

Information Ecology, Interface and Interactivity

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ABSTRACT

In the last five years we can discovery development of the new networks' technology and some aspects of these are discussed in this article: smart networks; networks based on machine learning; M2M network; network using deep learning. The interface is an environment that in the past 50 years has been the subject of research by media ecologists. The main problems faced by researchers are the following: how to build comprehensive and deep relationships and connections between the physical environment, information resources, and media. One solution is to introduce more interactive elements on media sites to visualize scenes and improve the quality of content. The article is devoted to the models of building an interactive space using new technologies, considering the trends in the development of information ecology. In this paper we also analyse the following very important topics related to interactive technology, and intelligent systems: conversation in the interactive space; artificial intelligence, big data and analytical techniques, mobile technology and some aspects of communication problems in the 21st century.

Keywords: *Information domain, media ecology, interactive models, new media technologies, artificial intelligence, interactive agents*

The interface is a space in which the media can interact with itself. In the “*technopedia.com*” technology encyclopedia, the user interface is defined as a means of user interaction with electronic devices, such as computers, television systems, portable devices, and other applications. The interface uses icons, menus, graphic indicators, display of information about stops, and also relates to various control devices that the application still finds - computer mice, special rolls, pens, touch screens. The first human-computer text interface is implemented using the keyboard. The interface provides more opportunities for interacting with the environment and forming an environment of the “mutual evolution” type.

The french researcher of modern computer technologies, Michel Lafon[1] explores human-computer interaction through the prism of interactivity. According to him, there are three main models of interactivity: a computer is considered as a means; computer as a partner; computer as a medium. We are interested in the latest model, in which computers serve to communicate with people through e-mail, chat rooms and video conferencing. The interactive model has three dimensions and features:

- Descriptive: ability to identify impact and existing interfaces.

- Evaluative: allows access to the development of various alternatives.
- Generative power: helps designers refine and create a new design.

The evolution of media technologies over the past 200 years has focused on: newspapers; phone; moving pictures; radio; TV; cable TV; the Internet; web and semantic networks; network based on data; Big data; machine learning; media based on AI.

Next, we look at the characteristics of the five basic technologies[2] that will influence on the media in the 21st century:

- “Bluetooth” (2000)-leads to the concept of data exchange in a continuous mode, in wireless communication between people; formation of personal networks using mobile devices;
- Skype (2003) - one of the greatest technological innovations - special software provides verbal communication through computers and, more importantly, launches video chats;
- Facebook (2004) Social media pioneer - gives the average person the opportunity to share their own ideas about the world; social media is becoming a part of business, a

major news channel and global influence; transformation of how people work and live; social networks are a means of communication and interaction with a large group of people, providing an exchange of opinions and ideas;

- iPhone (2007), Apple's innovative product, appeared 29.06. 2007. This has a huge impact at the beginning of the 21st century on the development of technologies and methods of communication; as a result, functional touch screens, virtual keyboards, the boom of smartphones, the global impact of product innovation;
- IBM Watson (2010) - there are opportunities for interactive, compatible computer systems; allows a breakthrough in technology in the 21st century; new methods of processing and transmitting information are used, such as machine learning, automatic answer to questions, evaluation and interpretation of huge information archives; Manage automated devices with voice commands. The system is trained to compete in the Jeopardy television game, Watson successfully defeated the winners of the game from an earlier landing. Watson works using information management architecture related to deep technology.

In the nowadays companies for mobile services, social networks, various computer applications are constantly collecting data about people without the last suspicion, and then used to develop intelligent software systems to predict the behavior of wakefulness. As Rob McNimmy points out in combinations of similar systems with manipulative and internet platforms, there can be quite unpleasant things for people. One of the ways to protect citizens is to change the approach to the use of technology. Convincing methods are integrated into web platforms to attract readers to the services offered. At the moment, the audience does not understand the dark side of the platforms, as long as they do not engage in activities that lead to personal and financial losses. We, as consumers, have more opportunities to control the Internet and influence lifestyle.

