of significant population as research subjects, and application of statistical data processing (leading to some inevitable result reliability concerns) are unavoidable.

21. Could you estimate the accent on emotional (affective) aspects as appropriate in the context of offered research?

Not really. Emotional aspects are obviously important in making a decision in the field of education. Yet, higher education marketing is quite different from marketing in the other areas, e.g., consumer goods or holidays where affection could dominate decision making. In the field of higher education, rational aspects (employability, salary levels upon graduation, physical facilities offered by a particular educational institutions, and so on), could play predominant role in making decisions by parents and students.

22. Could you estimate the application of Matlab Statistics Toolbox as appropriate in the context of offered research?

MatLab Statistics Toolbox is well-established and well-regarded software for statistical data processing. I do not see any potential deficiency of its application in the context of the proposed research.

III. Novelty of research
23. Could the offered research be interesting for a) the development of quantitative measurement approaches in immeasurable contexts and b) for the development of educational management?

I suppose results of the proposed research would be of value and interest to specialists in marketing of variety of product groups and services, including marketing of higher education that could be loosely considered as a kind of social or commercial services.

From the practicing educator’s point of view, the proposed research can have both positive and negative values. For example, its results might lead to the development of some sort of attraction rankings of higher learning institutions, which can be beneficial to some institutions and detrimental to others, while its objectiveness and value could be questioned.

In a wider research sense any objective results of measurement and interpretation of behavior and emotional substances that have been previously considered as immeasurable, would be of great value and interest.

24. Does the offered research have practical and/or academic novelty?

… the proposed research will certainly have practical value and variety of applications. For example, I would see its value in application to international higher
education export market. Another field that could potentially benefit of the research results is in the area of international education provider branding.

It is hard for me to judge the academic novelty of the proposed research as the area of my personal research specialization is somewhat outside the scope of the marketing field. Yet, to the best of my knowledge, the proposed research is rather novel, in particular since it is in the intersection of several research subject fields.

Are there any notes or comments that you would like to add?

It would be interesting to see the outcomes of the research once it is complete. It would be interesting also to see and compare the research results for different socio-economical groups and as well as for different geographical/anthropological populations.
I. Current application of Kansei Engineering

1. Is a Kansei Engineering approach today purely practice oriented or is it also used in the academic domain?

There is a vast academic research in the field of Kansei Engineering. The first models were actually developed for industrial purposes, yet from an academic perspective. From the purely Kansei Engineering perspective, it would be interesting to see the new models being developed. Also, you can have look at a paper on kansei research I wrote recently, that tries to explain different approaches in kansei research.

2. How often is the Kansei Engineering approach used at the moment for the services (rather than products)?

I am not the best to answer this question… Also I am not sure what you call ‘service’. Is it service from a design perspective, or from a marketing perspective, or from a business perspective … Prof. Shinya Nagasawa from Waseda University has made some important work around business and branding aspects. Prof. Masayuki Takatera’s lab. at Shinshu University has some great projects around the complete textile process, including production, retail and related services. To try to answer something to your question, Kansei Engineering in its classic format has been mostly
oriented towards products. It is recently looking as well at manufacturing processes. We are approaching from the notion of service since we are now dealing with immaterial results. Prof Nagamachi was mentioning this during his keynote at KEER2014 in Linkoping. If you consider Kansei Engineering in a wider range, that is accepting kansei information and kansei science as well, then you will find many examples related to non-tangible objects, and not only display interfaces. I would say that services are not ignored by kansei research nowadays, and it will certainly be a growing topic. A great example is the Toyota Motor Europe ‘Window to the World’, presented as a kansei project.

II. Quantitative measurement in the context of offered research

3. Is the research topic relevant to the application of Kansei Engineering?

Yes it is, obviously. The affective or emotional appreciation of educational services is extremely important. I live it everyday as an educator for design students. Understanding the aspects of education that affect all stakeholders is important to improve education activities and the quality of the educational institution.

KE intends to provide such understanding. Yes it is relevant.

4. Could you estimate the choice of Kansei Engineering in offered research as appropriate?
Yes and maybe no... It worth to try. I am not sure if you are speaking about expected/experienced/reflected affective quality, which are three important aspects in education. And I am very confused with the mix of quantitative analysis and more qualitative and subjective ones such as Repertory Grid Technique. Alexandre Gentner mixed quantitative and qualitative analyses in kansei design, and it is quite difficult.

