

CIVIL PROJECT MANAGEMENT AT RUSSIAN DEFENSE ENTERPRISES TAKING INTO ACCOUNT CONSUMER ATTITUDE TO CHANGES IN THE PRODUCT DESIGN AND OPERATION

**Glebova Olga Vladimirovna, R.E. Alekseev Nizhny Novgorod State Technical
University**

**Gracheva Olga Vladimirovna, R.E. Alekseev Nizhny Novgorod State
Technical University**

**Lapaev Dmitry Nikolaevich, R.E. Alekseev Nizhny Novgorod State Technical
University**

**Glebov Vladimir Vladimirovich, Arzamas Polytechnic Institute of R.E.
Alekseev Nizhny Novgorod State Technical University**

**Simonov Alexey Vladimirovich, R.E. Alekseev Nizhny Novgorod State
Technical University**

**Moiseeva Elena Gennadevna, Arzamas Polytechnic Institute of R.E. Alekseev
Nizhny Novgorod State Technical University**

**Melnikova Oksana Yuryevna, Arzamas Polytechnic Institute of R.E. Alekseev
Nizhny Novgorod State Technical University**

ABSTRACT

The research aims to improve high-tech civil project management at Russian defense enterprises in view of decreasing the State defense orders taking into account consumer behavior. Defense enterprises are increasingly developing markets for medical equipment which is subject to special requirements for reliability, accuracy, and safety. One of the most acute problems in development and sale of civil production is related to consumer attitude to the products. Models of consumers' acceptance and use of ozone therapy devices taking into account changes in their design and operation are developed on the basis of theoretical analysis. The research was conducted among intermediate and final consumers in the south of Nizhny Novgorod region and is intended for Russian defense enterprises producing ozone therapy devices. Such research has not been conducted before.

Keywords: Defense Enterprises, High-Tech Civil Projects, Ozone Therapy Devices, Consumer Behavior.

JEL Classification: M31, Q32.

INTRODUCTION

One of the most important tasks of high-tech civil project management at Russian defense enterprises is to improve the assessment procedures related to the analysis of developed civil markets, the demand for innovative products in new markets, and constant monitoring of consumer attitude to products (Chemezov & Volobuev, 2017; Dubrovsky & Ponomareva, 2018).

Design and implementation of complex medical equipment is one of the most rapidly developing areas of diversification of Russian enterprises in civil markets. Some Russian defense enterprises, in particular, have developed and are constantly upgrading ozone therapy devices, which are used in medical and health resort institutions, as well as in cosmetology. Devices for home use have been produced in recent years.

Ozone therapy, one of methods of oxidative therapy (Alekhina, 2003), is a rapidly developing area of clinical and preventive medicine. It has gone through heyday, and temporary but very persistent rejection. The research carried out at Nizhny Novgorod State Medical Academy (Maslennikov & Kontorschikova, 1999; Peretyagin et al., 2013) contributed to the revival of ozone therapy at a new theoretical and experimental level. Various methods of ozone therapy have been developed and implemented into practical medicine as part of long-term clinical and experimental research. These methods have been successfully used in more than 20 countries of the world. Research in the field of ozone therapy is actively ongoing in various countries (Bocci, 2002; Struchkov & Morozov, 2016; Wang et al., 2018), although there are many discussion issues. Ozone therapy was prohibited for use in clinical settings in some countries.

The most important requirements to modern ozone therapy devices are the following (based on information from the BestOzon Company website):

1. Ozone production in a sufficiently wide range of concentrations; possibility of more accurate and flexible regulation of the produced ozone in all concentrations with the minimum possible job step.
2. High accuracy of maintaining the necessary concentration of ozone in the entire range of produced concentrations.
3. Automatic stabilization of the feed rate of ozone-oxygen mixture.
4. Maximum automation, locking in case of erroneous actions of staff.
5. High level of service support (network of service technical centers in warranty and post-warranty service).

Ozone therapy devices have been improved. The first devices had a number of technical shortcomings: a low level of maintaining the accuracy of the required ozone concentration; insufficient resource of the discharge chamber; narrow range regulation of ozone concentration (Bocci, 2002). These devices are currently equipped with automatic gas supply system, remote control and registration of the fulfillment of ozone therapy procedure. Modern information technologies help to reduce the risk of ozone therapy procedure. Ozone therapy devices are being constantly improved.

We, therefore, believe that it is necessary to study the behavior of intermediate consumers of ozone therapy devices, who use them in the provision of services (medical workers), and that of final consumers of ozone therapy service. Medical and health resort institutions, as well as manufacturers of ozone therapy devices are interested in such research in order to improve operation, maintenance, and technical characteristics of devices. Russian defense enterprises will be able to manage the civil project portfolio flexibly, and ensure that strategic objectives of increasing civil market share will be met.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Scientists from different countries have been conducting long-term research which has resulted in a wide range of high-tech project management methods.

A great contribution to developing project management on design and production of new high-tech products has been made by the following studies (Archibald, 1976, 1992 & 2003). In the first publication the author identifies the life-cycle features, approaches to management and selection procedure of the projects under consideration, paying particular attention to their riskiness (Archibald, 1976).

When evaluating the effectiveness of research and development (R&D) in high-tech industries, Russian scientists Puzynia & Zalasnyuk (1978) paid great attention not only to scientific, technical and economic aspects, but also to social aspects.

