

Розглянуто основні технологічні інновації цифрового маркетингу як специфічної форми маркетингу в умовах інформатизації суспільства. Обґрунтовано, що головним напрямком цифрового маркетингу є персоналізоване відношення до користувачів. Доведено, що персоналізований зв'язок з потенційним клієнтом стає суттю маркетингу, першопричиною його ефективності. Показано, що цифрові методи обробки та використання інформації стають основним джерелом підвищення ефективності маркетингу.

Необхідність порівняльного аналізу технологічних інновацій цифрового маркетингу обумовлена тим, що науково-технічний розвиток стимулює виникнення значної кількості методів впливу на споживача. Дослідження цих методів дозволяє виявити їх сильні сторони для використання при розробці маркетингової стратегії та тактики підприємств.

В результаті дослідження виділена система класичних інструментів цифрового маркетингу – пошукова оптимізація, контекстна реклама, маркетинг в соціальних мережах, технологія великих даних, ретаргетінг, електронна пошта. Визначено сутність, зміст, призначення та області використання інструментів цифрового маркетингу, які з'явилися в результаті новітніх технологічних інновацій – нативний контент, штучний інтелект, інтеграція маркетингових технологій, віртуальна і доповнена реальність, голосові боти, Інтернет речей, відео- і мобільний маркетинг, партнерський маркетинг. Виділено п'ять стратегій монетизації додатків в мобільному маркетингу. Виконано аналіз SPI-мереж з орієнтацією на мобільний і невмотивований трафік. Розроблено модель взаємодії контрагентів та принципи інтегрованого підходу проектів партнерського маркетингу, зокрема показано необхідність пошуку розумного, обґрунтованого компромісного плану. При цьому задачу вибору оптимального варіанту проекту сформульовано як задачу багатокритеріальної оптимізації. Проведено аналіз методів вирішення цієї задачі та надано відповідні рекомендації щодо вибору найбільш доцільного методу.

Значимість отриманих результатів обумовлена тим, що вони можуть стати теоретичною базою підвищення ефективності маркетингової діяльності в умовах інформатизації суспільства за рахунок використання адекватних стратегій монетизації, покращення форм взаємодії контрагентів партнерського маркетингу, виявлення умов застосування, переваг і недоліків технологічних інновацій цифрового маркетингу. На відміну від відомих методів підвищення ефективності маркетингової діяльності запропоновані підходи створюють підґрунтя для прибуткової роботи в умовах цифрової економіки

Ключові слова: нативний контент, штучний інтелект, мобільний маркетинг, Інтернет речей, партнерський маркетинг

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ANALYSIS OF TECHNOLOGICAL INNOVATIONS IN DIGITAL MARKETING

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1. Introduction

The postulates of classical theory of marketing were formed in the 20th century – the concept, categorical apparatus, and the toolset. Over the course of the existence of marketing, one has observed a functional relationship

between the development of marketing theory and scientific-technical progress. It is obvious that the ever-changing realities of economy predetermine moral ageing of the theoretical foundations of marketing since the effectiveness of marketing activities depends on the degree of adequacy of its forms to the character of industrial relations. The new in-

formation stage in the post-industrial economy necessitates the modernization of the classical theory of marketing. First, that concerns the marketing toolkit whose evolution is governed by the laws of dialectics. This is the case of the most pronounced manifestation of the law “objection to objection”. “Creative destruction” of marketing lays the foundation for digital marketing. The digital-transformation is under way, as well as the dying of classical offline businesses – if an enterprise is not represented on the Internet, it leaves the market. Thus, there is a task on choosing the most adequate and effective instruments for the personalized interaction between sellers and buyers. The result of permanent changes in the field of information systems is the emerging technological innovations related to digital marketing, which is a driver towards the higher efficiency. The new realities call for the consideration of emerging technological innovation from a scientific point of view.

To develop effective marketing strategies under conditions of digital economy, it is necessary to define the scientific basis for the newest technological innovations related to digital marketing. Prerequisites for such a study are the changes in motivation, mentality, way and quality of life, the emergence of opinion leaders in the Internet space, the rise of communities in social networks, development of the market for specialized applications, improvement of systems that manage relationships with consumers. In this case, the rapid pace of technological change predetermines the diversity of views regarding the generalization of theoretical principles of innovations in digital marketing.

2. Literature review and problem statement

The following is classic definition by the American Marketing Association: “Marketing is the function of the organization, which includes a set of processes for creating, promoting and supplying consumer values based on the management of relationships with customers, resulting in that the organization takes risks and receives benefit” [1]. It does not mention trends relative to the personification of relationships with consumers, because, when formulating this definition, the level of technology could not provide for the personification of work with consumers.

Authors of paper [2] have proven that marketing strategy should focus on strengthening the interaction between the seller and the consumer. However, the researchers did not highlight specific areas to monetize the proposed solutions.

The model “4D” (Data base management, Strategic design, Direct marketing, Differentiation) from paper [3] addresses the issues of differentiated interaction with the customer based on analysis of data from a customer base, constructed using CRM systems. However, this paper did not suggest principles for such an interaction.

While stressing the importance of the personalized valuable information about each consumer and analyzing personification issues based on the use of web-sites to stimulate sales, author of [4] did not indicate the characteristics that enhance engagement with users.

In paper [5], author stressed the importance of operational transactional interaction in real time. He systemized basic methods and tools of digital marketing, as well as the specificity of their application. However, digital marketing tools are quickly modernized, so the results of such studies require further development.

Work [6] provides analysis of modern trends in marketing research in the Internet environment. However, there is an impression that the research was not completed as there are no strategic decisions, specifically, in the field of mobile marketing, which is the most rapidly progressing among other areas of digital marketing.

In paper [7], authors systematized the classical tools of digital marketing and the general aspects of application of digital technologies. At the same time, no trends that had given rise to innovative digital technologies were specified.

In study [8], researchers emphasize the growing importance of inter-organizational associations, partnerships in marketing. However, the study does suggest any proposals related to models of partnerships, nor the strategy and tactics of their implementation.

Authors of work [9] distinguish “Affiliate marketing” as a promising direction of inter-organizational associations in the online environment. They consider the issues related to the implementation of partnerships, but they fail to analyze the causes why contractual obligations of their members are not complied with.

In paper [10], authors analyze the types of affiliate marketing platforms, explore issues of privacy, legality and legitimacy, the means to combat Internet fraud in affiliate networks. However, a given research concentrates mainly on the issues related to safety in operations of affiliate networks, rather than the forms of interaction between partners.

