

## INTERNET OF BEHAVIOR (IoB) - AN ALTERNATIVE FOR DIFFERENTIATION IN THE DIGITAL ENVIRONMENT

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**ABSTRACT.** In recent years, a global health crisis has disrupted the lives of all people in a way that is difficult to manage; both at the individual and economic level, everything has changed; we all saw how difficult periods of restrictions alternated with those of relaxation and how the development of individual and professional lives changed sometimes even completely; also, we saw how the huge necessity appeared to move most of our activities from a real world, to a digital world, with many unknowns for a large part of people; in these conditions, the need for individuals to adapt to a life moved to the online environment, has intensified the need to develop a more robust, smarter and more specialized ITC infrastructure to support a world that is constantly migrating towards digitization; thus, intelligent technologies and new concepts and acronyms have imposed themselves in our lives, forcing us all to adapt and learn to use them and continue; thus, the use of IoT (Internet of Things), ML (Machine Learning), AI (Artificial Intelligence) solutions have become common; a mix of these technologies, together with the awareness and management of behavioral changes in times of crisis, increasingly imposed another technological concept, IoB (Internet Of Behavior); starting from these realities, a study was carried out regarding human behavioral changes in the digital environment in crisis conditions and which sought to obtain a complex image, made up of segments of transgenerational and international populations and comparing human behaviors in two types of periods, one of restrictions and another of relaxation in the pandemic; the analysis of the obtained data allowed the design of very complex profiles of

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users of the digital environment, with similar behaviors, but also remarkable differences; we consider that the obtained results can provide important informational support for companies from all industries, so that they can understand and use IoB applications, in order to be able to design sets of strategies for sustainable development, in times of crisis, as well as competitive differentiation solutions.

**Keywords:** IoB, IoT, online environment, differentiation

**JEL classification:** L86, M15

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## **Introduction and review of literature**

The Internet, in the last decade, has offered the population of this planet a digital alternative for ordinary life in the real world, bringing with it and also allowing the creation of new tools and solutions for managing the new, digital environment.

We could all see how everything that until recently meant our real/offline life environment, begins to be transformed and translated to a very large extent, towards the digital environment, thus assisting every day the increase in the ubiquity of the Internet; it is not at all unusual that with the help of the most advanced and new technologies, we use all the objects we have at our disposal in an interconnected form and, moreover, interact with them in various situations of our individual and professional lives; starting from these aspects, IoT (Internet of Things) which can possibly be considered as the most important technology of this century, can be defined as “a network of physical objects linked together that collects and exchanges information and data via the Internet” (Javaid et al., 2021, p. 1).

The Internet of Things technology “uses radio frequency identification technology, infrared induction technology, global positioning system and laser scanners and other sensing equipment, according to the agreed

protocol, connects objects and the Internet and realizes the intelligentisation of objects through information exchange and communication” (Chin et al., 2021, p.2). In recent years, the big companies in the ITC industry “have created IoT ecosystems, for faster development; the best known are Google and Microsoft, which launched the Android Things system and the Microsoft Windows IoT system” (Wu Zhao and Lei Yi, 2022, p.57).

Nowadays, IoT allows objects to be interconnected with each other, engaging sensors, specialized software and other various elements allowing multiple exchanges of data and information between devices and platforms, over the Internet; the multiple IoT applications are very well known, as well as the possibility that the use of these technologies can contribute to improving people’s lives; from another perspective, the multitude of data collected in the use of IoT devices, created huge opportunities in identifying extremely valuable information regarding the users of these devices and technologies, in their different contexts and poses; the last years, thus, have brought to the fore a new concept, the Internet of behavior (IoB); based on a mix of technologies and behavioral psychology, IoB, generically, can be viewed as “a process of analyzing data collected in various IoT ecosystems and which allows the identification of some aspects related to the user experience, with the aim of trying to improve and optimize it”; IoB operates “in three areas: IoT devices, User/Search experience and Behavior” (Elayan et al., 2021, p.2).

IoB systems, can combine data from “multiple IoT environmental sensor sources with commercial customer data, citizen-driven data, data processed by public departments and government agencies, social media and geographic information science (GIS) data; Based on such data sets, data mining and machine learning enable people’s behaviour to be analysed, then an IoB can enable different stakeholders. e.g. businesses. Authorities, citizens to better interpret human behaviour en mass” (Zhang et al., 2021, p.2).