Crawford (1983), one of the founders of new product management, paid great attention to assessment procedures for new products. As a rule, a large number of potential projects on the development of new products are unsuitable for commercialization. A tried and tested selection process allows identifying more promising products in advance, and providing resources to relevant projects. This helps to reduce failures, and eliminate errors in resource allocation (Cooper, 1985).

Cooper (1985) analyzed the approaches and models used for initial selection of new product development projects and identified the following:

1. Benefit measurement models involve using a group of respondents who provide subjective feedback on the characteristics of a new product. As a rule, economic indicators are not used.
2. Economic models mainly analyse a new product as an investment opportunity, therefore the following indicators are used: profitability, return on investment and other economic indicators.
3. Portfolio selection models consider a new product in view of resource allocation that can be solved using optimization methods. A portfolio of existing and new products is formed upon maximizing company goals taking into account company resource constraints.
4. Market research involves using focus groups and custom panels.

Cooper (1985) proposed the NewProd model for selecting new products. The author noted that the model can be adapted according to the specifics and sector profile of the company. The NewProd model was intended to select a single project, prioritize a number of possible new products, and detect weak points of the project. The model solved only one task in managing the process of design and production of a new product: to separate winning projects from failures. Questionnaires consisting of 48 questions were developed for people interested in the new product. A factor analysis revealed that these questions cover the following eight factors that influence screening data (Cooper, 1985):

1. Excellence / product quality.
2. Economic attractiveness of the product for final consumers.
3. Resources required for a new product / company's available resources ratio.
4. Technological compatibility with the resources that the company is able to provide.
5. Degree of novelty for the company.
6. Market demand, market growth and size.
7. Competitive market situation.
8. Product content.

The model was actively used in various countries and industries, showing the predictive power of 73–84%. The NewProd model was followed by modifications with modified factors and computer graphics (Cooper, 1992). This model is no longer used; it has been replaced by the Stage-Gate model (Cooper, 1994). When applied effectively, this model stimulates design and implementation of successful new products. Assessment procedures in the Stage-Gate model are continuous throughout the entire product life cycle.

Many researchers put forward the need for continuous assessment activities when managing a risk project portfolio related to design and production of new types of products. According to Archer & Ghasemzadeh (1999), project portfolio management is a periodic activity that involves portfolio building from potential project applications and projects in progress. This activity meets the goals of the organization without exceeding existing resources or violating other restrictions. In order to simplify decision-making process when selecting projects for a portfolio, Archer & Ghasemzadeh (1999) proposed to structure a complex process and identified three stages in this process: strategic review, individual project assessment and portfolio selection. The stages are close to the requirements of modern standards of project management.

Archibald (2003) emphasizes problems of selecting projects related to R&D. This is a wide range of projects—from search, basic research to highly specialized research which is related to the development of new products or services or improvement of existing ones.

Assessment and selection of projects related to development is a complex type of assessment procedures at different stages (predictive assessment, assessment during project implementation, end-of-project assessment). Assessment procedures, along with monitoring role, accumulate knowledge both about the project implementation and about difficulties in assessment procedures. The following subjective and objective factors influence formation and use of the assessment system for high-tech projects related to R&D:

1. The complexity and vagueness of the subject area, which is especially acute in the initial stages of assessment.
2. Subjectivity in criteria for selecting projects and indicators for monitoring individual projects and the portfolio.
3. Limited financial, human resources and time budget that are necessary for assessment and monitoring.
4. Subjectivity in R&D assessment due to the fact that assessment participants have different views and specializations, interpret and perceive challenges differently, which can contribute to conflict situations.
5. Lack of an efficient selection mechanism of specialists for assessment procedures.
6. Competence of experts according to the level of knowledge, experience, qualification in a specific scientific field as well as related subject areas.
7. Groundlessness of assessment methods.

High-tech project assessment of development, production and sale of civil products at defense enterprises can be considered as a set of the following components: assessment targets for various levels and stages; assessment participants; assessment tools; conditions of system existence, i.e. external and internal factors affecting its development, use and possibility of conflicts in assessment procedures.

Crawford & Di Benedetto (2015) identified main tasks and methods at different stages of new product life cycle, and highlighted the need to constantly monitor product market attractiveness to reduce the risk of consumers' acceptance of new products or to improve them. This requires development of models to measure customer satisfaction (Jiang et al., 2015).

However, consumers' acceptance and use assessment of new technologies is, as a rule, considered in marketing research and is not adequately presented in project management of developing new (improved) products. In project management standard of Project Management Institute (PMI) which was launched in 2018, the system ensuring strategy implementation consists of interrelated activities: project management practice including portfolios, programs and projects; business management practice; organizational project management practice.

In view of the targets of developing new markets and maintaining developed markets by Russian defense enterprises, we propose to add as a separate research practice the study of

existing and new civil markets, including, in particular, consumers' acceptance and use assessment of new products.

Much research is conducted to track product market attractiveness, changes in consumer behavior, but there are many discussion issues. Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003) made a great contribution to the theory of consumers' acceptance and use of new technologies. UTAUT is actively used in information technologies and other high-tech areas. Table 1 presents UTAUT and ways of its improvement.

