MEASURING THE CONSUMERS INFORMATION SKILLS IN A DIGITAL SUPPLY CHAIN

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ABSTRACT

In order to study the level of human integration into the information environment of tangible and intangible goods supply chain, a measurement technique was developed, which includes three stages: self-assessment of the level of one's own information competence; fulfillment of tasks related to interaction with e-government, e-business and e-learning system; and self-assessment after completing tasks. It is suggested to use this tool to analyze and evaluate the information competencies of different population groups, as well as to solve problems related to the search, processing, evaluation and dissemination of information. Therefore, it can help increase motivation to acquire information skills. An experiment was conducted to evaluate the information competencies of local government officials and students. The proposed tool allows the user to diagnose and solve problems identified in the process of acquiring information skills in students and public servants (as a category of potential consumers). As a result of the experiment, groups of users were distinguished according to their level of motivation to improve their knowledge and skills.

Keywords: information integration, customers' information skills, public servants, digital supply chain.

1   INTRODUCTION

The digitalization of society changes and integrates all processes that take place in society. The processes of creating tangible and intangible goods, their distribution and consumption cover the supply chain. At the stage of bringing benefits to the end consumer, the effectiveness of the digitalization of supply chains is associated with the development of e-commerce and the ability of end-users to get involved in this process. In addition to the availability of technical capabilities, this requires people (potential consumers of goods and services) to acquire information skills.

The formation of the necessary information and communication competences for people of different social strata will ensure a comfortable healthy life in the information and communication environment. More employers are looking to have professionals with advanced transferable skills (media and internet literacy, database analysis, programming). According to LinkedIn, there is a significant worldwide growth in the business needs of HR professionals with skills: Blockchain, cloud computing, analytics and AI (WEF 2020). For the effective adaptation and transition of each person to the information age, the important tasks of modern society are the systematization and reduction of information load, the availability of tools to acquire the skills to use services that simplify life, free up time. This requires setting up the national education system for lifelong learning. As information technology evolves rapidly, this ability becomes especially relevant and guarantees the prosperous human activity

of a person in the information environment. Issues of digital ethics are also becoming relevant. Overcoming information inequality between people and societies can engage not only in the technical sphere but also in the field of the human ability to use modern learning tools. This will require mechanisms to measure the level of information and communication competencies of people.

1. THEORETICAL DEVELOPMENT AND HYPOTHESES FORMULATION

Smart technologies mediate the relationship between digital transformation and relationship performance, covering both internal and external aspects. Therefore, when companies' couple smart technologies with digital transformation, the impact on relationship performance will be enhanced. (M. Nasiri, 2020).

The Global Brain proposes a positive vision for a more sustainable society. The Global Brain can be defined as the distributed intelligence emerging from all human and technological agents as interacting via the Internet. It plays the role of a nervous system for the social superorganism (Heylighen F., Marta Lenartowicz M., 2017).

ICT carries the potential of opening economic opportunities, promoting social and political changes in society, providing access to knowledge, creating stimulus and a field for best practice sharing in all areas of life, the actual processes of informatisation across the globe are quite asymmetrical (Schlichter B. R., Danylchenko, L., 2014). Without internet access, which facilitates economic development and the enjoyment of a range of human rights, marginalized groups and developing States remain trapped in a disadvantaged situation, thereby perpetuating inequality both within and between States (Daniel Joyce, 2015).

Across the European Union, indicators that measure information society emphasize many disparities and especially characteristics of this sector (Lăcrămioara Cîmpian, Ede Lazar, Manuela Rozalia Gabo, 2014).

The information and communication factor influences on economic development of the countries, which are measured by global indices (Global Competitiveness Indexand and Doing Business). The correlation analysis has shown a close connection among these indices. The increase in ICT level gives the fastest and largest effect in highly developed countries. However such effect is most slowed in the group of countries with a middle level of information and economic development (N. Gavkalova, Y. Lola, S. Prokopovych, D. Mykhailenko, 2019). The development of the information society and the introduction of new ICT in all spheres of society is determined by a priority of national public policy (Babenko V., Petuhova V., 2017). The current world informatization level in conditions of international globalization is characterized by unevenness and heterogeneity. In addition, it is found homogeneous groups of countries with a similar level of informatization development. This led to the assertion that in each group of countries with their characteristic level of informatization development, there are their most influential factors that determine the development of this process. (Babenko V., Perevozova V., O. Mandych, T Kvyatko, O. Maliy, I. Mykolenko, 2019). The recent trends in the development of contemporary international relations have led to the transition from classical interstate military the confrontation to confrontation in the information sphere. Information weapons became A practical means of its implementation (Kharchenko I. M., Sapogov S. O., Shamrayeva V. M., & Novikova L. V., 2017).