Author of paper [11] carries out an operational analysis of affiliate marketing programs. However, the issue on the substantiation of selection criteria for an affiliate program has not been paid enough attention to.

Paper [12] investigated the evolution of determinants for inter-organizational interactions. Recommendations are given regarding the implementation of projects of affiliate marketing. However, the researchers left unanswered questions related to the systematization of various forms of partnership cooperation in marketing.

An analysis of the scientific literature that addresses the tasks on comparing the technological innovations of digital marketing in terms of improving their efficiency has testified to that, first, the studies are fragmented and do not show a system of the advanced, yet most effective, tools; their strengths and weaknesses have not been revealed. Second, although the issues of mobile marketing are examined in studies, not enough attention is given to strategies of its monetization. Third, in the presence of multivariate models for the development of affiliate marketing, there are no their systematization that would provide the characteristics of each model.

Thus, in order to develop effective marketing strategies under conditions of digital economy, it is necessary to improve the theoretical principles of the application of innovative digital marketing tools, to devise recommendations for effective strategies of their monetization and to build models of affiliate marketing.

3. The aim and objectives of the study

The aim of this work is to generalize and develop the theoretical principles of technological innovations of digital marketing.

To accomplish the aim, the following tasks have been set:

- to determine the fundamental theoretical principles underlying the application of digital marketing tools that have appeared as a result of the latest technological innovations;
- to devise strategies for the monetization of applications in the mobile marketing under conditions of adapting web-sites to mobile platforms;
- to formulate the principles of an integrated approach and the model of interaction between counterparties engaged in the projects of affiliate marketing.

4. Study into characteristics of technological innovations of digital marketing

Technological shifts of the digital economy, the exponential growth of the volumes of information, the need to accelerate the process of decision making, enhance the culture in the field of information and communication technologies, force enterprises to employ new tools in their marketing activities. And the emergence of more complex tasks on analyzing the growing volumes of information stimulates the proposal of such analytical tools.

Within the digital economy, improving the productive forces of labor occurs primarily due to technological innovation. That is confirmed by that the five companies that have the highest capitalization in the world, Apple, Amazon, Facebook, Microsoft, Alphabet, are the leaders in the implementation of technological innovations in the field of digital channels and technologies.

4.1. Theoretical principles of innovations in digital marketing

Digital marketing is a form of the implementation of marketing activity using digital channels and technologies (Table 1).

The main tools of digital marketing are the following.

1) SEO (search engines optimization) is the optimization of a web site in search engines. It promotes a web site to the first page of queries at search engines.

2) Contextual advertising is the context-based banners or text advertising announcements that are displayed directly below the search bar, or to the right of the search query results.

3) SMM (social media marketing) is the social media marketing, media advertising – advertising messages in the form of static or animated images, which are placed on pages of web sites to promote products.

4) SMO (social media optimization) is the optimization for social networks, advertising on social networks, blogs, forums, dairies.

5) Big Data technology implies analysis of data arrays of large volumes. By using an opinion analysis in social media, it is possible to obtain results based on reviewing tens of thousands of opinions.

6) RTB (real time bidding) is the real-time bidding, an auction of advertising announcements in real time.

7) Retargeting is the retargeting, multiple showing of the Internet advertising that has been already seen.

8) SEM (search engine marketing) is the search engine marketing activities, aimed at increasing the attendance of a web site.

9) Mobile marketing is the marketing activities using mobile devices.

10) Viral marketing is the advertising strategy, whereby a person targeted by advertising is at the same time the transmitter of advertising.

11) Mailings are the text messages sent by e-mail.

Table 1

Basic activities in digital marketing

Activity	Essence	Effect for customer
Web site optimization for search engines	a totality of actions that make it possible to move a web site to the top positions in a search engine and increase its attendance: – construction of a list of keywords; – audit of the web site – identification and elimination of errors that prevent the promotion of the web resource; – search engine optimization – activities to improve the technical, text, and visual characteristics of a web site	– comprehensive promotion of a web resource; – an increase in a web citation; – an increase in a web site’s ranking in customers’ search
Design of banner advertising	– graphical images related to advertising	– an increase in the web site attendance; – an increase in the volume of sales; – possibility to control advertising efficiency
Design of contextual advertising	– Google-provided advertising	– an increase in the web site attendance; – an increase in sales
Direct marketing	– compilation of the client database and work with the database; – mail newsletters; – personalized personal sales	– personalization of interaction with customers
Electronic survey of visitors	– analysis of competitors, suppliers and potential clients, profiles of their web sites, products offered via the Internet; – analysis of statistics collected from the Internet databases, acquisition of data on the conducted market research, proposed by marketing agencies over the Internet	– acquisition of the primary marketing information
Comprehensive audit of a web site	– detection of errors in the operation of a web site; – drawing up a plan for a web site promotion	– an increase in the attendance of a web site; – an increase in sales
Database support	– analysis of current needs of the customer; – managing the behavior of the customer in the future	– an increase in customer loyalty

The principal direction of digital marketing is the personalized attitude to users. Efficient product sales are driven by the personal address to a potential customer. Personalized communication with a potential customer becomes the essence of marketing, the core of its effectiveness. The vector of development of information and communication technologies implies enhancing the technical capabilities

to collect and analyze information about the demographic characteristics, target audience interests, web site-related activity, statistics of purchases, the content used, data on the location of a client. The benefits of digital marketing include targeting; the possibility to estimate effectiveness of a web site; determining the demand based on tracking the requests' subjects; the reactivity of sales.

It is possible to highlight the following technological innovations of digital marketing over recent time:

- native content;
- artificial intelligence;
- integration of marketing technologies;
- virtual and augmented reality;
- the voice bots;
- Internet of Things;
- video and mobile marketing;
- Affiliate marketing.

Native content. Previously, it was enough to buy a lot of links to a web site in order to automatically move it up in a list of search engine's query results. At present, search engines such as Google are actively opposing such an approach. However, creating interesting content by the site owner is getting more complicated. Social networks make it possible for users themselves to generate the content, uploading photographs, video materials, and authoring blogs. There are technologies that help automate the generation of content, as well as create UGC (user generated content, created by users). Video content has played a significant role in increasing the attendance of a web site. Video content has become much easier to produce. Google released the tool YouTube Director, which facilitates making commercials. There technologies have been developed that automatically adapt content for the target audience, forming a unique newsfeed. Yandex selects music tracks based on the customer's preferences at Yandex.Radio, creates songs to the music fan's favorites, and has released the album "Neural defense". Thus, digital marketing was supplemented with the notion "native content". Native in the English language means "natural", "native". The mission of the native content is to create "organic" communication products in order to increase the target audience and, ideally, increase the volume of sales. The advantages are in that users feel favorably toward such information, they are willing to share it, thereby increasing conversion and sales.