Internet of Behavior (IoB) has been introduced by Gartner “as an extension of the IoT, that collects the digital tracks of people lives from a multitude of sources, determining people’s attitudes, their interests, preferences and regular habits and practices and these information could reveal significant information on themselves and can be used to influence their behavior” (Salis, 2021, p.2).

IoB, can provide “to individuals and/or communities a new means to indicate selected and meaningful behavior patterns, as many as they like, by assigning a specific IoB address (analogous to the internet of things) to each behaviour”; from another perspective, “while the IoT is concerned with connecting devices, the IoB, leveraging on data analytics and behavioral science, is focused on connecting people and their behaviors and deals with tools and methods to best use the data to change or influence behaviors.” (Salis, 2021, p.3).

IoB, thus, can also be considered as a “combination of IoT with AI techniques, now called Artificial Intelligence of Things (AIoT), used to analyze behavioral patterns to infer people’s needs, interests and preferences; IoB, consists of collecting sensor data about a user (or multiple users) and analyzing it from a behavioral perspective to learn from the inferences derived to design better user experiences or when used in healthcare, to learn and respond to the actual needs of the patient; it can also be of great help in behavioral economics to analyze customer preferences” (Tinhinane et al., 2022, p.1-2). IoB, can also be viewed as “a socio-technical system design approach due to the underlying IoT, taking into account the interaction between behavior entities.” (Stary, 2020, p.121).

Internet of behavior can also be interpreted as a mix of technologies “IoT, data analytics algorithms and AI, covering data, its type and applications, being the application of behavioural science” (Molla et al., 2021, p. 4). On the other hand, “one of the capabilities of IoB as a technology is mixing and matching of data, collected (different sources which are generated by different IoTs and applications; objective is to conduct psychosomatic analyses to assess behaviour of netizens” (Paritosh, 2021, p.72). A system of IoB technologies can cover a set of business purposes, such as “monitoring, understanding and influencing behaviours to achieve desired commercial such as improved customer services, personalisation of products and services and eventually revenue and societal goals”; from this perspective, there are also many known applications of IoB, of public and private interest, as they are:” digital marketing and research, mobility, public health, government, personal healthcare, cyber security, workplace relations (Molla et al., 2021, p. 5); also, with the help of IoB applications, they can be better understood “data and use this understanding to create new products, promote current products, redesign the value chain, increase profits or reduce costs from a psychology perspective” (Elayan et al., 2021, p.2).

From an IT outsourcing company perspective, IOB applications can cover the most important activities focused on consumers, namely: “monitoring consumers’ buying trends across all social media platforms, tracking customers’ buying journey, understanding customers’ interaction with products/services, providing a point of sale notifications and target ads, resolving customer issues and ensuring that they are satisfied at the end of closing sales” (Digit, 2022).

According to a very well-known next-generation global technology company, IOB will allow managers to “examine customers’ purchase habits across different platforms, access crucial data about consumers’ interaction behavior with devices and products, magnify and analyze a consumers’ buying journey, derive real-time notifications for point-of-sales and target ads, identify and resolve bottleneck procedures, provide better user experience” (Cron, 2022)

An important technology evaluation software company, identify a set of different types of data relevant to the IoB “social networking activities, IoT data (sensor readings. cameras. etc.), purchasing and spending habits, metadata, user location and the actions that take place at different locations, interactions with sales and customer support, biometric data (i.e. physical features, facial characteristics, etc.)”; also, IoB technology generates some important challenges, regarding “regulations (data privacy has become a significant political issue in many jurisdictions), especially after massive data breaches from platforms that rely on personal information, value (better products and services, outstanding customer experiences, etc.), security (IoB technology represents another potential attack vector for criminals to target)” (Techno, 2022).

In addition to the advantages and positive results of the use of IoB, the disadvantages and risks generated by the implementation of the applications of this technology must also be pointed out; the first of these problems arise from the fact that “are not able to manage heterogeneous data in different data formats; In fact, most of them only process time-series data using LSTMs, but sensors can capture a variety of data types, including images, videos and graphics” (Tinhinane et al., 2022, p.4).

On the other hand, IoB, “is faced with the affliction of how information is gathered, put away and utilized; Its degree of access is hard to control and in this way all organizations should know about the obligation of

IoB use; this presents critical legitimate and security danger to protecting individual rights, which can additionally change our behavior all throughout the planet; cybercriminals could take phishing to another level by creating further developed tricks and accordingly amplifying the probability that clients will be misled” (Rustemi and Tahiri, 2021, p.11).