Today, platforms for automatic data management are limited to several technologies, such as Amazon Alexa, Google Home, Apple Siri, but very soon sensitive information about us will be able to receive funds such as television systems, cars, refrigerators, toys, etc. As a result, the collected personal data can

be used in intelligent systems and algorithms with which you can manipulate the attention and behavior of consumers in order to make a profit for owners of web platforms. We now have control over the extent of the Internet impact of items, because they are very poorly distributed as technologies. Experts advise people to think about the negative aspects of technology right now, before it is too late. Our voice - our experience is of paramount importance. Otherwise, anti-utopian technologies will control our life in the near future. Excessive reliance on Internet platforms as something good and positive causes people to ignore warning signals about hazards.

Seven important principles that can help a company using an artificial intelligence platform[3] to solve potential problems, published on "euronews.com" from 11.27.2018g. The available issues will be discussed at the World Economic Forum in Davos in 2019, related to the consequences of the "Industrial revolution-forth".

- Accuracy — Knowing what happens to business algorithms and the implications for companies;
- Transparency- to be open to change, to publicly talk about your problems and requires seven reliability, consistency, realism;
- Empathy - to be in direct contact with those affected by our services and products;
- Critical thinking - encouraging research and an honest answer;
- Strategic approach - based on scenarios, presentation of the results of the strategy implementation /being part of the community - important requirements /;
- Democratization of processes - avoiding centralization, constant control and narrative monopoly;
- Collaboration — To help decision makers and policy makers explain massive changes.

In other words, actually speaking, the long-term expected benefits and realities as a populist element that is part of the democratic process can lead to huge losses for entrepreneurs.

Bonnie Nardi and Vicki O'Day in their book "Informational Ecologies"[4] show how technology can acquire a human face when properly managed and integrated into a social

environment where the human factor cannot be ignored. Information ecology is a system that includes people, practices, technologies and values as part of the local environment. Nardi (researcher at the Lab AT & T) and O'Day (analyst at Xerox) encourage the reader to become more sensitive and know how people and technology to interact. The key to understanding such actions is finding the answer "know-how" before moving on to the question "know-how."

We will also focus on some aspects of the impact of new technologies[5] on the media:

- **Accessibility:** the technology allows you to transfer news and quality content using mobile applications and smartphones, the reader can reach the material much faster than with traditional means.
- **Use of social networks:** today most of the media use active social networks such as Facebook, Twitter and Instagram.
- **Involvement:** through social networks, traditional news sites seek feedback and connect the reader with content. Comments help to improve the service of people in the future and get more information about interesting materials;
- **Podcasting:** the perfect way to stream audio programs, for example, using phones and computers. People listening to podcasts are easily trained to pay attention to discussions about politics, national issues and finances.
- **Streaming:** a new wave - puts the person at the center of what is happening. This is achieved through funds such as YouTube Live or Facebook Live.

In the journal "Newscientist"[6], physicists say that information is a fundamental dimension, as well as matter, energy, space and time. In recent years, many physicists believe that material physical reality, or even called "this" completely consists of information or bits. Recently, theories that describe space and time using quantum mechanics, which analyze elementary particles and substances based on information, are the most common language for describing processes. What is information? Is this a real or ontological structure, the magnitude arises where space, time and matter, just as an atom arises from elementary particles such as electrons, quarks and gluons? Or is epistemological information something that represents only our knowledge of reality? On these indicators, opinions are divided. The

cosmologist Paul Davis, in his book *Information and the Nature of Reality*, argued the thesis that information "is an ontological basis." In other words, it is not "something", but the "thing" itself. Assuming that all reality arises from information, this information is only knowledge of the basic quantum state of the universe.

Perhaps the worst feature of the Internet, says Richard Dawkins[7], one of the most popular scientists in Europe today, is that surfing is overly addictive, losing time and encouraging the habit of skipping a topic from the topic instead of completing what has already begun. Unplanned global networks are a mirror image of the evolution of the nervous system in multicellular animals. A very interesting thought about new technologies lies in the assumption of Dawkins that human society will become one if we can read our thoughts together through a high-speed direct connection between our brains. It is not surprising that the individual units that make up the Internet merge into something like that. It is known that the Massachusetts Institute of technology/MIT/ is working on the communication "brain to brain", successful experiments have already been conducted in 2018, and many publications on this topic. In this direction, new neural networks will be improved. Dawkins concludes that virtual reality and high-resolution images will be increasingly difficult to distinguish from the real world.