Theory / model	Theory / model description
Unified Theory of Acceptance and Use of Technology (UTAUT)	Venkatesh et al. (2003) conducted empirical research using eight most famous models. As a result, a unified model called the Unified Theory of Technology Adoption and Use (UTAUT) was developed. The model included four main determinants of intention and use (performance expectancy, effort expectancy, social influence, and facilitating conditions) and four moderators of key relationships (gender, age, experience, voluntariness of use). UTAUT is more suitable for B2B consumers (employees of organizations implementing new technologies to organize the launch of new products or services).
Expanded Version of Unified Theory of Acceptance and Use of Technology (UTAUT 2)	Venkatesh et al. (2012) proposed to expand the Unified Theory of Technology Adoption and Use (UTAUT) in order to study acceptance and use of technology in the context of various consumer types. Three constructs were incorporated into UTAUT2: hedonic motivation, price value and habit. Individual differences (age, gender and experience) are assumed to moderate the impact of the introduced constructs on behavioral intentions and use of technology. Additional constructs allow bettering assessing behavior of final consumers of products or services (B2C consumers).
A Multi-level Framework of Technology Acceptance and Use	It was proposed to combine main determinants of intention and use in basic UTAUT / UTAUT 2 model (Venkatesh et al., 2016). The following determinants were left: facilitating conditions, habits, individual beliefs, which include performance expectancy, effort expectancy, social influence, hedonic motivation, and value. Separate results of acceptance and use of technologies are also added to the basic model, but moderate effects of age, gender, experience and voluntariness of use are derived. Introduction of conceptual factors of two levels is also proposed. The authors refer to the conceptual factors of the individual level: user attributes, technological attributes, task attributes, events (time). Environment attributes organization and location attributes are referred to the conceptual factors of a higher level. The authors have formulated further research in areas of identification and systematization of new factors affecting consumer behavior and decision-making.

Source: Venkatesh et al., 2003 & 2016

Many researchers studied consumer behavior in healthcare services on the basis of UTAUT and UTAUT2 models, including technologies of mobile healthcare and medical robots (Venkatesh et al., 2012 & 2016). It should be noted that there are few Russian publications in this area. 160 publications were found in the Russian Science Citation Index (RSCI) (search date August 12, 2019) by keyword UTAUT. Only 23 of them were written by Russian authors, there were no publications related to research of consumer behavior in healthcare services. Both in foreign and Russian databases of scientific citation, we did not find research related to consumer behavior in ozone therapy. It is consumer behavior of various types that affects the decision on further improvement of ozone therapy devices, which are complex devices with the use of information technology and automation. This research proposes to expand the scope of

application of the UTAUT and UTAUT2 models taking into account recommendations for their improvement (Venkatesh et al., 2016).

Tables 2 and 3 represent latent and open variables of the proposed models of acceptance and use of ozone therapy devices by final consumers (patients of medical institutions) and intermediate consumers (employees of medical institutions).

Table 2
LATENT AND OPEN VARIABLES OF THE MODEL OF ACCEPTANCE AND USE OF OZONE THERAPY DEVICES BY FINAL CONSUMERS
1. Facilitating Conditions (FC)
FC1: Manual on ozone therapy device is available.
FC2: Software for remote control and registration of performed procedure contributes to the quality of implementation and reduces possible risks.
FC3: No malfunctions due to device failures.
2. Individual Beliefs (IB)
2.1. Performance Expectancy/Perceived Usefulness (PE)
PE1: I believe that ozone therapy procedures help to reduce recovery period, increase performance, improve well-being and reduce relapses of chronic diseases.
PE2: In my opinion, ozone therapy device of this modification (used in the medical institution) is better in its main characteristics than previous ones or devices developed by other companies.
2.2. Effort Expectancy/Perceived Ease of Use (EE)
EE1: I think that medical staff provides enough information on possibilities, limitations and usability of ozone therapy procedures.
2.3. Social Influence (SI)
SI1: In my opinion, people who are important to me and influence my behavior, my family and colleagues support my decision to use ozone therapy procedures.
SI2: I believe that ozone therapy positively affect my appearance.
2.4. Hedonic Motivation (HM)
HM1: I feel better after the procedure.
HM2: I like the way ozone therapy procedure is done, and the interior of the ozone therapy office.
2.5. Price Value (PV)
PV1: I believe that I get my money's worth from the procedure, and the price is not too high for me on condition of regular ozone therapy procedures.
3. Habit Influence (HI)
HI1: I have developed a stable habit of using ozone therapy procedures for health purposes, fitness and cosmetology.
HI2: I am used to taking ozone therapy procedures to treat chronic diseases.
HI3: I have developed a habit of sharing information in my social network about ozone therapy procedures and their impact on well-being and performance.
4. Anxiety and Risk (AR)
AR1: A high level of side effects and complications.
AR2: Possibility of idiosyncrasy.
AR3: High concentration of ozone can adversely affect health.
5. Behavioral Intention (BI)
BI1: I intend to continue ozone therapy procedures to treat the proceeding disease.
BI2: I intend to take ozone therapy procedures to treat other diseases.
BI3: I plan to take ozone therapy procedures regularly for therapeutic and recreational purposes.
6. Behavioral Attitudes to Use with Change Accounting (BU)
BU1: It will be easier to accept and use ozone therapy procedures if information on possibilities and limitations of ozone therapy is provided by leading specialists and is posted on the websites of medical institutions.
BU2: I believe that it is necessary to conduct such surveys regularly to accumulate data on consumer attitude to ozone therapy, and identify necessary changes in the way procedures are organized.
BU3: It is necessary to organize in local medical institutions consultations with highly qualified specialists in

ozone therapy from leading clinics; it will contribute to a better use of procedures.
 Source: Author's Adaptation (Venkatesh et al., 2003, 2012 & 2016; Bocci, 2002; Alekhina, 2003; Kummer et al., 2017)