There has been a proliferation of e-readiness assessment measures in recent years that each one has a certain objective. Based on definitions, objectives, dimensions, methods andapproaches, in this paper, the measures are categorized and finally, a measure for e-readiness assessmentis presented. The convergence measure for e-readiness assessment include some common indicators: infrastructure and access, access to and use of ICT by households and individuals, E-businesses, E-education, E-government, basic enabling indicators (Hanafizadeh P., Hanafizadeh M.R., Khodabakhshi M., 2009). Contemporery enterprices can to improve the quality of information security solutions using structural analysis and design tools as CA AllFusion ERwin Data Modeler (Chagovets L., Prokopovych S., Chahovets V., 2018).

New character of cognitive processes is caused by the new informative means which have appeared together with the Internet, e-mail and system of mass communication. They connected the world in uniform space (Pogukaeva N., 2015).

The changed society dictates new tasks to the education system. These include retraining of adult staff, as well as the adaptation of school education to new requirements. In the learning process, each student must not only master the main subjects of the program, but also acquire the skills of self-study, critical thinking, quick analysis of information and communication (Avdeeva S., Rudnev M., Vasin G., Tarasova K., Panova D., 2017).

Widening higher education participation is a key priority for government and universities around the world because improving the education level and skills of the population as a whole is seen as key for national and individual economic wellbeing and as a key tool in achieving a more equitable society (Judy Reading, 2016).

The Skills Framework for the Information Age (SFIA) is a popular international skills framework for the Information and Communications Technology (ICT) sector for which version 7 was released in June 2018 (Jason Brown, 2020).

There are studies aimed at finding the key skills required for the position of information security management as well as the methods to develop these skills through professional training programs. The study adopts the Delphi method, which requires building a list of items through a literature survey, and involves experts with certain expertise to modify the list until a consensus on less than 20% of the items is reached. Through completing three rounds of the Delphi technique - data collection, relevance voting and ranking - sixteen skills are shortlisted as the key skills. In the final list, the majority belong to core information security skills,

and the top two skills belong to project/process management skills and risk management skills, indicating the importance of these skills for the information security manager role (Husam Haqaf, Murat Koyuncu, 2018).

The types of jobs emerging in the global economy span a wide range of professions and skills, reflecting the opportunities for workers of all backgrounds and educational levels to take advantage of emerging jobs and the new economy. Identifying emerging jobs and the skills that they require provides valuable insights on information training investments, and paves the way for a "Reskilling Revolution," as individuals seek new skills to keep pace with change (WEF, 2020).

Hypothesis 1. Not all people adequately assess their level of integration into the information society.

Hypothesis 2. The level of information competence of different social groups varies significantly depending on age that makes its own characteristics at the final stage of the supply chain.

Hypothesis 3. It is possible to distinguish groups of people who differ in the adequacy of self-assessment of the level of their informational competence, as well as the motivation to improve their informational competences.

A number of open tests for assessing the level of information literacy are available in the Internet space (Table 1).

Table 1. Tests to assess the level of information literacy and competence

Test	Developer	Characteristic
The Information Literacy Test (ILT) https://www.madisonassessment.com/assessment-testing/information-literacy-test/	the JMU Center for Assessment and Research Studies (CARS) and JMU Libraries	It is designed to assess the ACRL Information Literacy Competency Standards for Higher Education. These standards call for an information literate student to determine, access, evaluate and use information effectively and efficiently; understand many of the economic, legal, and social issues surrounding the use of information
Information Literacy Tutorial – Quiz https://library.ncc.edu/c.php?g=596954&p=4136568	this tutorial was created by NCC Librarians	Include 8 parts: quiz, knowledge cycle, books, databases, basic search, advanced search, evaluating source, citation
WCCC Information Literacy Modules https://library.ncc.edu/c.php?g=596954&p=4136568	Warren Community College	Through these modules include : What information literacy means to you How to determine your information need How to find information to fit your need How to use resources ethically and legally Why you cite
Media Literacy Perspectives	J.Brown	Media workshops and curricula emphasize moral values (the defensive, inoculation approach), discriminating responsiveness (the critical viewer), antimedia resistance, and consumer revolution.
Information and Communica-tion Literacy Test	National Training Founda-tion	It includes 7 components: definition, availability, management, evaluation, integration, creation, communication of information
International Computer and Information Literacy Study	Fraillon, Ainley, Fraillon, Schulz, Ainley	computer-based international assessment of 8th-grade students' capacities "to use information communications technologies (ICT) productively for a range of different purposes, in ways that go beyond a basic use of ICT
International Computer Drivers License (ICDL) http://www.ecdl.com/	ECDL Founda-tion	The ICDL programme defines the skills and competencies necessary to use a computer and common computer applications. It offers a wide range of modules including Computer Essentials, Word Processing and IT Security