Knowledge and control of the information field has recently become an important condition for structuring a communication system and providing useful information about threats to enterprises and institutions, as well as providing knowledge about potential problems and risks. The information domain includes the following main elements: the construction of a modern information system; creation of data storage and processing centers; implementation of platforms and programs of cloud resources; building an analytical architecture; software for data analysis and interpretation of information; integration and integration of individual platforms; training managers to work with information retrieval programs; education and training organization.

Key areas for improving IT:

- **Mobility and ease transfer of media content;**
- **Stability - requirements as result of non-standard environment in difficult problem situations;**

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- Flexibility / interchangeability - creating unified and hybrid web platforms;
- Simplicity - ease of technology application and software, minimal costs for employee training and quick development;
- Accessibility - low costs when using technology.

The technocrats want constant change, as the law of Moore, which means that every two years there is a significant transformation and the emergence of new types of technology. New phenomena and related concepts that have emerged in recent years: fourth industrial revolution/industry 4.0/; post-digital technology; machine learning; cognitive technologies; post-truth, offering an individual approach to finding information; more emotions and feelings when defining problems.

The main directions of development of intelligent tools are focused on automatic recognition of patterns, forms and objects. Every day, people generate 2.5 centners of data bytes, with 90% of the world's data generated in the last 3-4 years. Other recommendations for improvement include: automatic process planning; using natural language to control machinery and objects; knowledge presentation and discussion on various mobile platforms; the introduction of a social and emotional element into computer systems. Modern machine learning models also appear: the explosion of data sources and the complication of information lead to the fact that the manual classification of facts and analyzes becomes ineffective and uneconomical. Depth neural networks automate data processing tasks.

Modern networks, by definition, are information-oriented, encoded in an algorithm for collecting, analyzing and structuring end-user data. Information is a significant capital, and all organizations based on the information area, on the one hand, are easily adaptable, and on the other hand, they are competitive and can generate significant profits. Information is of strategic importance, building appropriate storage platforms, extracting and accessing information provides significant advantages to modern organizations. The information strategy has the following objectives: to make information more accessible; reduce costs and effort in managing and using information; promote the development of information skills at all levels of the organization; improve the quality and accuracy of information.

The main property of information is its value, it is also more valuable than gold. It is no accident that information is subject to special legislation, and governments devote significant resources to its protection and security. There are dozens of specialized agencies around the world to collect information, and the military and technologically advanced countries have developed a special methodology for organizing and conducting information operations. When searching for data on the term "information" on the Wolfram Alpha network (see www.wolframalpha.com), the following results were obtained: the information was received and understood by the message; knowledge gained from research, experimentation or training; a set of facts on the basis of which we can draw conclusions; (theory of communication) measurement of uncertainty using numerical methods. The concept of information appeared in English in 1387, starting with Latin and old French. The frequency of use of the term has increased significantly since 1950. Synonyms of this term are: information, data, selective information. Other terms related to information: database, formatted data, details, facts, factors, formatting, gene. In a broader sense, the concepts that interact with this term are: content, communication, thinking, knowledge, accumulation, assembly, collection, information measure, content.

Information theory is the result of not only the research of Claude Shannon[8], but also a number of scientists before him with different orientations and knowledge. Mathematically, Shannon proves that there are ways to encode information so that errors are reduced to zero, despite the interference during the signal transmission. This is achieved by entering an unlimited number of bits and codes so that the back side can recover most of the information. On the other hand, an increase in the complexity and length of a message can slow down the communication flow as much as possible, but the main thing is that we can minimize errors. Shannon is still aware that the content of the message is not related to its transmission, regardless of what it means: text, sound, image, video. In the end, data can be represented in digital form and transmitted without errors. Shannon's views combine existing and future communication architecture and engineering related to the transmission of text, telephone and images, and from that time on all communication models can be encoded using

bits. This digital form of communication is becoming dominant today.

In 1945, Claude Shannon used the phrase "information theory" in an special article[9]. According to him, information is uncertainty, surprise, complexity and entropy.