Table 3
LATENT AND OPEN VARIABLES OF THE MODEL OF ACCEPTANCE AND USE OF OZONE THERAPY DEVICES BY INTERMEDIATE CONSUMERS
1. Facilitating Conditions (FC E)
FC1E: Automation of the gas supply system, software for remote control, and registration of the performed procedure provide control of the device use during medical procedures.
FC2E: Safety training courses are held regularly for workers using ozone therapy devices to treat patients with various diseases.
FC3E: Manual on ozone therapy device is available.
FC4E: Managers of the medical institution took part in the selection of ozone therapy devices, organized medical service, and constantly help to increase paid medical services provided by ozone therapy devices.
FC5E: Customer service is available if there are problems with ozone therapy devices.
2. Individual Beliefs (IB E)
2.1. Performance Expectancy/Perceived Usefulness (PE E)
PE1E: I believe that ozone therapy procedures help to reduce recovery period, increase performance, improve well-being and reduce relapses of chronic diseases.
PE2E: In my opinion, ozone therapy device of this modification (used in the medical institution) is better in its main characteristics than previous ones or devices developed by other companies.
2.2. Effort Expectancy/Perceived Ease of Use (EE E)
EE1E: I think that use of the device is clear and easy.
EE2E: I am interested in examining effects of ozone therapy on patients with various diseases.
2.3. Social Influence (SI E)
SI1E: In my opinion, highly professional medical workers and managers of medical institutions, who are important for me and influence my behavior support use of ozone therapy devices to treat patients with various diseases.
SI2E: I believe that availability of ozone therapy devices is a status symbol of a medical institution.
3. Habit Influence (HI E)
HI1E: I have developed a habit of using all functions of the ozone therapy device in the medical institution I work for.
HI2E: I have developed a habit of discussing in my professional environment possibilities and limitations of ozone therapy.
4. Anxiety and Risk (AR E)
AR1E: A high level of side effects and complications.
AR2E: Possibility of idiosyncrasy.
AR3E: High concentration of ozone can adversely affect health.
5. Behavioral Intention (BI E)
BI1E: I intend to continue ozone therapy procedures in my work.
BI2E: I intend to apply new approaches, examine possibilities and limitations of ozone therapy.
6. Behavioral Attitudes to Use with Change Accounting (BU E)
BU1E: It will be easier to accept and use ozone therapy procedures if information on possibilities and limitations of ozone therapy is provided by leading specialists and is posted on the websites of medical institutions.
BU2E: I believe that it is necessary to conduct such surveys regularly to identify necessary changes in the way procedures are organized.
BU3E: It is necessary to organize in local medical institutions consultations with highly qualified specialists in ozone therapy from leading clinics; it will contribute to a better use of procedures.
BU4E: Ozone therapy procedures will be facilitated by additional development of special devices.
BU5E: Flexible portable structures will make use of ozone therapy devices more convenient.

BU6E: High quality after-sales service will improve efficiency of ozone therapy devices.
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Source: Author's Adaptation (Venkatesh et al., 2003, 2012 & 2016; Bocci, 2002; Alekhina, 2003; Kummer et al., 2017)

A distinctive feature of the proposed models is interpretation of the endogenous variable “*Behavioral Attitudes to Use with Change Accounting*”, which allows assessing consumer attitude to possible changes in design and operation of ozone therapy devices.

The analysis has made it possible to formulate the following hypotheses:

- H₁* Facilitating conditions, individual opinions and habit influence will have a significantly positive effect on behavioral intentions of final consumers of ozone therapy devices.
- H₂* For final consumers, facilitating conditions, habit influence and behavioral intentions will have a significantly positive impact on the behavioral attitude to the use of ozone therapy devices, taking into account possible changes in their design and operation.
- H₃* Facilitating conditions, individual opinions and habit influence will have a significantly positive effect on the behavioral intentions of intermediate consumers of the ozone therapy devices in medical institutions.
- H₄* For intermediate consumers, facilitating conditions habit influence and behavioral intentions will have a significantly positive impact on the behavioral attitude the use of ozone therapy devices, taking into account possible changes in design and operation.

METHODOLOGY

The goal of the research is to improve high-tech civil project management at Russian defense enterprises taking into account consumer behavior. Various methods both theoretical (analysis, synthesis, simulation approach, comparison, abstraction) and empirical (survey, expert methods) were used (Novikov & Novikov, 2010).

Using analysis and synthesis, the authors determined the interrelated activities that ensure increasing civil product share by Russian defense enterprises; identified the main significant factors affecting consumer behavior of various types, and the interaction among all these factors. Simulation approach made it possible to identify the behavior patterns of final and intermediate consumers of ozone therapy devices. The scope of use of well-known models UTAUT and UTAUT2 was expanded taking into consideration recommendations for their improvement (Venkatesh et al., 2016). The developed models consider behavioral intentions and consumers’ attitude to the use of ozone therapy devices taking into account possible changes in their design and operation. Comparison was used to analyze the behavior of various consumer groups of medical equipment (ozone therapy devices) produced by Russian defense enterprises. Abstraction was used to simplify the models.