It is obvious that the use of IoB applications produce important benefits for users and can ensure a degree of differentiation on the profile markets; some of the advantages generated by IoB technologies are: “quality of experience, increased profit, tasks automation, target customers, accuracy, real-time interaction” (Elayan et al., 2021, p.2); also, must be considered some aspects regarding “security, ethical use, Ostrich effect (a phenomenon that occurs when the rational mind believes something is important and the emotional mind expects it to be painful)” (Elayan et al., 2021, p.2).

A very important risk in the implementation of IoB applications also comes from the generation of a “huge volume of such data stored in data warehouses either in private or public cloud are the target zones for cybercriminals” (Paritosh, 2021, p.74). Then, “cybercriminals can steal not only scattered bits of sensitive medical records or banking details, but also deep behavioural patterns identified from a combination of cyber-physical systems and use that for fraud, espionage or blackmail” (Molla et al., 2021, p. 5).

### **Material and method(s)**

IoB applications are available and used in all fields of human activity and in all industries; results of the use of IoB, also allowed the identification of some important aspects, including during the pandemic period that we were still going through and for which the World Health Organization emphasized that online shopping generated an addiction disorder for millions of people. (Gartner, 2022); according to a Gartner study, by 2023 “individual activities will be digitally tracked by an IoB to influence eligibility for benefits and services for 40% of people worldwide” (Gartner1, 2022). From this perspective, for companies a new level opens for the development of marketing strategies, by adopting some

IoB programs, resulting in the creation of extremely valuable sets of competitive and differentiating advantages in the conditions of a huge digital competition.

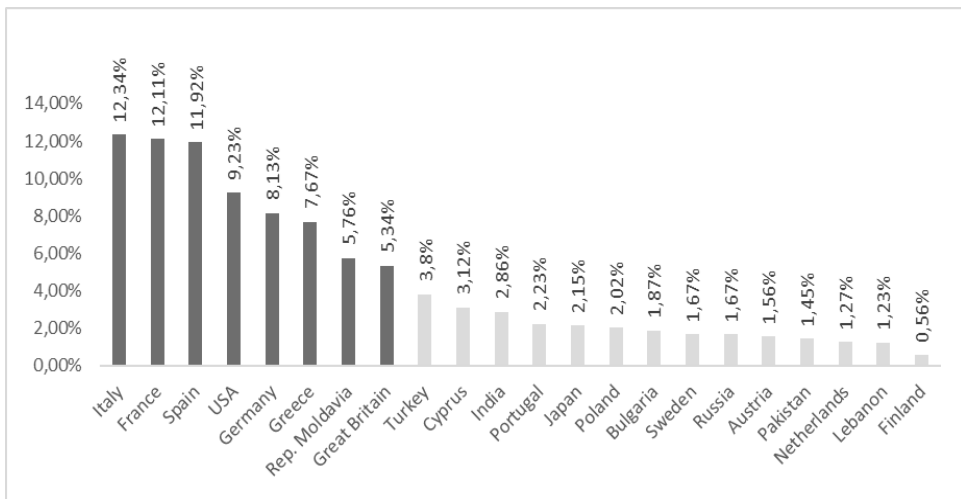
Starting from these elements, the conducted study aims to identify an image of the behavioral changes of people/users in the digital environment in crisis conditions, a pandemic; study regarding human behavioral changes in the digital environment in crisis conditions, took place in two stages (August 1 - 30. 2021 and January 15 - February 15. 2022), with the aim of covering two different periods, one of more intense restrictions and the other of relaxation; it was also followed, the surprise of some behavioral changes generated by the changes in our lives, of everyone by the emergence of the pandemic crisis; another level of study was opened to identify potential behavioral differences between users in Romania and those from other countries; the mobile survey was used, based on the administration of a questionnaire, covering the social networks widely used by individual users; generational structuring was used according to the year of birth of the respondents (after 1997 - Gen Z/iGen/Centennials, 1981-1996 - Millennials/ Gen Y, 1965-1980 – Gen X, 1946-1964 – Baby Boomers (BB) and 1928- 1945 - Silent Generation (SG)); the behavioral changes were studied using several dimensions, namely: the ITC infrastructure used, preferred forms of online communication, online shopping habits and online professional activities; The sampling was carried out by simple random sampling; the final sample for the first stage, there were 733 subjects, of which 701 formed the final sample and for the second stage - 692 subjects, generating 685 valid questionnaires.

## **Results and discussions**

The analysis of the collected data allowed the creation and identification of important profiles, namely:

- use of a specific ITC infrastructure;
- online communication;
- online shopping;
- online work;
- socio-demographic.