III. To the novelty

5. Could the application of Kansei Engineering for educational services be characterized as a novel? Is it interesting for the Kansei Engineering development?

KE to education can be considered as novel. I don’t know much work around this, nothing that has had great impact at least. And yes it is interesting to KE (and even kansei research in general) because your research might provide a new perspective on kansei research and kansei challenges.

6. In the offered research the Semantic Differentiation was replaced by the Grid Technique. How often are the alternatives of Semantic Differentiation used? Is usage of the Grid Technique novel and value for the Kansei Engineering development?
SD is much more classic, and following a well establish approach will lead to consistent results. In the KESC paper I referenced before, we used the Repertory Grid Technique. It is very powerful, but need to be used with delicacy. I personally don’t trust statistical analysis based on the result of RGT inquiry. The analysis needs to be a reflection case by case, from which (more or less) global tendencies can be extracted. If you can well manage a RGT based research, I believe you will find much relevant results for the educational context. That is because, although education is something massive in all societies, experiences (and path, and opportunities, and life-change encountering) are always very individual and personal. RGT will help you more to understand and explore these valuable experiences.
Part 5 – Mr. Andrzej Chmielewski, Dr. Ing.

I. Quantitative measurements in educational management

1. Could you characterize quantitative research as widely used in such areas as educational marketing management, pedagogy or psychology?

I can state that in spite of importance of quantitative analysis it is not widely used in a day to day functioning of the educational institution. The main reason is the lack of the appropriate tools and methods that fit to the usual activities. Availability of such tools will help to make educational process more formalized and predictable.

2. Do you use any methods/applications for quantitative estimation of students feedback? If yes, please give some details. If no, can you say that it is needed?

Unfortunately as I’ve mentioned we don’t use any particular tool for quantitative estimation of students’ feedback. However it would be very interesting to try the tool which will use Kansei Engineering in processing students’ feedback. I am curious if it can lead to non obvious results. For example it could be useful to apply it in such area as correlation of student clusters.

II. Quantitative measurements in the context of offered research

3. Is the research topic relevant to the application of some methodology and tools
for quantitative measurement?

Yes, it is relevant. However, it is important that the tool derived from the concept of this work will be easy to use. Also, I think that offered concept has much wider application potential as educational services analysis. For example as generic tool for marketing research.

4. Could you estimate the accent on emotional (affective) aspects as appropriate in the context of offered research?

We've never considered emotional aspect in educational services planning. However for deeper understanding of the processes in educational institution I see it is relevant. It would be very interesting to look at the results of the statistical data processing under this angle.

III. Novelty of research

5. Could the offered research be interesting for the development of didactics and educational management?

Educational management need to react on the needs and interests of the students. At the same time it is important to use numerical representation of them. Results of this
work potentially could give the formalization of this intangible objects. That's why I think it can be interesting.

6. Does the offered research have practical and/or academic novelty?

This work demonstrates the novel approach based on Kansei Engineering applied for educational marketing management. This could be interesting from the methodological point of view. Achievement of the emotional aspects digitizing could be very interesting from the academical point of view. Based on this the practical tools could be created.

Are there any notes or comments that you would like to add?

I see unusual combination of the disciplines in this work.
Part 6 – Mr. German Sorokin, Phd.

1. Quantitative measurements in intangible areas

1. Could you characterize quantitative research as widely used in such areas as marketing, education, psychology?

Due to the continuous development and broad application of information technologies in practice, value of quantitative researches constantly increases. Mathematical ideas and methods get into different areas of knowledge. Quantitative researches could be viewed today as an integral part of humanities as well. Mathematical education should be considered as one of the major components in the system of fundamental education for the specialists in the social sciences.

2. How often quantitative measurements are used today to measure things that often have considered as immeasurable (f.e. emotions or affections)?

Current evolution of information technologies and their application opportunities gives chance to apply quantitative methods in almost any area of human knowledge. Therefore quantitative methods in the immeasurable contexts also gained development in the last decades. It is possible to say that today essentially non-mathematical disciplines don't exist at all.
II. Quantitative measurements in the context of offered research

3. Is the research topic relevant to the application of some methodology and tools for quantitative measurement?

Research topic seems to be relevant to the application of the methodology/tools of quantitative measurement. However, it is necessary to consider that degree of a mathematization can be different for different areas of knowledge and in this case quantitative methods have some restrictions caused by the nature of studied object. Application of quantitative methods also depends on a stage of evolution of scientific discipline/methodology at which the mathematization becomes necessary. In the case if the chosen Kansei Engineering methodology means application of the quantitative methods, their application can be regarded as justified.