Artificial intelligence as a means of implementation of Big Data. There is the notion of "artificial intelligence" in digital marketing. These are DMP-platforms (Digital Management Platform) that automatically analyze the effectiveness of channels to attract users to a web site, advertising costs, form a portrait of the target audience, find, and propose buyers, and target advertising messages. The theoretical basis for the functioning of "DMP" platforms is the psychometric theory by M. Kosinski. His theory is based on that the human behavior on the Internet is automatically recorded and stored. By analyzing this information, it becomes possible, with a high probability, to predict consumer behavior. The essence of psychological targeting implies that the advertisement announcement is directed only at those who can be interested in it. The system automatically selects sites for advertising, finding the most effective point of contact with the target audience.

The integration of marketing technologies. It implies the development of standards for data exchange, which ensure a synergistic effect resulting from the harmoni-

zation of a variety of digital tools. "API" (application program interface) are made for interfaces of different software. Thus, a web site integrates with CRM and CRM integrates with a DMP-platform. Then, when a customer fills out the purchase form at a web site, he at the same time provides information to CRM while a DMP platform determines where the customer came from, the cost of his attraction to the web site, what he was doing at the web site and how to optimize relationships with the customer.

Virtual and augmented reality. Virtual reality is the artificially created reality, which is explored using the specialized glasses. Augmented reality implies the inclusion, by means of the specialized software, in the existing reality of objects through their demonstration in a virtual environment, and providing opportunities to perform certain actions with them. Thus, when selling real estate, they use virtual projections of apartments that a potential buyer could virtually renovate and furnish. The technology of augmented reality does not require disengagement from the real world and makes it possible to conduct transactions while saving time, money, human energy, improving the emotionality of purchases, reducing risks.

The voice bots. The voice bots is a call center consisting of robots who ask questions, take and analyze the responses, thereby collecting information for management decision making (Google – "OK, Google", Apple – "Siri", Amazon – "Alex", "Echo", Microsoft – "Cortana").

The Internet of Things (IoT). The Internet of Things is the acquisition and analysis of information from household devices equipped with Wi-Fi or Bluetooth. The household devices connected to the Internet compile databases on behavioral characteristics of users.

4. 2. Strategies to monetize the applications in mobile marketing

Video and mobile marketing. Video-marketing is the distribution of video content with the purpose of communication with target audience (Facebook Live – a platform for posting videos; comments to videos in Facebook appear 10 times more frequently than at web sites). Mobile marketing is the dissemination of information using mobile phones, smartphones. It provides potential customers with a possibility to find an enterprise and goods through mobile applications, landing, mobile advertising, SMS mailing.

It is possible to distinguish five strategies for the monetization of applications in mobile marketing (Table 2).

4. 3. Models of interaction between counterparties in affiliate marketing

Affiliate marketing. This is the method to promote business on the Internet by webmasters-partners at which a partner receives a reward for every visitor, subscriber, buyer, obtained through his efforts. That makes it possible to engage a target customer at a lower cost than that in other promotion channels.

Table 3 gives the suggested model of interaction between counterparties in affiliate marketing.

Partners will gain additional opportunities and sources for optimizing administrative expenses and investments in the logistics of marketing; for the promotion of products or services; for choosing advertising sites, thematic offers, sources of traffic; for the application of tools to drive and handle traffic. However, the difficulty of finding effective networks and high risk of breaching business ethics by an advertiser define the relevance of choosing the business model of affiliate marketing.

Table 2

Strategies of applications monetization in mobile marketing

Strategies	Conditions for application	Benefits	Drawbacks
Paid Apps	– unique content and design; – absence of big competitors in the market	– developer receives a share of profit from each download; – there are no banner ads; – employment of innovative tactics to attract new users	– intense competition with free applications; – up to 30 % of the software cost is left to the shopping site
In-App Purchase	– availability of a network version	– it makes it possible to compile a large database of customers; – an opportunity to monetize each client; – a deeper involvement of the user with the application; – it reduces the risk of losing a customer	– part of the profit is left to the shopping site
Free, But With Ads	– free versions of the software	– fast gain of users; – there are no issues on finding an advertiser	– advertising grabs some useful space in the screen
Freemium	– the business model of Internet startups and applications; Mainly for smartphones – a limitation of an operating system	– users excess basic options at no cost; – access by subscription to the enhanced functionality; – engagement of user database without spending resources on expensive advertising campaigns or conventional staff of sales managers	– there is a risk not to attract attention of the user (narrow content); – there is a risk of lack of interest in buying from the user (wide content); – there is a risk of losing a large part of the audience (free content)
Paywalls (Subscriptions)	– attractive content and topics; – optimal satisfaction of the subscriber; – affordable price of a service	– receiving regular payment for using the service; – access to resources of the application during subscription; – basic volume of content is free of charge; – payment for full access for a certain time	– access to content rather than the features of software; – additional (hidden) payments

Table 3

Model of interaction between counterparties in affiliate marketing

Counterparty type	Role in an affiliated network	Examples
Advertisers	– proposal (offer) to customers; – payment of a commission or a percentage to partners	banks, online shops, online games, mobile applications, tourism
Affiliated networks	– aggregator of proposals; – targeted transition	a site of interaction between advertisers and partners
Customers	– interest (click on the advertising announcement); – implementation of target activity (purchase, installation, registration)	users of the Internet, visitors to web sites (leads)
Partners	– building relations with advertisers; – search for relations at which the cost to drive traffic from a source is lower than the income from payments within an offer; – combination of the sources of traffic and offer; – providing information about a product or service to customers	web site owners

The seller (advertiser) obtains flexible possibilities to control and analyze the quality of leads; the application of a scenario-based approach to testing an advertising strategy; the implementation of feedback and further adjustment and optimization. In addition, s/he receives protection from unwanted partners and types of traffic.

An analysis of the risks and benefits of affiliate marketing has allowed us to devise recommendations related to the stages on the life cycle of an affiliate program.

1. At the stage of designing an affiliate program.

Given a broad diversification of partner networks in terms of operation schemes, it is necessary to thoroughly understand the conditions, to analyze advertising strategy, to choose the affiliate program with respect to the specificity of activities, to carefully prepare promotional materials, to employ modern technological tools to analyze the leads. It is required to pay great attention to contractual issues to foresee possible fraud.