The main ones in this case are:

- Information is closely related to uncertainty. Uncertainty can be measured by counting the number of possible messages. If there is only one message, then there is no ambiguity, but in this case there is no information.
- Some messages may be more likely than others, because the information implies an unexpected or even way of expressing probabilities.
- The complexity of sending messages from one point to another is of theoretical importance.
- Information entropy. Entropy is a complex concept and is a measure of the system imbalance in thermodynamics / science for heat and energy.

From the point of view of IT engineers, to transmit more information to the channel, power must be increased, but this principle does not work over long distances due to increased noise. Shannon proposed a solution to the problem, looking at the signal in the form of a chain of discrete symbols. Instead of increasing the power, the source can overcome the noise using additional error correction symbols, or this means an increase in the number of words in the message. Shannon uses a special algorithm for measuring information - H , which he calls the entropy of a message or just information. Karl Eckart (biologist) says that "thinking creates entropy." Schrödinger, the creator of quantum physics, argues that organisms feed on negative entropy, or in other words, the organism limits the order of the environment. By analogy with the law, Moore Shannon defines a roadmap for the development of communication and information technologies and invites people to understand where they are at present and where they can go in the future. It should be clear that information on household and interpretation is important for the development of social and cultural development, i.e. without information. A huge amount of information from DNA can be transferred to each, recorded in the form of systems of completeness and integrity.

One publication in the forums of website in MIT [10] trying to answer the question: What is the meaning of information? All this means that popularity of this term is still important. The forum set forth the basic principles of the philosophy of information and global values: useful for business and management of attention; production and management based on data; media technologies; accessibility and access to information technologies will increase the efficiency and important of freedom and liberty. Answer questions related to information and knowledge there is different approaches:

- Complexity and diversity - information is private, fragmentary and specific, structured, universal and universal;
- Time frame - information on the time and economic value;

in / space-information flow; knowledge disposal and spatially expansive. All that is needed for this is all that is needed to get information about what is all that is needed; syntactic: information structure, basic rules; as soon as it is recorded, it will be remembered that it is necessary for mastering the rules of syntax; semantic: inclusive value on information, i.e. The exact value does not have a single structural information; pragmatic: focused on actions related to Korean information policy, value information, information about the state of light; approbation: attitude to the goals and focus on the content.

The underlying principle on the Internet, i.e. keep up with the news when you are in the news, museums or videos that can be found in web, which can be proved. In this case, the fundamental rules in business can be violated. For example, many American meditations should be focused on high-quality shooting. Formation: text, books, news, sound, music, conversational, imaginative, photographic and illustrative, file.

You can count on a complex value, measured based on data measured on complexity. Many possible cases and possibilities vary depending on the situation. The number of problems associated with the problem, tolerance and time, and the search space, to solve the problems needed to solve the problem. Specific and visible information about the opportunities and consequences taken to achieve specific goals depends on the way of life. Non-specialized information about opposing conditions. For example, a cryptosystem transmission system

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must generate open information, and then understand the information cryptosystem to set specific information. Grigory Cetin, Ray Solomonof and Andrei Kolmogorov. Instead of developing information theory algorithms, individual consequences for character decoration are developed. When using this information, $H(X)$ requires the minimum size of the program necessary for the development of events X .

Interactivity is the main activity of so-called "information experts", including:

- Strategists
- Coordinators
- Analysts and knowledge workers - engineers, scientists and technologists
- Data interpreters
- Data analytics and communicators

Distinctive activities related to the effectiveness of interactive initiatives;

- Search for information: by phone; by network; using intelligent "web agents";
- Traditional mail; by email; electronic data exchange;
- Monitoring / updating the portfolio for business /: media / Reuters, Business Wick, Wall Street Journal, Financial Times /; online; on the IoT online networks.

Principles of interactivity: variable content; integrated internet technologies; platform flexibility; scalability and modularity; program code; automation / data processing and solutions /; active participant in the individual sessions; streaming of information and video / streaming technology /; mobile applications; accessibility from anywhere; media as a translator of reality / pattern, object and voice recognition, speech to text conversion /; construction of additional and mixed reality / AR, MR /; communication depends on the speed of information exchange.