4. Could you estimate the application of Matlab Statistics Toolbox as appropriate in the context of offered research?

Yes, it could be estimated as appropriate. Matlab Statistics Toolbox is an universal widespread package which functionality will allow not only to carry out the qualitative analysis of statistical data, but also and to visualize results in acceptable form.

III. Novelty of research

5. Could the offered research be interesting for the development of quantitative
Mathematization of the immeasurable context is relatively new phenomenon with a huge potential, for example in those areas of science in which objects of the research are difficult and often not directly measurable objects: in economy, art, linguistics, medicine, education, etc. Therefore any new and valid scientific results in this area will provide interest for the development of quantitative measurements in non-measurable context.

6. Does the offered research have practical and/or academic novelty?

This work presents academic novelty for such areas as quantitative measurements in immeasurable context, Kansei Engineering methodology application and development, marketing and educational marketing. Practical novelty could be interesting for higher education institutions management and administration and design using Kansei methodology. However, it is necessary to consider that practical application of the offered approach depends on how user friendly it will be formalized.

Are there any notes or comments that you would like to add?
I. Quantitative measurements in intangible areas

1. Could you characterize quantitative research as widely used in such areas as marketing, education, psychology?

Generally quantitative research is dealing with measuring a market and quantifying that measurement based on some scale. The measurement relates to market size, market share, market growth rates and others market features. What concerns the education domain the quantitative research is widely used for, at least, students’ level of knowledge’s estimations.

Nevertheless quantitative research can also be used to measure customer attitudes, satisfaction, feelings and other useful for marketing and education data. Quantitative research can be applied to measure the quality issue not only for the products but also regarding to some services including higher education service.

According to our understanding the quantitative research can be characterized as the very interesting and promising area of research traditionally used in marketing domain. Application of the quantitative research for service quality assessment can be regarding as the novel approach especially for educational and healthcare service assessment.
2. How often quantitative measurements are used today to measure things that often have considered as immeasurable (f.e. emotions or affections)?

Some research suggests that consumers can become emotionally attached to consumption product or service. However, a scale to measure the strength of consumers’ emotional attitude to product or service, especially what concerns the quality issue, has yet to be devised. The quality, in general, can be regarded as immeasurable thing.

Mostly all known approaches and techniques for quality measurement are based on the SERVQUAL methodology. The customer satisfaction according to the SERVQUAL methodology can be measured as the difference between expectation and the performance obtained within the five dimensions of service quality. The number of dimensions, the scale of estimates, as well as, the conceptual bases of SERVQUAL are still under consideration and discussions.

II. Quantitative measurements in the context of offered research

3. Is the research topic relevant to the application of some methodology and tools for quantitative measurement?

The proposed research topic is relevant to the methodology and tools of quantitative measurements in the field of higher education. The research is based on Kansei Engineering, Repertory Grid Technique (RGT) and different statistical methods for
data analysis. The software tools based on MATLAB were applied for quantitative measurements.

This methodology and tools can be regarded as the minimal set of instruments for the implementation of the quantitative measurements in the context of the offered research. The application of the modern data mining approaches including artificial neuron nets and genetic algorithms can be also used for the quantitative measurements. It seems to us it can be applied as the further step in the developing this area of investigations.

4. Could you estimate the application of Matlab Statistics Toolbox as appropriate in the context of offered research?

Statistics Toolbox™ provides numerous statistical and machine learning algorithms and tools for representation, visualization, analyzing, and investigating of different data sets. It allows performing pilot data testing, data descriptive statistics, cluster analyses, regression analyses, factor analyses and others.

The wide range of the Statistics Toolbox™ functionality is sufficient for the topic under investigations. Based on the Statistics Toolbox™ it is possible further investigations in the context of offered research.
III. Novelty of research

5. Could the offered research be interesting for the development of quantitative measurement approaches in immeasurable contexts?

There are numerous kinds of services offered for the customers within different sector including educational sector, healthcare sector, repair services, hotel service and others. Within all this sector there are a lot of issue for which the development and application of quantitative measurement approaches is very important and useful. The quality issue within all kinds of services has the immeasurable contexts.

The proposed research is very interesting for developing of quantitative measurement approaches in immeasurable contexts. Moreover, the proposed methodology can be applied for service quality assessment of different Higher Educational Institutions.