2. At the stage of launching an affiliate program.

Implement CRM (Customer Relationship Management) system to analyze the status and origin of leads, the quality of traffic from webmaster tools, the implementation of

programs to motivate webmasters; to disable the unwanted kinds of traffic, to adjust an application form, to add different validation techniques.

Affiliate marketing is characterized by the diversity of the types of programs that differ in the ways and terms of payment; a variety of risks; television audience cover; depth of analytics; the flexible settings of affiliate programs; possibilities to cooperate with other partner networks.

It is possible to highlight several types of pricing models for affiliate programs:

1. CPS (Cost Per Sale) or PPS (Pay Per Sale) is the pricing model of “pay per sale”. It implies receiving of a commission reward based on the fact of payment for the goods. The partner is paid a commission reward upon the transaction completed by the user by having paid for the goods. This model is the most profitable from an advertiser’s view because the conversion depends on its activities and provides the possibility to plan a budget. However, there are risks related to analysis and leads retention.

2. CPA (Cost Per Action), PPA (Pay Per Action) is the pricing model “pay per action”. It is based on the advertiser’s payment to partners for specific activity of the attracted vis-

itors (filling out registration forms, subscribing to newsletters, answering questions in a survey). A commission reward is paid based on the fact of executing a certain action by the user, which makes it possible to easily handle the incoming traffic in large volumes without scaling, to easily attract and retain leads. However, it has a low conversion rate and significant risks of fraud.

3. CPL (Cost Per Lead), PPL (Pay Per Lead) is the pricing model “pay per lead”. The payment is made not after each activity, but only for the effective one when a customer reports a desire to purchase the product.

4. CPC (Cost Per Click), PPC (Pay Per Click) is the pricing model “pay per click”. Receiving a commission reward is linked to the fact of the user clicking on the link. This model generates significant volumes of incoming traffic but has a big problem related to filtering out quality traffic, analysis of leads and artificial boost by automated scripts or programs of clicks by unscrupulous partners.

5. CPV (Cost per Visit) is the pricing model “pay for the visit.” It sets the price for the number of visitors that land at the web site of the advertiser. It makes it possible to cut off those visitors who clicked on the link to the publisher’s web site, but did not make it to the web site. Given the fact that registration can be carried out only at the advertiser’s side, the model requires a more sophisticated technology.

6. FFA (Flat fee advertising) is the pricing model “pay for time”. The size of payment is established depending on the attendance of web pages, topic of the server, duration of advertising announcements at the web page over a certain calendar period without accounting for the number of views and clicks. The fixed fee without regard to the number of views and clicks complicates predicting the conversion and economic efficiency of a marketing event.

7. CPI (Cost Per Impression), PPI (Pay Per Impression) is the pricing model “pay for showing”. It is based on calculations by the advertiser of the number of hits or views. It yields a low cost of leads, as well as cost optimization, but it has a risk of decline in conversion, and the complexity of forecasting approximation.

8. Combined (integrated) pricing model. It combines various payment schemes at the same time, which helps attract the greatest number of partners, traffic, leads, owing to covering a variety of channels and transition techniques to the affiliate network. This is the most flexible and efficient model, however, it requires the selection of high quality affiliate networks and the methodological adjustment of the affiliate campaign.

9. Multilevel pricing model. Payments are awarded not only for visitors, but also for other partners attracted by partners. The partner who engages another partner to the program receives a percentage of his earnings (in this case, the commission reward is not deducted from those earnings, the commission reward is paid by the affiliate program itself).

10. CPI (Cost Per Instal) is the pricing model “pay per install”. It is designed for the segment of mobile applications. Payment is made for a specific installation. The size of the payment for the efficiency of placement is determined based on the cost of a single installation of a mobile application. The risks of CPI-model include lack of transparency, low quality of installations, and a large number of motivated installations (a user installs an application based on the bonus only, the application itself might not be interest, in contrast to the non-motivated traffic when the user is actually in-

terested in the application, thereby clicking on the link and downloading the application).

11. CPE (Cost Per Engagement) is the pricing model “pay per action in the application”. Advertisers pay only for active users (who acted in the application) that motivates to improve the quality of traffic and to eliminate motivated traffic. An advertiser must select the degree of user engagement and the required activity from his side. The cost of engagement is determined using a test campaign.

There are three options for project management in affiliate marketing:

- In-House Management;
- Network Management;
- Outsourced Program Management.

Choosing the best option is a non-trivial task, because effectiveness of a project depends on the characteristics of the project itself, the qualitative and quantitative parameters of the team of actors, the flexibility of external relations. Thus, if the content essence of a project and the skills of staff allow its implementation using own resources, or if the critical parameters are the balance between quality and price and the confidentiality of a project, it is then advisable to choose the option of the in-house management. That makes it possible to accelerate implementation of the project through the application of an integrated approach: the conveyor one for linear decisions (allocation of tasks between team members) and the parallel one for nonlinear solutions. The risks related to the experience and qualification of the project manager necessitate the application of control tools based on information technologies.

For complex specialized projects, at insufficient personnel skills, if the critical parameters are quality and time, it is then advisable to choose the option of the outsourced program management. It implements the advantages of the “best practices” method (successful experience of an expert) and the model of reengineering (orientation towards a future structure). The risks are related to the project control, a possible increase in the number of administrative links, poor communication between a project manager and the management team.

When the specificity of a project permits the use of existing networks, the network management is selected. Such an option is the most maneuverable but also the most expensive. An important issue is quality of the partners (affiliates), efficiency and long-term duration of an affiliate program, recruiting of partners.

Note a fundamental feature of the task on choosing the optimal option of the project – estimation of expediency of application, the efficiency of each of them, this is a problem on the multicriteria optimization. In this case, various specific criteria tend to conflict. That is, the plan that minimizes the cost of the project does not ensure its highest quality and, accordingly, does not minimize risk. Thus, there is a need to search for an intelligent, reasonable compromise plan.

We shall introduce a mathematical model of the problem on multicriteria optimization. Let a mathematical model of the designed system be set in the form of the totality of mathematical relations that depend on a set of parameters $\alpha_1, \alpha_2, \dots, \alpha_n$. The space of parameters is a n -dimensional space, each point A in which is uniquely given by the Cartesian coordinates $\alpha_1, \alpha_2, \dots, \alpha_n$. Typically, in the process of design, one can specify the reasonable ranges of possible values for each parameter, that is, one can state the constraints in the form of inequalities

$$\alpha_j^{\min} \leq \alpha_j \leq \alpha_j^{\max}, \quad j=1,2,\dots,n, \tag{1}$$

which are called parametric. These constraints cut out in the n -dimensional space of parameters a hyperparallelepiped, which assigns permissible region G_n of possible values for parameters. In addition to the parametric constraints, the functional constraints of the following type are imposed on the set of possible values for parameters

$$d_k^{\min} \leq g_k(\alpha_1, \alpha_2, \dots, \alpha_n) \leq d_k^{\max}, \quad k=1,2,\dots,p, \tag{2}$$

which assign region G_Φ of possible values for parameters. The intersection between regions G_n and G_Φ ultimately define region $G = G_n \cap G_\Phi$ of the permissible values for parameters.