A survey was conducted to study consumer behavior. Expert methods, which are referred to the group of empirical methods, were used to identify ways of improving design and operation of ozone therapy devices (Novikov & Novikov, 2010).

The research has addressed the following objectives:

1. In theoretical aspect: it has presented a more flexible system which ensures completion of the strategy of Russian defense enterprises to use accumulated experience in implementing high-tech civil projects. The system includes assessment of consumers’ acceptance and use of new or improved products (services).

2. In practical aspect: it has revealed behavioral intention and attitude of consumers (living in the south of Nizhny Novgorod region) to ozone therapy devices produced by Russian defense enterprises, taking into account possible changes in their design and operation.

Questionnaires were introduced to measure the intentions of final and intermediate consumers. Most of the questions were adapted, taking into account specific use of ozone therapy devices (Venkatesh et al., 2003; Alekhina, 2003; Venkatesh et al., 2012).

Questions in endogenous variable “*Behavioral Attitudes to Use with Change Accounting*” were determined with the help of the expert poll in which designers of ozone therapy devices (representatives of defense enterprises) and medical workers who actively use them for therapeutic and recreational purposes took part, taking into account the recommendations of Venkatesh et al. (2016).

To measure all elements of questionnaires (indicators) for final and intermediate consumers, the five-point Likert scale was used (with extreme values: 1 - strongly disagree, 5 - completely agree). Armstrong (1987) introduced in detail the features and advantages of this scale.

The pilot survey was conducted in January 2019 (the sample scope for final consumers was 50 people, for intermediate consumers-30 people), then a number of questions that were ambiguously interpreted by consumers were corrected. The main survey was conducted for six months (from February 1, 2019 to July 31, 2019). Patients (after the procedures) and medical workers (at work) of five clinics in the south of the Nizhny Novgorod region were interviewed. The sample scope of final consumers of medical services is 495 people, intermediate consumers -203 people.

SmartPLS (v. 3.2.8.), based on the analysis of Partial Least Squares (PLS), was used to process data on consumer behavior. PLS can be used in dispersion-based structural equation modeling in contrast to covariance-based structural equation modeling. It can also be used in regression models. PLS is largely based on nonparametric approach to modeling that does not ensure normal data distribution, and is recommended for small samples (Garson, 2016). PLS is used in many areas, including success factor selection in marketing research (Albers, 2010).

The first stage involved evaluating reliability and significance of the models, and testing the developed hypotheses. At the second stage, measures of predictive accuracy of the models were cross-validated.

RESULTS AND DISCUSSION

Descriptive statistics showed the following. The survey among patients in the south of the Nizhny Novgorod region revealed: average level of addiction to ozone therapy procedures; average age of patients (59 years old); more active use of procedures by men (57.1%); average age among medical workers (43.3 years old); similar gender composition-women make up 54.2%.

Anxiety and risk factor (AR) was initially included in latent variables of the model that affect consumer behavior (IB). However, the analysis revealed a low negative impact of this factor (for final consumers the path coefficient had a negative value of 0.056, for intermediate consumers-0.074) and later it was excluded from the models, which confirms the recommendations made by Venkatesh et al., 2016. From the point of view of descriptive statistics, it can be said that final and intermediate consumers were mostly worried about side

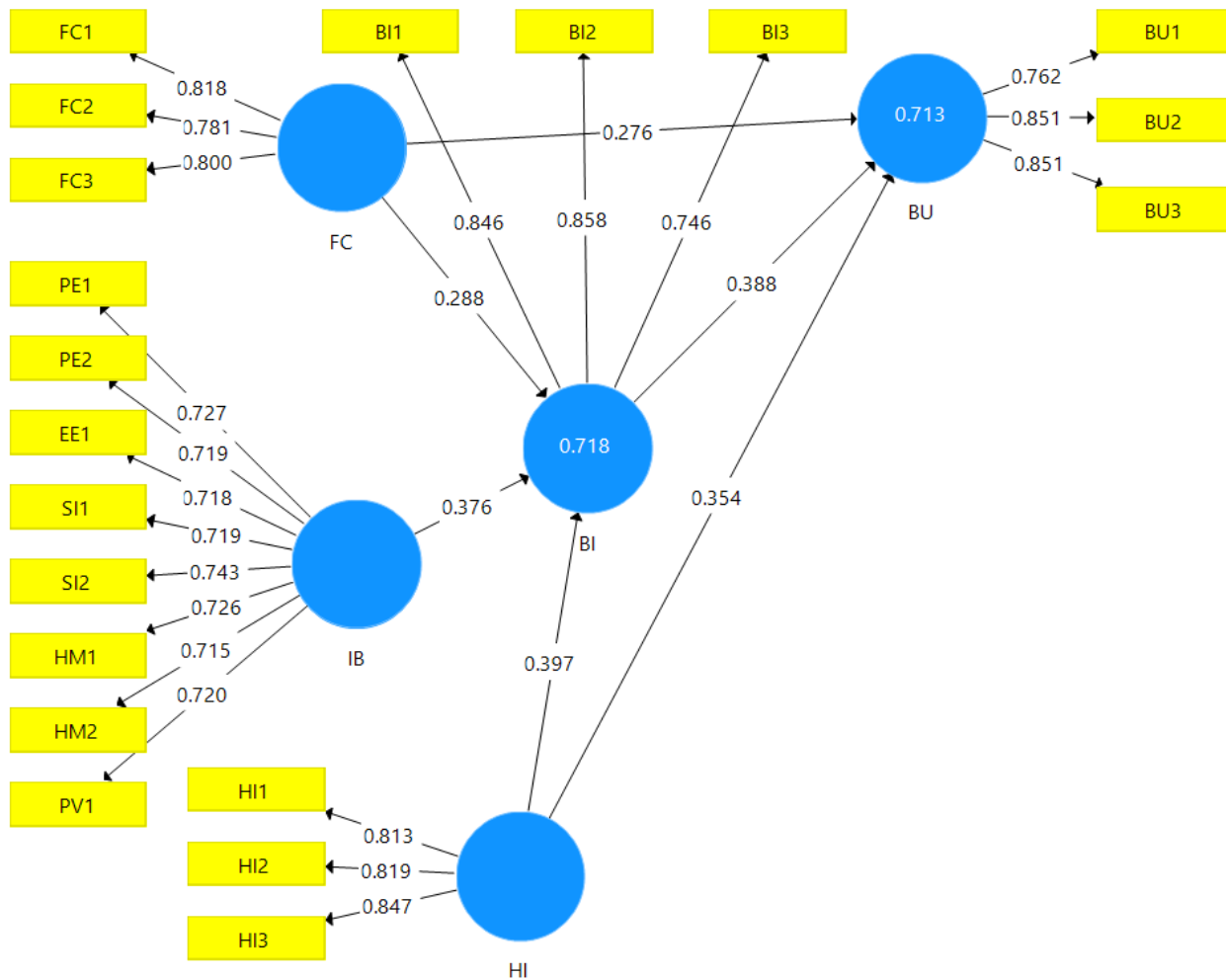
effects and complications. The average value of indicators AR1 and AR1E significantly exceeds the average value of other indicators of anxiety and risk variable in both considered models.