Interactive media [11], by definition, refers to the digital type and includes a combination of electronic texts, graphics, dynamic images and sounds, structured in a computer environment that allows people to interact with the data to achieve certain goals. The digital environment, according to experts, includes the Internet, telecommunications, interactive digital television. Digital space is characterized by a huge variety of data transfer channels and data

delivery platforms. With the advent of computer media or the so-called "digital", the term "new media" appears. In this case, the definition of "new" is added to the basic term "carrier", which leads to problems with definitions. The combination of "interactive media" is a more appropriate term, with an emphasis on interactivity as a key function or, in this case, a search for something essential to distinguish traditional media from more modern ones. The confusion becomes even stronger after the emergence of terms such as "social networks", which describe the success and boom of social sites such as Facebook, a masterpiece and twitter. On these open source sites, interactivity is inherent, but to a certain extent. Other concepts that have gained popularity in recent years are "apps" or mobile phone apps; ICT; Digital revolution, convergence, digital literacy. The main channels for delivering digital content are- DVD, iTV, web and mobile devices;

As for interactive design, Columbia University / USA / offers several recommendations listed below to achieve greater interactivity on information sites.

- The more interactive elements in the project, the greater the cost of its creation and implementation.
- Greater interactivity - means a greater involvement of the viewer in content.
- Better interactivity - leads to a more efficient content structure, prompts the user to do something familiar.
- Many site variations may confuse the user. The design is a hidden network of possible ways for the site user.
- Less interactivity increases the likelihood that the viewer will be bored with content.
- Using "metaphors" - the interface of the page is closer to the daily activity of the audience / pages of booklets to continue reading; opening special folders for more detailed content. Metaphors must be adapted to the topic. Metaphors do not simplify and minimize the described object.
- Simple page navigation - limiting the number of clicks to get the necessary information / more clicks on resources leads to a loss of interest /.
- The system used the structure, links and site navigation should be clear to the user, otherwise disappointment and rejection of the content.

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Next, we consider some forms of communication used in online learning, which are used in world practice. Interactive e-learning is often defined as a “dialogue” between students and learning tools, providing students with greater motivation and active participation in the learning process.

You can specify the following levels of online learning:

- Passive level of e-learning without interaction: the process in this case is linear without interactive elements and includes - pictures, graphics, video, audio, test questions;
- E-learning with limited interactivity: limited participation in the process; students may have some control over the experiments; simple interaction with the material is available. This level includes -animations; selectable menus; download and save files; multimedia;
- The level of complete interactivity: immersion in the learning environment. Students fully control the experience, experiment, can interact with the content and receive feedback. This level includes the following techniques: interactive games; simulated exercises; setting up audio and video elements; stories and scripts.

Interactivity is a process associated with communication environment variables. Like face-to-face communication, computer-mediated communication has a high level of interactivity. The result of these processes is the motivation and involvement of participants in actions. Interactivity can better explain interactions typical for groups in a computer environment. Interactivity is not a feature of the environment. It is rather the processes that form communication. It also determines how each subsequent message corresponds to the previous one or, more precisely, how the later messages relate to the earlier ones. Considering the theory of Hoffman (1967 and 1981), Brett (1983), Rogers (1986), Tannen (1989), Elgolf (1992), Walter (1992). It can be said that communication is mainly related to the goals of interaction. Interactivity is still the place to exchange the interpreted context. Interactivity involves different ways of interaction between participants. With the help of a conversation considered as an iterative process of communication, collective generation of meaning is achieved. Interactivity encompasses

those forms of communication that are more personal, personalized, and dialogue-oriented. It is more logical to say that interactivity is an important model used to map the activity of groups using computer communication technology, also referred to as a hybrid construct. Interactivity is the link between personal and mass communication, mediated by the media and direct communication, between written and oral communication.

According to Rafaelli’s classical interactivity development, since 1998 we can talk about three forms of communication:

- Declarative or single-level (typical for radio and television);
- A reactive or two-stage advanced model;
- Interactive - requires consideration of the following messages with the previous ones but considering the reaction to them.