We assign the set of quality criteria $\Phi_1(A), \dots, \Phi_m(A)$ over the multitude of points A in the parameter space. For certainty, we shall assume that it is desirable to minimize the numerical values for all criteria.

Note that the formal transition from a maximization problem to the minimization problem is always possible by replacing

$$\tilde{\Phi}_k(A) = \frac{1}{\Phi_k(A)} \text{ or } \tilde{\Phi}_k(A) = -\Phi_k(A).$$

Now, the task on design can be stated as the following multicriteria problem from mathematical programming: it is required to find such a set of $A = (\alpha_1, \alpha_2, \dots, \alpha_n)$, which renders an extreme value to all the criteria $\Phi_1(A), \Phi_2(A), \dots, \Phi_m(A)$ on the multitude of permissible values from region G . It is clear that such a problem not necessarily has a solution (usually such a point A does not exist). Thus, there is a specific problem on matching the criteria, whose solution complexity is defined, first of all, by the inconsistency of requirements to the system, which are assigned by different criteria.

Analyze possible approaches to solving the problem on multicriteria (vector) optimization.

1. *Scalarization of a vector criterion by introducing the linear combination of criteria.*

In this case, vector criterion $\Phi_1(A), \Phi_2(A), \dots, \Phi_m(A)$ will be additively transformed into the scalar one in the following way:

$$\Phi_\Sigma(A) = \sum_{i=1}^m \Phi_i(A) \Rightarrow \min_A. \tag{3}$$

It is clear that ratio (3) can be used only if all $\Phi_i(A)$ have the same sign.

The obvious disadvantage of approach (3) is that it does not make it possible to take into consideration the different significance of each of the specific criteria. This disadvantage can be eliminated by introducing appropriate weighting coefficients C_1, C_2, \dots, C_n and constructing

$$\Phi_\Sigma(A) = \sum_{i=1}^m C_i \Phi_i(A) \Rightarrow \min_A \tag{4}$$

or

$$\Phi_\Sigma(A) = \sum_{i=1}^m C_i |\Phi_i(A)| \Rightarrow \min_A. \tag{5}$$

In the case when according to the actual content of individual criteria some of them need to be minimized, and the rest to be maximized, ratio (4) is then transformed to the form:

$$\Phi_\Sigma(A) = \sum_{i=1}^{m_1} C_i \Phi_i(A) - \sum_{i=m_1+1}^m C_i \Phi_i(A) \Rightarrow \min_A. \tag{6}$$

Here, criteria $\Phi_1, \Phi_2, \dots, \Phi_{m_1}$ are minimized, and criteria $\Phi_{m_1+1}, \dots, \Phi_m$ are maximized.

The principal difficulty of the practical implementation of this approach is the need to estimate numerical values of coefficients $C_i, i=1,2,\dots,n$, which take into consideration the differences in the significance of criteria. One can formulate some general considerations concerning the magnitude of coefficients C_i .

1) magnitude C_i must be greater in proportion to how great is the following

$$L_i = \Phi_{i\max} - \Phi_{i\min}, \quad \Phi_{i\max} = \max_{A \in G} \Phi_i(A), \quad \Phi_{i\min} = \min_{A \in G} \Phi_i(A);$$

2) magnitude C_i must be greater in proportion to how great $\min_j \left(\frac{\partial \Phi_i(A)}{\partial \alpha_j} \right)$, is the j -th component of vector

$$\text{grad} \Phi_i(A) = \left(\frac{\partial \Phi_i(A)}{\partial \alpha_1}, \frac{\partial \Phi_i(A)}{\partial \alpha_2}, \dots, \frac{\partial \Phi_i(A)}{\partial \alpha_n} \right)^T;$$

2. *Scalarization of the vector criterion by constructing the product of the individual ones.*

In this case, we introduce as an analog to (3):

$$\Phi_n(A) = \prod_{i=1}^m \Phi_i(A), \tag{7}$$

as analogs to (4) and (5):

$$\Phi_n(A) = \prod_{i=1}^m |\Phi_i(A)|, \tag{8}$$

$$\Phi_n(A) = \prod_{i=1}^m (\Phi_i(A))^{C_i}$$

or

$$\Phi_n(A) = \prod_{i=1}^m |\Phi_i(A)|^{C_i}, \tag{9}$$

and, finally, as an analog to (6):

$$\Phi_n(A) = \frac{\prod_{i=1}^{m_1} (\Phi_i(A))^{C_i}}{\prod_{i=m_1+1}^m (\Phi_i(A))^{C_i}}. \tag{10}$$

It is crystal clear that this approach has the same drawbacks as the previous one. Indeed, by taking an algorithm and making the necessary replacement of variables, we derive from formulae (7) to (10) the ratios (3) to (6).

An additional disadvantage of this approach is as follows. Let each of the criteria has the probability of implementing in the system any property (cost, resistance to external disturbances, etc.), or the probability of solving any separate task given to the system. Then $\Phi_i(A) \in [0,1], i=1,2,\dots,m$. In this case, it is clear that the minimum criteria of $\Phi_{i_0}(A) = \min_i \Phi_i(A)$ majors the product, that is, $\Phi_n(A) < \Phi_{i_0}(A)$.

If in this case $\Phi_{i_0}(A)$ is small, the criterion $\Phi_n(A)$ then becomes weakly sensitive to changes in all its components.

3. *Assessment of proximity to the "perfect" system.*

When implementing this approach, one initially determines, for each specific criterion, its best, "perfect" value. This role could be taken, for example, for the i -th criterion, by such its value that would be achieved at its independent optimization, that is

$$\Phi_i^* = \text{extr}_{A \in G} \Phi_i(A), \quad i = 1, 2, \dots, m.$$

Now, in order to estimate the degree of proximity of the actual system, whose efficiency and quality are assigned by a set of numbers $\Phi_1(A), \Phi_2(A), \dots, \Phi_m(A)$, to the perfect system, we shall introduce

$$\Phi_H(A) = \sum_{i=1}^m C_i |\Phi_i^* - \Phi_i(A)| \quad (11)$$

or

$$\Phi_H(A) = \sum_{i=1}^m C_i (\Phi_i^* - \Phi_i(A))^2, \quad (12)$$

or

$$\Phi_H(A) = \sum_{i=1}^m C_i |\Phi_i^* - \Phi_i(A)|^{C_i}, \quad (13)$$

or

$$\Phi_H(A) = \sum_{i=1}^m C_i (\Phi_i^* - \Phi_i(A))^{2C_i}. \quad (14)$$

It is obvious that all the shortcomings of the previous approaches are present here although not that conspicuously.