Figure 1 shows that in final consumer behavior model determination factor R2 for endogenous variable BI is 0.718. This means that three latent variables (FC, IB, and HI) moderately account for 71.8% variance in BI.

Path coefficients of latent variables affecting BI are more than 0.2, which indicates their significant influence (Garson, 2016). HI has the greatest impact on BI.

Determination factor for endogenous variable BU is 0.713. Thus, latent variables (FC, BI, and HI) moderately account for 71.3% variance in BU.

Path coefficients of variables affecting BU are also significant. BI has the greatest impact on BU.



Source: Authors' Compilation.

FIGURE 1
PLS CALCULATIONS OF FINAL CONSUMER BEHAVIOR MODEL

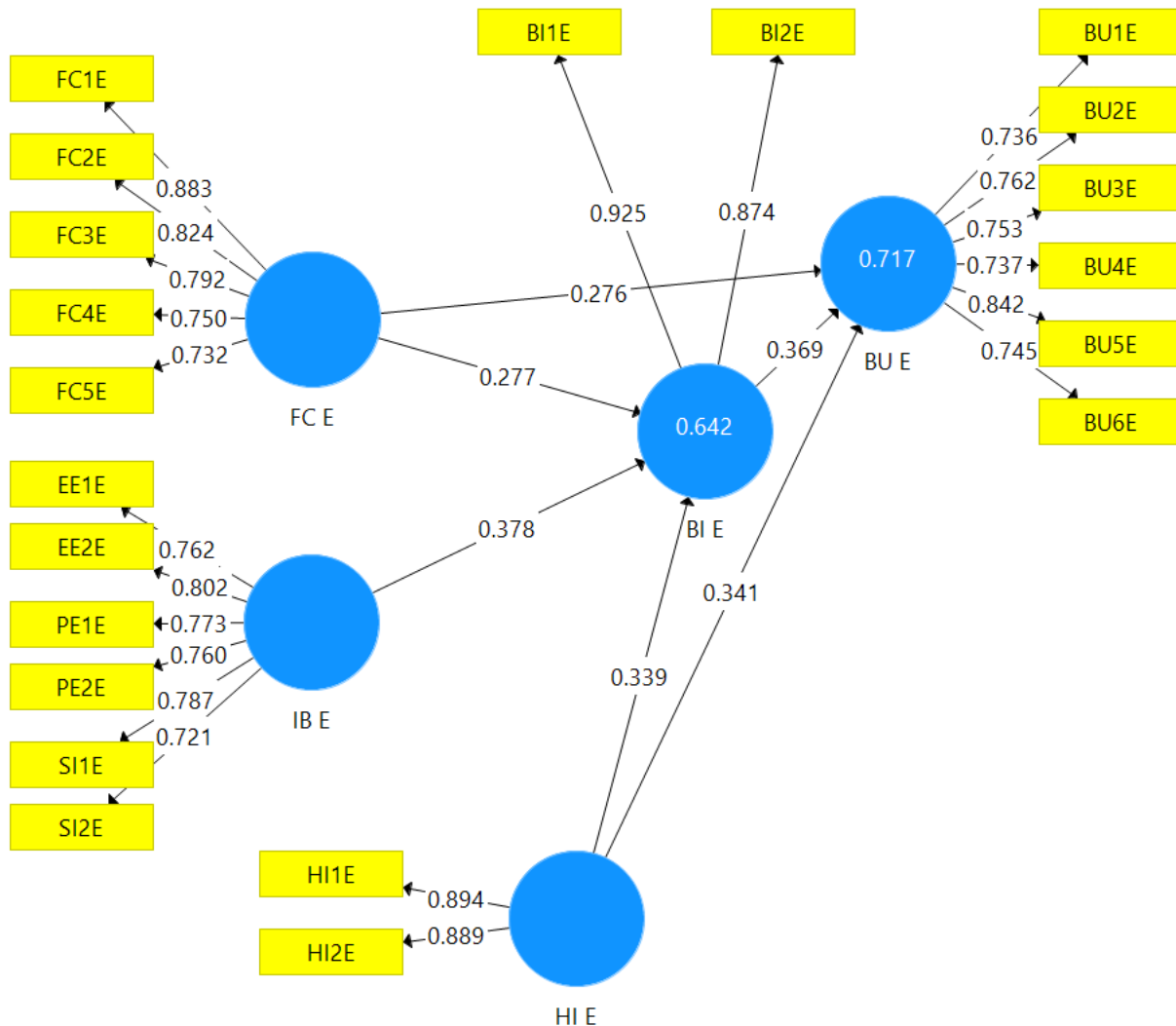
Figure 2 presents intermediate consumer behavior model. In this model, determination factor for endogenous variable BI E is 0.642. Latent variables (FC E, IB E, HI E) moderately account for 64.2% variance in BI E.