The obtained results highlighted important aspects regarding generational behavioral changes for all the levels studied. For both periods studied, in the easing of restrictions as well as during them, the structure of the sample of respondents from outside Romania, according to their country of origin, allowed the identification of a set of 8 countries with a greater representativeness (over 5%) - Italy, France, Spain, USA, Germany, Greece, Rep. Moldova and Great Britain (Figure 1); this fact can potentially be explained from two perspectives; on the one hand, considering the growing number of young people who in recent years have come from these countries to study in Romania, and on the other hand, considering the existence of important communities of Romanians, established in these countries.



**Figure 1.** Sample structure (by country)

*Source: author's data*

From the socio-demographic perspective, the identified profile showed both similarities and differences between residents and non-residents in Romania (Table 1); for the entire population and for both studied periods, some similarities were identified:



- in the generational structure - the best represented generations were Gen X and Y;
- in the educational level - most respondents indicated high school and university studies;
- from the occupational perspective - the best represented are those who work/are employed (over 58% per total studied population).

The evolution of the number of respondents from the two categories and during both studied periods, led to the identification of some differences, namely:

- during the period of relaxation, Gen BB from Romania was more active than during the period of restrictions, compared to foreign respondents;
- in the case of Romanian respondents, the number of university graduates increased during the relaxation period, while the number of high school graduates decreased; in the case of non-residents, this evolution was reversed;
- Romanian respondents from the category of other occupations, became more active during the relaxation period, compared to those from other countries.

Differences also appeared in the gender structure of the respondents; in the case of Romanians, in both studied periods, women were more active, while in the case of respondents from other countries, there were men.

**Table 1.** Sample structure (socio-demo)

		Restrictions		Relaxation	
		Romania (%)	Other countries (%)	Romania (%)	Other countries (%)
<b>Gender</b>	Female	<b>54.23</b>	49.02	<b>50.65</b>	47.23
	Male	45.77	<b>50.98</b>	49.35	<b>52.77</b>
<b>Generations</b>	Gen Z	19.02	21.17	17.55	19.43
	Gen Y	<b>33.22</b>	<b>29.76</b>	<b>27.12</b>	<b>25.36</b>
	Gen X	<b>27.89</b>	<b>26.19</b>	<b>32.32</b>	<b>29.52</b>
<b>Education</b>	BB	17.05	20.53	18.89	17.67
	SG	2.82	2.35	4.12	8.02
	Basic	5.28	7.56	4.89	6.07
	High school	<b>29.03</b>	<b>32.13</b>	<b>26.78</b>	<b>39.69</b>
	College	27.94	22.63	24.21	20.45
	University	<b>30.02</b>	<b>28.81</b>	<b>36.11</b>	<b>30.06</b>
	Post university	7.73	8.87	8.01	3.79
<b>Occupation</b>	Students	18.32	16.52	22.74	23.22
	Employees	<b>70.65</b>	<b>63.51</b>	<b>60.37</b>	<b>58.63</b>
	Other categories (retirees, other occupations/other cases)	11.03	19.97	16.89	18.15

*Source: author's data*

The analysis of the data regarding the ITC infrastructure used (Table 2), surprised aspects related on the one hand to the type of device and category of software solution used in preference and on the other hand, to the preferred form of communication of the respondents.

**Table 2.** ITC infrastructure

	Restrictions		Relaxation	
	Romania (%)	Other countries (%)	Romania (%)	Other countries (%)
<b>Preferred device for daily use</b>				
<b>Mobile devices</b>	<b>60.24</b>	<b>58.92</b>	<b>79.11</b>	<b>68.89</b>
Non-mobile devices	39.76	41.08	20.89	31.11
<b>Preferred software solution used</b>				
<b>Websites</b>	<b>42.82</b>	<b>38.8</b>	<b>49.98</b>	<b>54.97</b>
Mobile apps	20.07	30.75	18.49	25.23
Social networks/media	37.11	30.45	31.53	19.80
<b>Preferred form of communication</b>				
Offline (face-to-face, letters, direct mail, printouts/publications, etc.)	11.01	15.01	24.92	27.02
<b>Online/digital</b> (e-mail, instant messaging apps, social networks, livechat, video-conferencing, other online tool)	<b>58.22</b>	<b>50.77</b>	<b>44.36</b>	<b>40.18</b>
Mobile (mobile calls, video-calls, SMS, messaging apps, social networks, etc.)	30.77	34.22	30.72	32.8

*Source: author's data*

The results obtained, in this case too, showed some elements of similarity; for the entire population and for both study periods, it was identified that:

- mobile devices are preferred (over 58% of the total population), with a higher percentage of users among respondents from other countries; the percentage of respondents who identified themselves as users of mobile devices, increased, in the period of relaxation, compared to the period of restrictions; in this case, a potential explanation arises from the individual's mobility during the period of relaxation, when it was necessary to use mobile devices for communication more than during the period of restrictions;

- the preferred software solution used by the respondents (with over 38.8% per total population), were websites; there is also an increase in websites preferred for use during relaxation;
- the preference for mobile applications and social networks, for the entire studied population, was decreasing during the relaxation period; this evolution can also be correlated with the increase in physical mobility of people during the relaxation period;
- online/digital communication (in its most common forms) was indicated by all respondents as being permanently preferred (over 40% per total population); here too, a decrease in the use of these forms of communication during the relaxation period is noted; also, the increase in respondents' preferences for offline communication, during the relaxation period, is also visible, which cannot be considered at all surprising.

The identification of shopping habits was initiated by establishing the preferred location for shopping (offline or online/mobile) (Table 3); the evolution of preferences for Romanians and those from other countries were extremely similar; all the respondents identified the preferred use of online locations during the period of restrictions (over 67% for the entire population) and also, the massive migration, during relaxation, to physical/offline locations (over 60% for the total population) was identified.

**Table 3.** Online shopping habits

	Restrictions		Relaxation	
	Romania (%)	Other countries (%)	Romania (%)	Other countries (%)
<b>Products/services purchased/used online</b>				
<b>Food</b>	<b>40.77</b>	48.34	<b>37.14</b>	45.22
Home / garden / DIY products	30.56	39.15	27.33	38.12
<b>Electronics / home appliances</b>	<b>39.82</b>	40.36	<b>30.16</b>	38.14
<b>Clothing / personal care</b>	<b>34.47</b>	37.98	21.22	29.76
Health products	19.01	22.34	8.05	18.12
Entertainment/fun	9.11	15.11	10.27	19.92
<b>Utilities / invoices (C2B)</b>	29.82	<b>69.11</b>	<b>35.12</b>	<b>68.77</b>
<b>Taxes (C2A)</b>	7.12	<b>69.72</b>	19.07	<b>70.22</b>

	Restrictions		Relaxation	
	Romania (%)	Other countries (%)	Romania (%)	Other countries (%)
Streaming services	16.17	20.33	10.36	18.12
Ticketing / booking	10.22	20.01	22.14	37.12
Travel & tourism/leisure/entertainment	8.12	11.76	17.92	30.33
Education / personal development	17.22	15.22	11.46	13.15
<b>Online/mobile banking</b>	18.65	<b>70.14</b>	22.37	<b>75.12</b>
<b>Payment systems used</b>				
<b>Card payments</b>	<b>39.78</b>	<b>67.12</b>	30.12	<b>51.67</b>
<b>Cash / cash on delivery</b>	30.17	7.67	<b>49.1</b>	8.05
Mobile payments	30.05	25.21	20.78	40.28

*Source: author's data*

The preferred online channels, the influencing factors in the purchase decision and the frequency of online purchases were also studied; as a common trend identified for the entire population, e-marketplaces prevailed for both periods (minimum 39% for the entire population) as the preferred channel for buying, followed by company websites;

The influencing factors in the decision to buy online/mobile, bring to the fore some differences both between the studied periods and between Romanians and foreigners; during the restrictions period, for the entire studied population, free delivery and 24/7 convenience were the main ones chosen; but, in the case of Romanians, the third important factor indicated was the price, and for foreigners, there were reviews, ratings/consumers opinions.

For the relaxation period, some differences were highlighted between the preferences of Romanians and those from other countries; if the Romanians were still influenced by the price of the products, in the case of the majority of respondents, the opinion of consumers/reviews and the existence of free delivery prevailed.

The frequency of purchase foreshadows another important difference between Romanian respondents and those from other countries; regardless of the period studied, Romanians choose to shop monthly (44.22% in restrictions and 38.11% in relaxation), while those from other countries prefer weekly shopping (44.16% in restrictions and 44.11% in relaxation).