We note, finally, another common disadvantage in the components of criteria of type (3) to (14). When optimizing for these criteria, it might appear that the optimal solution, from the point of view of the constructed scalar criterion, is matched with the unacceptably small values for one or several specific criteria. To some extent, this disadvantage can be eliminated in the following way.

We introduce functions

$$\phi_i(A) = \begin{cases} \frac{\Phi_i(A)}{\Phi_i^*}, & i \in E \text{ max}, \\ \frac{\Phi_i^*}{\Phi_i(A)}, & i \in E \text{ min}, \end{cases}$$

where $E \text{ min}$ is the multitude of numbers of those specific criteria that must be minimized; $E \text{ max}$ is the multitude of those specific criteria that must be maximized,

$$E \text{ min} \cup E \text{ max} = E.$$

Then magnitude $F(A) = \min_{i \in E} \phi_i(A)$ defines a value for the "worst" specific criteria. Now, it is possible to set the task to search for a set

$$A^* = \arg \max_A F(A) = \arg \max_A \min_{i \in E} \phi_i(A).$$

In this case, naturally, we achieved an improvement for the worst quality indicator of the system. The constraint here is the difficulties that arise given such a minimax problem.

Structural elimination of the above-mentioned shortcoming is achieved through a transition from the model of unconditional optimization to the models of conditional optimization.

4. *Joint optimization using multiple criteria (Pareto-optimization).*

Thus, m criteria $\Phi_1(A), \dots, \Phi_m(A)$ are assigned in the n -dimensional parameter space $(\alpha_1, \alpha_2, \dots, \alpha_n)$. We shall assume that point A' is not worse than point A if

$$\begin{aligned} \Phi_i(A') &\leq \Phi_i(A), \quad i = 1, 2, \dots, m_1; \\ \Phi_i(A') &\geq \Phi_i(A), \quad i = m_1 + 1, \dots, m, \end{aligned} \quad (15)$$

and point A' is *better* than point A if, among inequalities (15), at least a single one is strictly satisfied. We shall assume that point A is effective if there is not any point $A' \in G$ that is better than A . If such a point A' does exist, then point A is inefficient. Denote via E the multitude of all effective points. The procedure for deriving the multitude E will be explained in a separate case, at $m=2$.

Let $\Phi_1(A)$ and $\Phi_2(A)$ be the criteria for the system that is being minimized. Fix the numeric value for one of the criteria, for example, $\Phi_2(A)$ at the level of b_2 and build the following problem on conditional optimization: it is required to find

$$A^*(b_2) = \min_{A \in G_2} \Phi_1(A), \quad (16)$$

$$G_2 = G \cap G(b_2), \quad G(b_2) = \{A : \Phi_2(A) = b_2\}. \quad (17)$$

It is clear that the point $A^*(b_2)$ obtained in this case is effective. Indeed, let us assume the opposite: let there be at some point A' $\Phi_1(A') < \Phi_1(A^*(b_2))$, and in this case $\Phi_2(A^*(b_2)) = b_2$. It is then contrary to that the point $A^*(b_2)$ is the solution to the problem on conditional optimization (16)–(17).

Because the value for criterion $\Phi_2(A)$ must be minimized, we shall solve a sequence of problems (16), (17) for the decreasing values $b_2^{(1)} > b_2^{(2)} > \dots > b_2^{(N)}$. The sequences $A^*(b_2^{(1)}), A^*(b_2^{(2)}), \dots, A^*(b_2^{(N)})$, obtained in this case, will be compared to the corresponding sequence of pairs

$$\left\{ \begin{aligned} & \left(\Phi_1(A^*(b_2^{(1)})), b_2^{(1)} \right), \\ & \left(\Phi_1(A^*(b_2^{(2)})), b_2^{(2)} \right), \dots, \left(\Phi_1(A^*(b_2^{(N)})), b_2^{(N)} \right) \end{aligned} \right\}.$$

Thus, the obtained totality of pairs of numbers $(\Phi_{11}, \Phi_{21}, \Phi_{12}, \Phi_{22}, \dots, \Phi_{1j}, \Phi_{2j}, \dots, \Phi_{1n}, \Phi_{2n})$, makes it possible to build a dependence $\Phi_2 = f(\Phi_1)$, which assigns a multitude of effective points. The corresponding curve in the (Φ_1, Φ_2) coordinate system demonstrates a clear interpretation of correspondence between Φ_1 and Φ_2 .

5. *Determining the decisive criterion.*

In this case, out of the totality of criteria $\Phi_1(A), \Phi_2(A), \dots, \Phi_m(A)$ one chooses a single one, $\Phi_{i_0}(A)$, which is the most important. For all other criteria $i \neq i_0$, we set the required value d_i . The multicriteria optimization problem now transforms to a regular problem of optimization for a conditional extremum: it is required to find

$$A^* = \arg \text{extr}_{A \in G(A)} \Phi_{i_0}(A), \quad (18)$$

where

$$G(A) = \{A: \phi_i(A) = d_i, i \neq i_0\}. \tag{19}$$

A certain possible strengthening of this approach is associated with the introduction of “concessions”. In this case, it is assumed that the relatively small changes in the boundary values for criteria that form the permissible region, “a concession”, can lead to significant improvement in the value for the criterion based on which the optimization is performed. Thus, we come to the problem in which the numerical values for criteria – constraints – are superimposed by the bilateral constraints of the type

$$d_i \min \leq \phi_i(A) \leq d_i \max,$$

where $[d_i \min, d_i \max]$ is the permissible range of values for the i -th criterion. In this case, there is a significant expansion of the region of possible solutions, which naturally provides for the possibility of obtaining a better solution for the main criterion $\phi_{i_0}(A)$.

The problem derived (18), (19) is a general problem of mathematical programming with no universal method to solve. Depending on the structure and features of the task, in order to address it, we can suggest one of the following techniques.

A. Decreasing the dimensionality of the problem.

Let the permissible region $G(A)$ be assigned by equations

$$g_i(A) = 0, \quad i = 1, 2, \dots, m. \tag{20}$$

Suppose that equations (20) can be solved relative to part of the variables.