Path coefficients of three latent variables affecting variable BI E are more than 0.2, which indicates their significant influence (Garson, 2016). IB E has the greatest impact on BI E.

Removal of anxiety and risk factor from the model has led to a slight decrease in determination factor BI E.

Determination factor for endogenous variable BU E is 0.717, i.e., latent variables (FC E, BI E, HI E) moderately account for 71.7% variance in BU E.

Path coefficients of three latent variables affecting BU E are also significant. BI E has the greatest impact on BU E.



Source: Authors' Compilation.

FIGURE 2
PLS CALCULATIONS OF INTERMEDIATE CONSUMER BEHAVIOR MODEL

SmartPLS algorithm in two consumer behavior models converges at the eighth iteration, which confirms assessment stability. Indicators of all latent variables for both models under consideration are reliable, their values are more than 0.7 (Garson, 2016).

Table 4 shows that composite reliability is more than 0.70, but less than 0.9. Assessment with the help of Rho A, one of the most important PLS reliability indicators (Dijkstra & Henseler, 2015), confirms reliability of the initial data. Cronbach's alpha gives a more careful assessment, but for all latent variables acceptable values are more than 0.7. Average variance extracted (AVE) used to verify convergence is more than 0.5 for all latent variables.

Requirements of Fornell-Larker criteria are met. They state that for any latent variable, the square root of AVE must be more than its correlation with any other latent variable (Garson, 2016). Thus, the results presented in Table 5 shows discriminant reliability.

Table 4				
RELIABILITY ANALYSIS				
Latent Variables	Cronbach's Alpha	Rho A	Composite Reliability	Average Variance Extracted (AVE)
Permissible Values	More than 0.7	More than 0.7	0.7÷0.9	More than 0.5
Final consumer behavior model				
BI	0.756	0.781	0.858	0.669
BU	0.761	0.772	0.862	0.677
FC	0.720	0.725	0.842	0.640
HI	0.768	0.771	0.866	0.683
IB	0.871	0.874	0.898	0.523
Intermediate consumer behavior model				
BI E	0.768	0.801	0.895	0.810
BU E	0.857	0.864	0.893	0.583
FC E	0.857	0.879	0.897	0.637
HI E	0.742	0.742	0.886	0.795
IB E	0.864	0.884	0.896	0.590

Source: Estimated.

Table 5					
FORNELL-LARKER CRITERIA ANALYSIS TO TEST DISCRIMINANT RELIABILITY					
Final consumer behavior model					
	BI	BU	FC	HI	IB
BI	0.818				
BU	0.789	0.823			
FC	0.533	0.573	0.800		
HI	0.717	0.703	0.256	0.826	
IB	0.745	0.766	0.381	0.655	0.723
Intermediate consumer behavior model					
	BI E	BU E	FC E	HI E	IB E
BI E	0.900				
BU E	0.763	0.763			
FC E	0.603	0.675	0.798		
HI E	0.668	0.730	0.518	0.891	
IB E	0.655	0.703	0.398	0.491	0.768

Source: Estimated.

Table 6 shows that all F-square factors assessing relationship between latent variables are more than 0.15, but not more than 0.35 in both consumer behavior models. We can conclude that there are medium effects for significant variables to explain endogenous variables (Cohen, 1988).

There is no collinearity, which is confirmed by external and internal variance inflation factor (VIF) calculated by SmartPLS (v. 3.2.8.). VIF values are less than 5, which confirm their validity according to recommendations by Hair et al. (2016). Some researchers use more stringent values - less than 4 (Garson, 2016). Table 6 shows internal VIF values.

In SmartPLS significance testing is performed by bootstrapping, which relates to resampling methods (Davies, 2001). Resampling methods do not have specific requirements for sample size, however, the smaller the sample, the more likely that established confidence intervals will not correspond to base distribution. We analyzed T-statistics values, and corresponding values of probability levels for path coefficients, basic and specific indirect effects, external loads and external weights at the level of 0.05. All T-statistics values are more than 1.96, which indicates significance of the model parameters. Table 6 presents T-statistics for path coefficients.