To complete the picture of buying habits, aspects related to the category of preferred products/services in online/mobile purchases, as well as the payment method used in these situations, were also studied (Table 4); the results highlighted specificities for Romanian respondents vs. those from other countries; during the period of restrictions, for Romanians, priority was given to products and not services; the favorite category was food (40.77%), followed by electronics/home appliances and clothing/personal care; in the case of foreign respondents, their preferences were predominantly oriented towards services, starting with online/mobile banking (70.14%), followed by taxes (C2A) and utilities/invoices (C2B); the relaxation period did not change the habits of foreign respondents; for them, online/mobile banking services (75.12%), followed closely by taxes (C2A) and utilities/invoices (C2B); in the case of Romanians, during the relaxation period, the food category (37.14%) remained at the top of preferences, followed by utilities/invoices (C2B) services (35.12%) and then by electronics/home appliances.

The preferred payment methods also highlighted some differences; for Romanians, card payments were preferred only in the case of restrictions (39.78%) as the main payment method, while in relaxation, their preference moved to cash (49.1%); for foreign respondents, the permanent preference for card payments remains clear (67.12% in restrictions/51.67% in relaxation), followed by mobile payments, while cash payment is the least preferred (7.67% in restrictions/8.05% in relaxation).

The analysis of the data regarding the performance of professional activities, identified both the preferred location for their performance, as well as the DM (device management) model preferred by the respondents in supporting these activities (Table 4).

The preferred location of the respondents, on the total studied population, was only the online one; the evolution of this preference depending on the periods studied, generated differences between Romanians and foreigners; in the case of Romanians, their preference, although it remained dominant for working only online, dropped considerably from the period of restrictions (60.71%) to the relaxation period (37.27%), appearing as a secondary preference for the hybrid work system; in the case of foreign respondents, the preference for working only online remained constantly high even during the relaxation period (65.85%).

**Table 4.** Professional activities

	Restrictions		Relaxation	
	Romania (%)	Other countries (%)	Romania (%)	Other countries (%)
<b>Preferred workplace</b>				
Office / company	15.12	9.33	27.11	19.13
<b>Online only</b>	<b>60.71</b>	<b>75.59</b>	<b>37.27</b>	<b>65.85</b>
Hybrid	24.17	15.08	35.62	15.02
<b>DM model (device management) preferred for work</b>				
Personal devices (BYOD)	20.11	23.82	39.34	37.11
<b>Corporate-owned devices (COD)</b>	<b>79.89</b>	<b>76.18</b>	<b>60.66</b>	<b>62.89</b>

Source: author's data

For the choice of DM preferred model for carrying out professional activities, the results remain similar as trends; all the respondents chose the CYOD (corporate-owned devices) model as their first preference, in the case of Romanians it forms a very important segment of users (79.89%); it can be observed that for the BYOD model, there is still an increase in the relaxation period for all users (39.34% Romanians/37.11% foreigners); the profiled results can potentially be correlated with an important level of concern regarding the confidentiality of private data and the desire to separate professional activities from private ones as much as possible.

The final module of the questionnaire provided data on the respondents' perception of the changes imposed by the crisis in their personal and professional lives (Table 5); for Romanians, there is a very

**Table 5.** Perceived changes in private/professional life in the pandemic

	Romania (%)		Other countries (%)	
	private	professional	private	professional
Strongly Disagree				
Disagree			22.73	
<b>Neutral</b>	<b>67.34</b>	13.09		18.19
<b>Agree</b>	30.49	<b>70.17</b>	<b>57.74</b>	<b>65.38</b>
Strongly Agree	2.17	16.74	19.53	16.43

Source: author's data

important segment of respondents who indicate neutral perceptions in the case of changes in private life (67.34%), but more important in professional life (70.17%); foreign respondents, felt the pandemic changes more intensely, both in their personal life (57.74%), but especially in their professional life (65.38%).

## Conclusions

Finally, the obtained results allow the identification of complex profiles with generational/transgenerational behavioral specificities and which cover the four levels studied, bringing to the fore a comparative picture between two population categories, national vs. international.

In a first informational layer, three large transgenerational categories of users of the tools and solutions offered by the digital environment can be noted:

- **Z&Y - mobile&online-oriented**

- They are Mobile-devices users (72.25%);
- primarily focused on mobile shopping;
- using e-marketplaces and proprietary mobile apps;
- do weekly shopping, preferring clothes and electronics, followed by streaming services and payment of utilities / bills and fees, mobile banking services;
- they are influenced by online prices and reviews and prefer card and mobile payment;
- they prefer online delivery systems and online and contactless payments;
- they orient themselves and use mobile promotion tools and strategies;
- in professional life they prefer office and online work and CYOD (42.12%), in device management models;
- in their perception of pandemic changes in their private and professional lives, 69.23% indicated a high influence;