Then, if $A = (\alpha_1, \alpha_2, \dots, \alpha_n)$, $n > m$, we can derive ratios

$$\alpha_j = f_j(\alpha_{m+1}, \alpha_{m+2}, \dots, \alpha_n), \quad j = 1, 2, \dots, m. \tag{21}$$

In this case, variables $\alpha_{m+1}, \alpha_{m+2}, \dots, \alpha_n$ could be naturally termed “independent” as opposed to the “dependent” variables $\alpha_1, \alpha_2, \dots, \alpha_m$.

Substituting expression (21) into $\phi_{i_0}(A)$, we obtain the problem of unconditional optimization of functions $n - m$ of independent variables

$$\phi_{i_0} \left(\begin{matrix} f_1(\alpha_{m+1}, \dots, \alpha_n), f_2(\alpha_{m+1}, \dots, \alpha_n), \dots \\ f_m(\alpha_{m+1}, \dots, \alpha_n), \alpha_{m+1}, \dots, \alpha_n \end{matrix} \right).$$

The resulting problem is a fundamentally simpler than the original one. To solve it, one can apply any numerical algorithms or analytical methods. However, to implement the procedure of excluding part of the variables by constructive use of constraints (20) is quite difficult in practice. Another approach relates to the increased dimensionality of a problem.

B. Method of Lagrange multipliers.

We introduce the function

$$\Phi(A, \Lambda) = \phi_{i_0}(A) + \sum_{i=1}^m \lambda_i g_i(A). \tag{22}$$

Here $\lambda_i, i = 1, 2, \dots, m$ is a set of the undetermined Lagrange multipliers. Function $\Phi(A, \Lambda)$ from $n+m$ variables is termed the Lagrange function. Compute and equate to zero the specific derivatives from this function for A and λ .

$$\frac{\partial \Phi(A, \Lambda)}{\partial \alpha_j} = \frac{\partial \phi_{i_0}(A)}{\partial \alpha_j} + \sum_{i=1}^m \lambda_i \frac{\partial g_i(A)}{\partial \alpha_j} = 0, \quad j = 1, 2, \dots, n. \tag{23}$$

$$\frac{\partial \Phi(A, \Lambda)}{\partial \lambda_j} = g_j(A) = 0, \quad j = 1, 2, \dots, m. \tag{24}$$

Next, it is typical. Next, it is typical to employ the following technique. By solving a system of equations (23), one represents variables $(\alpha_1, \alpha_2, \dots, \alpha_n)$ through variables $(\lambda_1, \lambda_2, \dots, \lambda_m)$. The dependences obtained are put to ratio (24) and, by solving the derived equations relative to $\lambda_1, \lambda_2, \dots, \lambda_m$, one finds their values. These values are substituted in the previously obtained expressions that are related to $\lambda_i, i = 1, 2, \dots, m$ and $\alpha_j, j = 1, 2, \dots, n$, which yields the desired solution.

C. Method of penalty functions.

It is clear that the direct application of the method of Lagrange multipliers is technically challenging if the number of constraints-equalities is large. On the other hand, the method simply does not apply directly if the inequalities are the constraints. In this case, one can use a different approach, related to the introduction of the so-called penalty functions. In this case, in order to solve the problem of minimization of function $F(A)$ under constraints $g(A) = 0, i = 1, 2, \dots, m$, it is required to minimize the function

$$\Phi_k(A) = F(A) + C_k \sum_{i=1}^m g_i^2(A)$$

for a sequence of values $C_1 < C_2 < \dots < C_k < \dots$

The examined methods for solving a problem on conditional optimization could be employed to solve the above-stated problem on finding a consistent optimum for any number of competing criteria.

The possibilities for practical application of the described approaches to solving a multicriteria optimization problem become challenging under conditions of uncertainty. The most adequate model of uncertainty emerges when initial data for the calculation of private criteria are defined in terms of fuzzy [13, 14] or [15] imprecise mathematics. Possible ways to solve respective optimization problems were proposed in [16, 17].

Returning to the tasks of affiliate marketing, we shall categorize the appropriate programs in the following way.

1. Unrelated affiliation. The strategic task is to attract attention of the target customer. It is based on the models CPC (Cost Per Click) and PPC (Pay Per Click), capitalizing a click generated by the customer that followed the link. It is characterized by the lack of communication between a customer and a buyer.

2. Related affiliation. Placing links of affiliated character in blogs. It applies the pricing models CPI (Cost Per Impression), OPI (Pay Per Impression).

3. Involved affiliation. It implies the automated use of the advertised products and services in the format of direct recommendations. FFA (Flat fee advertising).

4. Multilevel affiliation. This is the hierarchical network structure that makes a profit, depending on the level (first levels gain the most). It is based on the multilevel pricing model.

5. Mobile affiliation (CPA and CPI-networks).

Table 4 gives an analysis of the characteristics and features of CPI-networks oriented towards mobile and unmotivated user traffic.

Increasing the efficiency of network functioning within the framework of affiliate marketing is helped by the compliance of the project to the overall promotion strategy based on the following algorithm:

1) determining the objectives based on the strategy of monetization (new downloads/ enhancing activity of the audience);
 2) selection of tools for analytics (tracker);
 3) choice of an affiliate CPA network (category of programs/ program type); 4) establishing rules and conditions for partners (project management options/ methods of payment);

5) generation of the required marketing materials;
 6) launching a campaign;
 7) analysis of results of the campaign.
 The current trend is the application of an integrated approach to the implementation of projects of affiliate marketing (Table 5).