Table 6						
HYPOTHESIS CONFIRMATION						
Hypothesis	Endogenous Variables	Path	Path Coefficient	F - Square	Inner VIF Values	T-Statistics
	Permissible values		More than 0.2	Medium effect 0.15÷0.35	Less than 5	At the level of 0.05 above 1.96
Final consumer behavior model						
H1	BI R ² =0.718	FC -> BI	0,288	0.251	1.170	12.004
		HI -> BI	0.397	0.319	1.751	15.634
		IB -> BI	0.376	0.262	1.913	16.561
H2	BU R ² =0.713	FC -> BU	0.276	0.181	1.463	16.690
		HI -> BU	0.354	0.202	2.153	22.317
		BI -> BU	0.388	0.186	2.809	8.052
Intermediate consumer behavior model						
H3	BI E R ² =0.642	FC E -> BI E	0.277	0.151	1.419	6.070
		HI E -> BI E	0.339	0.204	1.574	7.118
		IB E -> BI E	0.378	0.292	1.369	9.262
H4	BU E R ² =0.717	FC E -> BU E	0.276	0.165	1.633	6.738
		HI E -> BU E	0.341	0.219	1.877	9.636
		BI E -> BU E	0.369	0.222	2.161	5.454

Source: Estimated.

We can conclude that four hypotheses are confirmed, based on the data given in Table 6.

In SmartPLS cross-validation is done by sample reuse method, which allows calculating Q² Stone-Geyser (Stone, 1974; Geisser, 1974). It is a criterion of prognostic significance of model variables and indicators. Any positive Q² indicates that exogenous constructs have prognostic value for endogenous variable (Hair et al., 2016). All cross-validated measures of predictive accuracy of the models have positive values. If $0.15 < Q^2 \leq 0.35$, then it corresponds to high prognostic significance (Cohen, 1988). Based on the results of Q² presented in Table 7, we can conclude that exogenous variables embedded in consumer behavior models are quite high for endogenous variables. It should be noted that prognostic significance is slightly higher for intermediate consumer behavior model, though the sample size for it is much lower.

The result of the research compensates for the lack of papers in the field of assessing consumer behavioral intentions, their attitude to the use of ozone therapy devices, taking into account possible changes in design and operation. In order to improve the theory of acceptance and use of technology, Venkatesh et al. (2016) suggest developing new concepts of acceptance

and use of technology, noting that many papers ignore use assessment, and evaluate only consumer behavioral intentions.

Though the attitude to ozone therapy is rather controversial (Bocci, 2002; Wang et al., 2018), the research experimentally confirmed a positive attitude of consumers to ozone therapy devices used in medical institutions, and helped to determine the most preferred ways to improve design and operation of devices from the point of view of final and intermediate consumers.

Latent Variables	Q² Endogenous Variables	Q² Total Latent Variables
Final consumer behavior model		
BI	0.447	0.340
BU	0.457	0.349
FC		0.289
IB		0.373
HI		0.355
Intermediate consumer behavior model		
BI E	0.446	0.367
BU E	0.385	0.405
FC E		0.451
IB E		0.418
HI E		0.333

Source: Estimated.

The results of the research will help Russian defense enterprises that develop and produce ozone therapy devices to respond quickly to revealed consumer preferences, which will improve high-tech civil project management and ensure the implementation of the strategy to increase civil product share.

It should be noted that the interviewed patients had habits and views regarding ozone therapy. In further research, it is necessary to differentiate final consumers according to the degree of addiction, and the place where ozone therapy procedures are taken (to conduct surveys not only in medical institutions, but also in fitness centers and beauty salons).

CONCLUSION

The research leads to the following conclusions:

1. A differentiated approach is needed to evaluate consumers' acceptance and use of complex medical equipment. Model UTAUT is more suitable for assessing behavior of intermediate consumers (employees of medical institutions using ozone therapy devices for therapeutic and recreational purposes), model UTAUT2 is for assessing behavior of final consumers (patients taking ozone therapy procedures).
2. Final consumer behavior model helped to confirm the first and second hypotheses. Facilitating conditions, individual opinions and habit influence have a significantly positive impact on the behavioral intentions of final consumers of ozone therapy services (the most significant is habit influence). For final consumers, facilitating conditions, habit influence and behavioral intentions have a significantly positive impact on the behavioral attitude to the use of ozone therapy devices, taking into account possible changes in their design and operation (the most significant impact is behavioral intention).
3. Analysis of the results obtained with the help of intermediate consumer behavior model made it possible to confirm the third and fourth hypotheses. Facilitating conditions, individual opinions and habit influence have a significantly positive effect on the behavioral intentions of intermediate consumers of the ozone therapy devices in medical institutions (individual opinion has the greatest

- impact). For intermediate consumers, facilitating conditions habit influence and behavioral intentions have a significantly positive impact on the behavioral attitude the use of ozone therapy devices, taking into account possible changes in design and operation (the most significant impact is behavioral intention).
4. The presented models have a high level of prognostic significance.
 5. Defense enterprises producing ozone therapy devices accepted the results of the research positively, and developed an action plan for introducing changes in the design of devices.
 6. Medical institutions also developed an action plan to improve operation of ozone therapy devices.
 7. The action plans will contribute to the efficiency of design and implementation of new modifications of ozone therapy devices, which in turn will increase civil product share of defense enterprises.

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It should also be noted that defense enterprises have decided to apply the developed assessment procedures regularly in order to identify consumers' acceptance of ozone therapy devices and other types of civil products.

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