Interactivity, according to an article [12] published in 1997 in the journal *Computer Communications* and published in the specialized online library Wiley, is a state of communication in which spontaneous and continuous exchange of information takes place, which creates conditions for the formation of social power. connecting people. Interactivity in the communication environment is associated with behavioral attitudes of approval and satisfaction of communication. Processes are related to presentation, quality, motivation, understanding, sense of entertainment, learning, openness and honesty. It is believed that interactivity leads to increased cooperation and building partnerships between people in the social continuum.

Jensen [13] points out several forms of interactivity, considering the works of Raphael and others before him.

- Transmission - measures the media potential, providing a continuous flow of information, including video on demand, teletext, multichannel systems, data transmission;
- Advisory interactivity - refers to two-level media systems with a return channel /online information services, electronic encyclopedias, FTP, Gopher;
- Interactivity based on conferencing system - allows the viewer to create and enter their own information into multimedia systems based on two-way video and live video:

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examples here are newsgroups, video conferencing systems and email;

- Registration - recording information from the reader / viewer and adapting the media to the needs and actions of the person. The system is based on automatic response and adaptation. Examples: video surveillance and response systems, intelligent agents, smart guides, intelligent interface.

Michael Fox and Miles Camp [14] are modern authors who define more detailed interactive architecture. This architecture changes the vision of the future, based on intelligent projects (AI) and integrated new technologies. The existing landscape of interactive space is built based on the convergence of the space intelligent system and the physical, also called "kinetic system". Both systems provide structural adaptation in context and support the relationship between man and the environment. It is believed that future architectures will actively use unique applications and methods that are dynamic, flexible, self-tuning and functional. Part of the interactive structure is the construction of an intelligent space environment in which computer systems are freely used to expand the scope of routine, ordinary activities. In this regard, MIT finances projects based on a wide range of human-computer interaction; Integrating intelligent technologies into an environment with which people are in constant contact with all objects in their field of vision.

INTERACTIVE AGENTS

The creation of interactive agents combines research from several disciplines, such as linguistics, computer graphics, and virtual reality. They are usually managed using natural language, including- commands, questions, and declarative sentences. Information sharing is a two-way process between a person and an object. This type of technology is still unique programs and virtual objects that have environmental knowledge. Commands are focused on basic actions and behavior in a real environment. Questions are focused on obtaining information or require some action. Declarative sentences provide information to agents, change their knowledge of the environment, and teach them basic behavior. The main components of the interactivity of this machine are: sensors, controllers, knowledge, and actuators. Controllers create the appropriate behavior based on the knowledge of the agents. The interaction is carried out using a speech recognition system and is associated with

physical actions and the study of new information. The platform for implementing these types of objects is DLP. Interactivity is also important for networked intelligent devices that interact with almost all machines, ranging from home appliances, telephones and ending with cars and similar technology semantic networks. based on specific browsers, and programs can be personalized, interact, collaborate and complement each other. A typical example of such agents is the VITA / Virtual interactive training agent: this is a special virtual reality-oriented system that builds competencies during an interview. The program is designed to train people with autism and other diseases to build confidence in the interview. To successfully complete the interview in a simulated secure virtual environment, long-term training is provided. The goal is to develop and improve skills for people with a certain degree of disability. The project was developed by the Institute of Creative Technologies and is completely socially oriented.

In recent years, Microsoft has been developing and selling special glasses to create augmented reality, including interactive elements. With Microsoft HoloLens, so-called "mixed reality". MR -connects on the platform: people, objects and places taken from the physical and digital world. In this case, we are talking about the interaction of holograms, which allows visualizing scenes and processes with digital content as part of the real world. Holograms react to movements and gestures of both the participant and the signals from the external environment. The main goals of the device are to transform the ways of communication, content creation, partnership, and world exploration. Other features of the platform allow participants to change holograms, exchange ideas and understand the relationships typical of reality. Individual tasks can be displayed using 3D technology.

CONCLUSION

Technological developments are ahead of the pace of building competencies in the web environment. Undoubtedly it is the fact of the impact of new intellectual platforms on the way people live, and on the development and improvement of the media. In today's world, information literacy and network literacy play an important role in preventing the creation of systems or conceptual orientations leading to mass control over the habits and behavior of citizens.

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