Table 4

Analysis of CPI-networks oriented towards mobile and unmotivated user traffic

Title	Started from	Characteristics	Special features
MobioNet-work	2013	<ul style="list-style-type: none"> – own development of the company; – a complex of services for developers; – it makes it possible to attract large volumes of targeted traffic worldwide 	<ul style="list-style-type: none"> – the availability of detailed and useful guides to work not only with MobioNetwork, but with any other CPI-network; – the pricing model CPI and CPA
Clickky	2013	<ul style="list-style-type: none"> – own development of the company; – offices in 3 countries: United States, Israel, and Ukraine; – headquartered in Odesa; – more than 20 thousand partner companies; – more than 100 million clicks; – more than 6 million application installed 	<ul style="list-style-type: none"> – comprehensive work to promote applications; – the pricing model CPE (payment only for users who acted in the application); – Organic Burst is a unique analytical strategy that makes it possible to estimate the inflow of organic users and to efficiently use resources for advertising campaign
UniLead Network	2011	<ul style="list-style-type: none"> – mobile advertising network with a global reach; – specializes in advertising for mobile applications with the post install optimization (PIO); – one of the largest mobile advertising networks 	<ul style="list-style-type: none"> – detailed statistics; – own measurement tools; – dynamic analysis of clicks and target users' activities; – variety of advertising formats

Table 5

Principles of an integrated approach to projects of affiliate marketing

Principle	Benefits	Risks	Recommendations
Alignment with the strategy of promotion	<ul style="list-style-type: none"> – an increase in the number of new downloads; – an increase in the activity of the audience 	<ul style="list-style-type: none"> – lack of monetization model at present 	<ul style="list-style-type: none"> – to establish an indicator for efficiency of promotion; – to analyze the number of new installations, the cost of engaging a new user and the number of active users
Work with multiple networks at the initial stage of promotion	<ul style="list-style-type: none"> – maximum coverage of potential users and partners 	<ul style="list-style-type: none"> – too many networks for interaction; – high probability of substandard installations 	<ul style="list-style-type: none"> – to control traffic over the entire time of work with a source; – to analyze different sources of – to purchase traffic
Identify the sources and types of traffic	<ul style="list-style-type: none"> – formation of non-motivated quality traffic 	<ul style="list-style-type: none"> – motivated poor traffic does not leave the user in the application 	<ul style="list-style-type: none"> – banner and media advertising – contextual advertising; – traffic from other mobile applications; – traffic from advertising networks; – video advertising on the network
Traffic of analysis for each site	<ul style="list-style-type: none"> – the advertiser can measure the quality of traffic for each channel, but not over the entire network 	<ul style="list-style-type: none"> – a CPI network aggregates a multitude of sources; each works differently and yields a different result 	<ul style="list-style-type: none"> – to mandatory collect ID of each source in statistics; – a detailed estimation of traffic quality in the channels of the network
It is necessary to introduce a daily cap for each source	<ul style="list-style-type: none"> – the advertiser will be able to control the traffic and timely switch off ineffective channels 	<ul style="list-style-type: none"> – advertisers give an overall limit for the network; – possibility to connect 1–2 sources 	<ul style="list-style-type: none"> – it is important to introduce not a general cap per a network, but the cap for each partner
To establish the banned traffic sources	<ul style="list-style-type: none"> – it makes it possible initially to remove those traffic sources that are undesirable for the program and may negatively affect its brand 	<ul style="list-style-type: none"> – the lack of opportunities to optimize traffic 	<ul style="list-style-type: none"> – to stop using motivated traffic for installing the application at the initial stages
Adequate model for determining CPI	<ul style="list-style-type: none"> – network provides its estimates, advertisers compare them; – the higher CPI, the larger the volume of traffic; – high rate makes it possible to buy expensive sources with high quality traffic 	<ul style="list-style-type: none"> – understated CPI reduces the volume of traffic; – high rate makes it possible to buy expensive sources with high quality traffic 	<ul style="list-style-type: none"> – to set the competitive CPI; – to apply an iterative approach to the estimation of results; – to take into consideration the specificity of national markets; – to take into consideration the specificity of different types of applications

The use of affiliated networks is recommended when there are sufficient budgets and when an advertiser understands the principles of networking and knows how to create an efficient affiliate program.

5. Discussion of results of analyzing the technological innovations of digital marketing

The results obtained make it possible to highlight the main technological innovations of digital marketing, the scope of their application, risks, advantages, and disadvantages. Classification and comparison of digital marketing innovations was carried out based on the selection of technological changes in the functioning of the Internet. Specifically, these include the technology for automated content, video content, the technology to automatically adapt content to the targeted audience. A monetization strategy for mobile marketing applications is aimed at optimizing the users' activities. A model of the interaction between key counterparties in affiliate marketing will make it possible to optimize the activities of counterparties depending on the pricing model for an affiliate program or on the variant of affiliate project management.

The disadvantages of this study include the lack of a sufficient base of empirical data. The scope of application of research results covers both the theoretical and practical aspects. Results of this study could be implemented in the activities of enterprises from all sectors of economy during operations in the Internet environment. The further studies should include the development of guidelines regarding the appropriateness of the use of the specified tools of digital marketing in B2B and B2C markets. In this respect, there are several issues to be addressed: the way to estimate effectiveness of the toolset, the number of tools that would be sufficient, as well as to calculate a marketing budget.

6. Conclusions

1. We have defined the fundamental theoretical basis for using the tools of digital marketing. It is indicated that the result of the emergence of new digital marketing tools are the two factors: technological innovations and personalization of business appeals to the Internet users. It is proposed to define digital marketing as a form of implementation of marketing

activities using digital channels and technologies. We have described basic activities in digital marketing. Each activity is given its essence and its effect for the customer. We have highlighted main directions and activities of digital marketing, underlying the optimal promotion of a web site in the Internet. The following technological innovations of digital marketing have been identified: native content, artificial intelligence, integration of marketing technologies, virtual and augmented reality, the Internet of Things, voice bots, video and mobile marketing, affiliate marketing.

2. We have defined the strategies for monetizing applications in mobile marketing. The conditions for their application have been given, as well as advantages and disadvantages. It has been proven that effectiveness of marketing activity under modern conditions in many respects depends on the rational use of capabilities of mobile platforms. It is the mobile marketing that is the most popular tool in the system of marketing activities that have an impact on the potential consumer.

3. We have proposed 11 pricing models and three variants of affiliate marketing project management depending on the type of partners and their roles in the affiliate network: internal management, network management, external management. The criteria for choosing the optimal option were identified – characteristics of the project, qualitative and quantitative parameters of the team of executors, flexibility of external relations. For each type of counterparties in affiliate marketing, the benefits and risks were determined. We have devised recommendations for the algorithm of activities in affiliate marketing, depending on the stage of the life cycle of the program. At the stage of creating an affiliate program, it is recommended to pay considerable attention to contracting issues, to analyze an advertising strategy, to choose an affiliate program taking into consideration the specificity of activities, to prepare promotional materials, to apply modern technological toolset to analyze leads. At the stage of launching an affiliate program, it is required to implement a system for analysis of the status and origin of leads, quality of user traffic from webmasters, to introduce programs of motivation of webmasters, to add different validation techniques. We have defined criteria for selecting a variant of project management and the principles of an integrated approach to projects in affiliate marketing, as well as their benefits, risks, and recommendations. Specifically, the task on choosing the optimal option of the project is stated as the problem on multicriteria optimization. An analysis of methods for solving this problem has been performed.

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