- **BB&X - online&offline-oriented**

- being preferably users online & mobile infrastructure;
- using websites in their online activities;
- oriented towards online communication and shopping;
- they need monthly purchases, from the food and home/garden/ DIY products category and online banking services;
- are influenced by convenience 24/7 and free delivery;
- preferably paying cash and by card;
- in professional life they prefer hybrid and online work and BYOD, surprisingly, in device management models;
- in their perception of pandemic changes, 57.12% indicated that they were affected and the rest of them indicated a neutral influence;

- **SG - offline-oriented**

- they prefer the offline environment for communication and shopping; but still use the digital/online environment 21.57% and mobile (30.17%) for communication;
- for the active ones, prefers to work in the office, probably out of the need for solicitation;
- prefer cash payment (73.12%), but also there is a segment of online banking services users (22.56%);
- declare that they were strongly affected by pandemic (66.83%).

Apart from these general profiles and valid for the entire studied population, other important and useful aspects can be highlighted that allow completing a more complex picture:

- from the perspective of online work, Gen X and Y have some common characteristics; 81.13% of them indicated that they work online and 52.17% of them prefer the BYOD work system; the small percentage (12.89%) of those who wish to return to the on-site/ offline work system is surprising; for respondents from Romania, an important difference appears; only 29.13% of them want to return to physical work, and 48.34% prefer the hybrid work format;
- regarding the change in online shopping preferences, an important segment is emerging in the case of Gen Z; 65.78% of them indicated that they use the online environment for most purchases for

products from the categories usually purchased; for them, in choosing a certain online provider, the existence of a proprietary mobile application is the most important differentiating factor (72.11%), followed by the existence of a home delivery application/system;

- the perception regarding the collection and use of individual data by online providers, in order to outline the buyer's profile, generates different levels of acceptance between generations; Gen Z (46.13%) considers this practice very useful for the speed of orders; Gen X and Y (74.11%), are against these strategies;
- the different percentage, depending on the generations, can be considered surprising, in terms of awareness and concern regarding the aspects related to the confidentiality and security of private data, especially in the situation where our life migrates so much towards the digital environment; Gen Z is the least interested in these aspects (20.75%) in the case of respondents from Romania, compared to 29.65% in the case of respondents from other countries; the most attentive to these aspects turns out to be Gen X, (69.12%) in the case of Romanians and 63.12% in the case of foreigners.

The results of the study allow online companies to find important information in order to design development and promotion strategies starting from the identified behavioral profiles and from the generational segmentations obtained.

Likewise, cyber-bidders can also identify specific elements, which can be considered in the adoption of IoB applications, for building a set of competitive differentiation in the digital environment.

## **Limitations**

The current study presents some limitations related primarily to insufficient representativeness; then, given the complexity of the study and the attempt to include and compare segments of populations with very complex regional and generational profiles, as well as the study of two time periods with somewhat opposite characteristics during a crisis,

an insufficient coverage of all aspects could be generated, in the analysis of the collected data; however, we consider that the obtained results can offer multiple possibilities for the development and expansion of the study in various and much more complex directions.

## REFERENCES

1. Chin et al., (2021), Shih-Hsien Chin, Chunwei Lu, Ping-Tsan Ho, Yung-Fu Shiao, Tzu-Jung Wu, "Commodity anti-counterfeiting decision in e-commerce trade based on machine learning and Internet of Things", *Computer Standards & Interfaces*, Volume 76, 2021, 103504, ISSN 0920-5489, p:2, <https://doi.org/10.1016/j.csi.2020.103504>, <https://www.sciencedirect.com/science/article/pii/S0920548920303913>
2. Cron, (2022), <https://www.cronj.com/blog/internet-of-behavior-consumer-behavior-analysis-in-the-age-of-internet/>, accessed in July 2022
3. Digit, (2022), <https://blog.digitalogy.co/internet-of-behavior-iob-is-here-to-track-your-moves/>. accessed in March 2022
4. Elayan et al., (2021), Elayan. H., Aloqaily. M. & Guizani. M., 2021, *Internet of behavior (IoB) and explainable AI systems for influencing IoT behavior*, pp:1-9, p: 2, Ithaca: Cornell University Library, [https://www.researchgate.net/publication/354627659\\_Internet\\_of\\_Behavior\\_IoB\\_and\\_Explainable\\_AI\\_Systems\\_for\\_Influencing\\_IoT\\_Behavior](https://www.researchgate.net/publication/354627659_Internet_of_Behavior_IoB_and_Explainable_AI_Systems_for_Influencing_IoT_Behavior)
5. Gartner, (2022), <https://www.gartner.com/smarterwithgartner/gartner-top-strategic-predictions-for-2020-and-beyond>, accessed in March 2022
6. Gartner1, (2022), <https://www.gartner.com/smarterwithgartner/gartner-top-strategic-predictions-for-2020-and-beyond>, accessed in May 2022
7. Javaid et al., (2021), Mohd Javaid, Abid Haleem, Ravi Pratap Singh, Shanay Rab, Rajiv Suman, "Internet of Behaviours (IoB) and its role in customer services", *Sensors International*, Volume 2, 2021, 100122, ISSN 2666-3511, <https://doi.org/10.1016/j.sintl.2021.100122>, <https://www.sciencedirect.com/science/article/pii/S2666351121000437>, pp1-8, p.1
8. Molla et al., (2021), Molla, Alemayehu; Hoang, Giang; and Oshodin, Osemwonyemwen, "Conceptualising the Internet of Behaviours (IoB): A Multi-Level Perspective and Research Agenda" (2021), *ACIS 2021 Proceedings*, 57, p. 4-5, <https://aisel.aisnet.org/acis2021/57>