The most common ICT assessment tools are testing the ability to work with information in an online environment without considering the technical component. Attempts have been made to create a test, the results of which will compare the level of information competence of students between countries. Also, professional technical tests have been developed which require special training. However, there is no tool that measures the integration of a person or certain social groups of people into the information society in order to provide learning opportunities.

The developed Human Information Integration Test is aimed at establishing the ability of a person to use publicly available services in the field of e-commerce, e-learning and e-government. The result of this test is also affected by the ability to learn quickly, since the test does not limit the possibility of communicating. The purpose of the test is to identify the level of self-esteem of own information competence in the Internet space with its real level, as well as to help choose the own trajectory of improvement of information competence.

2. METHODS AND RESULTS

The methodology of studying the level of human integration into the information environment is based on the methods of social research. The most useful online services were identified in the focus groups of civil servants and students using the Delphi method. To verify mastery of online services, the following tasks were proposed:

E-education

Go to the site of KHNEU and look at the educational program in which you study.

Go to the Prometheus online website. Register for an online course.

Go to the Coursera website. Register for an online course.

E-commerce

Book a room at a hotel near metro Munich on 01.05.-08.05.2020.

Buy tickets for train Lviv - Kiev

Buy tickets for a concert in the theater

E-government

Register on the portal Kharkiv'yanin.

In order to study information integration of the participant in the experiment the following algorithm of the research is proposed:

Stage 1. formation of target groups of respondents;

Stage 2. self-esteem of the level of own information competence, comfort in the Internet space and desire to improve their information abilities;

Stage 3. fulfillment of tasks related to interaction with e-business, e-government and e-learning system;

Stage 4. self-assessment of the level of information competence and comfort after completing tasks;

Stage 5. Analysis of the basic statistical characteristics of the results of the survey, verification of the first and second hypotheses;

Stage 6. Verification of the third hypothesis based on the cluster analysis methods for the whole data set and within the separate groups of persons who took part in experiment.

Before performing the specially selected tasks and after them, it is proposed to independently assess the level of their information competence, comfort in the Internet space and the desire to improve their information skills with using a 10-point scale.

After self-assessment, you are asked to complete the task using QR codes. Tasks related to the ability to perform operations in the field of e-commerce, e-learning and interaction with local governments.

A trial experiment to assess the level of human integration into the information environment was conducted from December 2019 to January 2020. Two groups of respondents, significantly different in age, participated in the experiment:

students of 1-2 courses of the Public Administration educational program (36 persons);

employees of local authorities of Kharkiv region (42 persons) aged from 26 to 50 years.

Descriptive statistics were used to analyze the age composition of participants. This allowed us to process, systematize, and quantitatively describe empirical data, as well as calculate the following characteristics: mean, minimum, maximum, standard deviation, and histograms.

The results of the calculation are presented in Table.1.