With some modifications concerning the Constructs and Elements of the Repertory Grid Technique (RGT) the proposed research can be applied for the healthcare service quality assessment.

6. Does the offered research have practical and/or academic novelty?

There are some novelties proposed within the offered research. First of all it concerns the Kansei Engineering which has been used for the purpose of the higher
educational service quality estimations. The application the Repertory Grid Technique is quite interesting and novel solution within the nowadays Kansei Engineering. The thing is that traditionally Kansei Engineering uses the semantic scales for evaluation purposes. This research proposes the application of the Repertory Grid Technique instead of the semantic approaches.

The validation of the offered research has been carried out based on the real statistical data gathered at Darmstadt University of Applied Sciences. It supports the practical orientation of the proposed solutions.

Application the methodology and tools, proposed within the offered research, for the purpose of the service quality assessment has sufficient practical impact and can be applied not only for higher educational service quality assessments.
Part 8 – Mr. Aleksandr Ivaniuk, Prof. Dr.

I. Quantitative measurements in intangible areas

1. Could you characterize quantitative research as widely used in such areas as marketing, education, psychology?

Quantitative measure of consumer opinion regarding products or services, the measurement of the lifestyle of consumers are widely used for effective marketing solutions. Quantitative measurements in education undergo such indicators as performance, satisfaction with the educational process trainees and their parents, etc.

In child psychology, which is inextricably linked to the area of education, the measured parameters include levels of perception, attention, memory, imagination, thinking, motivation, etc. It can be stated, even by the example of these three areas, that research in the field of quantitative measurements are highly relevant and in demand.

2. How often quantitative measurements are used today to measure things that often have considered as immeasurable (f.e. emotions or affections)?

Examples of quantitative measurements that are always considered as immeasurable every year become more and more. For example recognition systems of human emotions from the digital images are already developed and implemented. Any
human emotion or experience is reflected not only in our facial expressions, but also in biochemical processes in our body. Availability of appropriate sensors and actuators, and most importantly the mathematical apparatus and methods of data collection and analyses, sooner or later, will allow to quantify human affections.

II. Quantitative measurements in the context of offered research

3. Is the research topic relevant to the application of some methodology and tools for quantitative measurement?

Certainly, the subject of the present research relate to the methodology and tools of quantitative measurements in the field of higher education. Affective quality of educational services in order to further marketing analysis on the example of Darmstadt University of Applied Science (Germany) is measured. The research is based on the methodology of Kansei Engineering, trans-disciplinary nature of research and Repertory Grid Technique (RGT). Statistical methods and data analysis software tools based on MATLAB were applied as tools for quantitative measurements.

4. Could you estimate the application of Matlab Statistics Toolbox as appropriate in the context of offered research?

From my point of view it was very appropriate application software based on MATLAB Statistics Toolbox functions. MATLAB is recognized around the world
not only as a powerful tool for automating statistical calculations, but also for visualization of statistical data.

III. Novelty of research

5. Could the offered research be interesting for the development of quantitative measurement approaches in immeasurable contexts?

Certainly, the results of the present research should be of interest to professionals working in the field of quantitative measurement of unmeasured. The results obtained for the measurement of the quality of educational services can be applied in other areas, such as marketing and psychology.

6. Does the offered research have practical and/or academic novelty?

Regarding practical novelty: I hope that the administration of Darmstadt University of Applied Sciences drew attention to the results of research that will help correct the educational process in a better way. Academic novelty undoubtedly present. From my point of view, the main result of this research is the proposed methodology for measuring the quality of educational services based on the use of Likert scale, expert RGT-elements and structures. Conducted versatile data analysis showed the consistency of the proposed methodology in practice.
Are there any notes or comments that you would like to add?

Just few questions. Have you carried out similar research in other Universities, not only in Darmstadt University of Applied Science? What kind of results have been obtained?
I. Quantitative measurements

1. Do you use any tools for the quantitative estimation of customers’ feedback in your practice? If yes, how often, what kind of them and for what purposes?

Quantitative estimation and visualization methods are widely used in the modern marketing. Almost every day it is necessary to use numbers to plan, analyse, forecast and reporting. Regarding tools we are using, well, it is SAP … .

2. Do you have any experience with the quantitative measurement tools in marketing that are used to measure things that often have considered as immeasurable (f.e. emotions or affections)?

Personaly I do not have such experience and do not use tools which directly measures emotions in my day to day work. However I do know that they exist but without too much details.