9. Paritosh, (2021), Paritosh Basu, "Digital Transformation -Internet of Behaviour for Framing Business Strategies and Value Creation", *The Management Accountant Journal*, Volume 56, Issue 6, June 2021, p.72,74,  
<http://www.icmai-rnj.in/public/journals/255/images/Volume-22-June-2021.pdf>, <http://icmai-rnj.in/index.php/maj/article/view/164415>
10. Rustemi and Tahiri, (2021), Ejup Rustemi, Mefail Tahiri, "Using Internet of Behaviour to Influence Customers – A Business Strategy or Privacy Intrusion", *International Scientific Journal Monte (ISJM)*, Volume 5, No.2, 2021, p. 11,  
[http://journalmonte.com/publications/article\\_2021/V5\\_n2/1.pdf](http://journalmonte.com/publications/article_2021/V5_n2/1.pdf)
11. Salis, (2021), Antonio Salis, "Towards the Internet of Behaviors in Smart Cities through a Fog-To-Cloud Approach", *HighTech and Innovation Journal*, Vol. 2. No. 4, 2021, p. 2-3,  
<https://hightechjournal.org/index.php/HIJ/article/view/143>
12. Sary, (2020), Sary, Christan, (2020), "The Internet-of-Behavior as Organizational Transformation Space with Choreographic Intelligence", In: Freitag, M., Kinra, A., Kotzab, H., Kreowski, H.J., Thoben. K.D. (eds) *Subject-Oriented Business Process Management. The Digital Workplace – Nucleus of Transformation. S-BPM ONE 2020. Communications in Computer and Information Science*, vol. 1278, Springer, p.121,  
[https://link.springer.com/chapter/10.1007/978-3-030-64351-5\\_8](https://link.springer.com/chapter/10.1007/978-3-030-64351-5_8)
13. Techno, (2022),  
<https://www3.technologyevaluation.com/research/article/internet-of-behavior.html> , accessed in May 2022
14. Tinhinane et al., (2022), Tinhinane Mezair, Youcef Djenouri, Asma Belhadi, Gautam Srivastava and Jerry Chun-Wei Lin, 2022, "Towards an Advanced Deep Learning for the Internet of Behaviors: Application to Connected Vehicle", *ACM Trans. Sen. Netw*, pp.1-18, p. 1-2,4,  
<https://doi.org/10.1145/3526192>,  
<https://dl.acm.org/doi/pdf/10.1145/3526192>
15. Wu Zhao and Lei Yi, (2022), Wu Zhao, Lei Yi, "Research on the evolution of the innovation ecosystem of the Internet of Things: A case study of Xiaomi (China)", *Procedia Computer Science*, Volume 199, 2022, pages 56-62, ISSN 1877-0509, p. 57, <https://doi.org/10.1016/j.procs.2022.01.008>,  
<https://www.sciencedirect.com/science/article/pii/S1877050922000084>
16. Zhang et al., (2021), Zhang. G.; Poslad. S.; Rui. X.; Yu. G.; Fan. Y.; Song. X.; Li. R. "Using an Internet of Behaviours to Study How Air Pollution Can Affect People's Activities of Daily Living: A Case Study of Beijing. China", *Sensors*, 2021, 21, 5569, p. 2, <https://doi.org/10.3390/s21165569>,  
<https://www.mdpi.com/1424-8220/21/16/5569>