Table 1. Descriptive Statistics for age criteria

Valid N	Mean	Minimum	Maximum	Std.Dev.
78	26	18	50	8.77

The histogram of distribution for groups of civil servants and students studying in the field of Public Administration depending on their age are presented in Fig. 1.
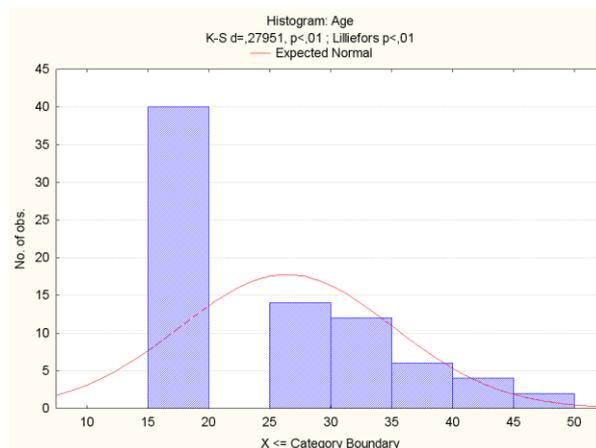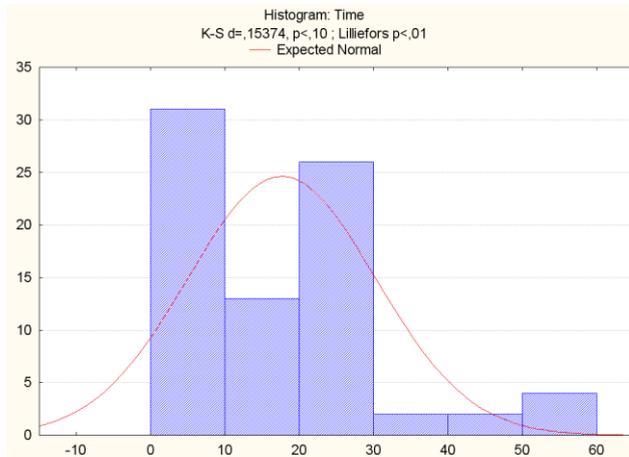

Figure 1. Distribution histogram of participants according to their age

As we can see from Fig. 1, almost 50% of the experiment participants are 18-20 years. Other participants are 25 to 50 years old. For further analysis, each participant in the experiment fills out a questionnaire, completes tasks, and records the time of task
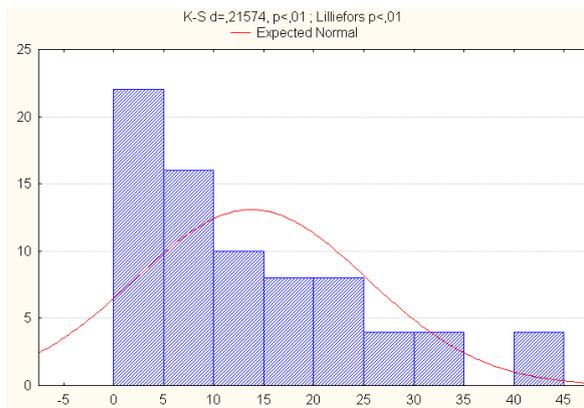
completion.

Participants took different time between 4.5 and 52 minutes to complete the tasks. The average required to complete the tasks was 17 minutes, the standard deviation was 12.6 minutes. Histogram for time Distribution is presented in Fig. 2.
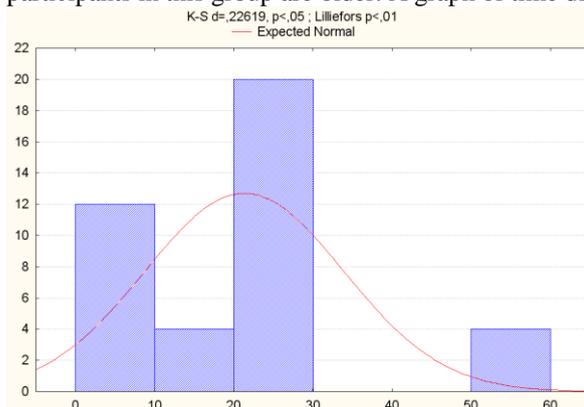

Figure 2. Distribution histogram for the time of task completion

As we can see from Fig. 2, most of the participants (40%) took no more than 10 minutes to complete the tasks, a considerable number (33%) ones - from 20 to 30 minutes, 10% took more than 30 minutes. For the group of civil servants, the time distribution is presented in Fig. 3.

Figure 3. Distribution histogram for the group of civil servants

As we can see from Fig. 3, the majority of participants in this group completed the task quickly enough, which indicates high informational integration of this social group. Interestingly, the result of the test in this group is better despite the fact that the participants in this group are older. A graph of time distribution for a group of students is shown in fig. 4.


Figure 4. Distribution histogram for students

According to Fig. 4, most students (almost 50%) needed to complete tasks from 20 to 30 minutes, 30% of students - up to 10 minutes, and a small group (10%) needed more time from 50 to 60 minutes.

Ordinary, a group of civil servants and students took different times to complete the tasks related to using online services. It is due to the different experiences and needs of the participants to these online services. During the experiment, participants were allowed to help each other, so almost all tasks were performed by each participant.