II. Emotional context in today’s marketing practice

3. How important is the consideration of the emotional/affective aspects in today’s marketing?
Emotions consideration is extremely important for the survival in today’s business environment. Marketing strategies without any emotion management don’t work. Emotions are always in play. Such giants as Nike, Coca-Cola works only on the emotional level already several decades. It is vitally important to find out what drives your customers, this insight ensures successful marketing strategy.

4. Does it have any practical potential or interest to apply some methodology/tools for the quantitative measurement of emotional or affective aspects?

This is definitely interesting and corresponds to modern trends. The need for such methods/tools does exist. What kind of potential it would have really depends on the particular tool implementation and how easy to use of would be. If such a tool would require additional time and effort for using it, than it is unlikely that it would be wide spread. From the other hand, if it will help to save time and other resources then it would have high potential.

III. Novelty of research

5. Could the offered research be interesting for the development of marketing practice?

I think yes. It would be especially interesting for the small and mid size companies to try use such new methodology which would help to make offer for the customer
taking in to account emotional aspect. Small companies need to use their limited resources effectively to move their product to the market starting from the product idea. Information acquired using described approach could be useful both for product development and marketing strategy improvement. Using such approaches could give competitive. However, methodology should be easy to use, affordable for the small companies and should not require significant time and human resources.

6. Could you estimate the offered approach as providing a novel concept?

It is hard to assess to me scientific novelty of this research. Regarding practical novelty it is definitely present. From one side appeal to emotions in marketing is not new, as I already mentioned, many companies – leaders of today’s markets takes in to the account emotional aspects of the current decade. However, till today emotional marketing, neuromarketing was available only for the large companies with large budget for the marketing. Small and mid size companies could not afford expensive research in the neuromarketing and they are either not using emotional marketing or doing based on their intuition. And tools described in the presentation are modern and long-awaited.

Are there any notes or comments that you would like to add?

It would be interesting to see the final result of the proposed by author methodology in the form of the finished tool.
Part 10 – Mr. Ryszard Szczebiot, PhD, Ing.

I. Quantitative measurements in educational management

1. Could you characterize quantitative research as widely used in such area as educational management?

Initiatives and standards that were brought to the educational area by the Bologna Process have caused the considerable change in educational accountability. The role of measurement increases due to the new accents in educational policy. It is important to measure such variables as students’ achievements, attitudes, feedback and other. So, the quantitative research is used in educational area and this trend is growing.

2. Do you use any methods or applications for quantitative estimation of students’ feedback? If yes, please give some details. If no, can you say that it is needed?

There is no standard instrument for quantitative measurement in our practice. The need of such an instrument exits. However, it should conform to the policy and standards brought in education by Bologna Process. However, are known qualitative methods to assess effectiveness of education used, for example, by accreditation
commissions of the European Union, including, for example, Polish Accreditation Committee.

II. Quantitative measurements in the context of offered research

3. Is the research topic relevant to the application of some methodology and tools for quantitative measurement?

Research topic is in the trend of today's educational policy in Europe. This trend is characterized by the increased attention to the interaction with the students. At the same moment, the need of formal reporting and quality control is also increasing. So, research topic could be characterized as relevant to the application of quantitative measurement tools.

4. Could you estimate the accent on emotional (affective) aspects as appropriate in the context of offered research?

Consideration of an emotional component in education management is a new trend. However, it is a promising direction because of the growing marketization of higher education. Higher Education Institutions begin to operate as the market-oriented organizations. Students are often considered as the customers with theirs moods and emotional component becomes important. Moreover, the consideration of an emotional component is not new for education sector. There are a lot of disciplines
that study also emotional aspects in education, for example educational psychology or pedagogy. Scientific results from these areas could be interesting also in a management context.

III. Novelty of research

5. Could the offered research be interesting for the development of educational management?

The results of the offered research seem to be useful in the different educational settings, testing organizations, government or consulting area. Presented approach could help in different tasks, for example in the evaluation of the educational achievement, program planing or survey implementation. Most likely every task or branch will need some completions to the offered research that will consider its specificity. However, the idea of this research is quite ambitious and could be interesting for the development of educational management.

6. Does the offered research have practical and/or academic novelty?

Presented research includes some points that sound very novel. Even the declared combination of disciplines speaks about high scientific potential of this research. Other points with high potential of the scientific novelty are: accent on emotional
aspect, consideration of Kansei Engineering approach, attempt to address today's European educational policy, attempt to formalize informal components.

Are there any notes or comments that you would like to add?