During the next step, using the cluster analysis methods, we obtain homogeneous groups of participants. The grouping of participants is based on the hierarchical method of full communication, which allows dividing the participants, who took part in the experience, into two, three or four clusters (Fig. 5).
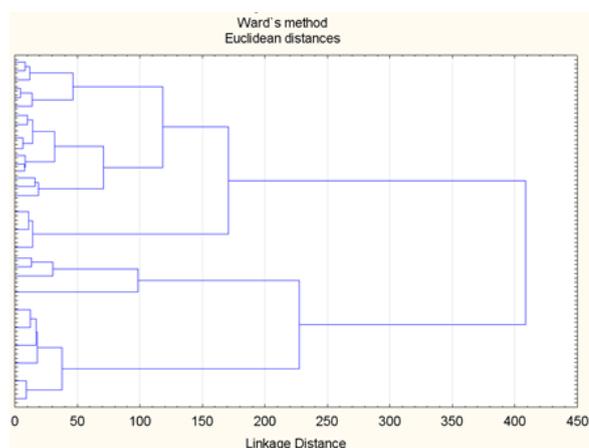
Figure 5. Tree Diagram

The division into 2 clusters forms groups with generalized characteristics, which does not allow to solve the research problem. Therefore, it is rational to divide participants into four clusters, which corresponds to the logical distribution of participants with advanced, high, medium and low levels of Internet integrity. The characteristics of the clusters are shown in Table 2.

Table 2. Characteristics of participant groups

Cluster	Level of competence	Level of comfort	Speed	Competence level after the experiment	The level of comfort after the experiment	Average age
1	high	high	low	high	high	23
2	average	lower	the lowest	low	low	27
3	high	high	the highest	high	high	38
4	lower	lower	average	average	average	22

As we can see from Table 2, the most progressive group of participants (16 people) belongs to Cluster 3, which is characterized by a high level of self-esteem of their Internet competence and comfort before and after the experiment. Additionally, this group of participants is in the area of assessment adequacy because their self-esteem corresponds to the realities (the speed of completing tasks is the highest). Such people are easily trained and able to choose independently the vector of improving their information skills.

Cluster 4 includes participants in a student group (20 people) who had a sufficiently high level of information integration but rated their level as insufficient. After completing the tasks, their self-esteem increased. This group is also likely to have sufficient motivation to learn but needs support in this process.

The first cluster is mainly comprised of a part of the student group (34 persons), who most likely do not have high information-integration ability, but they carefully and responsibly completed of the tasks. These participants have too much self-Esteem because they needed much more time to complete tasks than other participants. With the right motivational impact, they will have a high learning ability.

Participants in the second cluster (8 people) need support, development of special training services. It cannot be said that this group of people is not included in the integration processes of the information society since all participants have higher education or are receiving it, that is, all capable of learning and solving complex professional tasks, including those related to the digitization of society. None of the participants rated their level of information competence below 5 points.

Information integration of a person in the information society implies not only the presence of knowledge and skills in search, transformation, storage, transfer of information, but also a person's feeling of comfort in the information environment.

Due to the analysis of the results of the self-assessment of the participants of the experiment, the following was revealed:

correlation between self-esteem scores and participants' comfort after completing tasks (r = 0.84). Thus, awareness of participant information competence and sense of comfort became closer concepts to participants, after testing their ability to use publicly available online services;

a general tendency for a higher appreciation of one's competence and level of comfort after completing tasks. On the one hand, this is the result of being allowed to help one another. Thus, a learning process took place if one was able to quickly understand what to do. On the other hand, primary self-esteem was influenced by personal expectations of varying levels of task complexity.

4 CONCLUSIONS

The results of the experiment allow us to draw the first conclusions:

the level of information integration depends more on the social group of the population than on the age of the person, so hypothesis 1 was not confirmed;

the Human Information Integration Test is proposed to be used to analyze and evaluate the information competencies of different population groups, as well as to address issues related to the use of e-commerce, e-government and e-learning services. Therefore, it can help increase motivation to acquire information skills;

The test allows the user to diagnose and solve problems identified in the process of acquiring information skills of public servants and students. According to the results of the experiment, groups of users were selected according to their level of motivation to improve their knowledge and skills, that is, hypothesis 2 and hypothesis 3 were confirmed.

The conclusions presented are the result of the first trial of a series of experiments scheduled for 2020. The suggested model can be also detailed and extended according to:

conducting a large-scale experiment for a group of civil servants;

research of other social groups of the population of other professional directions;

gender-based sensitive disclosure;

testing and training software development.

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