



# World Journal on Educational Technology: Current Issues



Volume 11, Issue 1, (2019) 48-64

[www.wj-et.eu](http://www.wj-et.eu)

## An examination of digital footprint awareness and digital experiences of higher education students

**Yesim Surmelioglu\***, Department of Computer Technology, Ayancik Vocational High School, Sinop University,  
Ayancik/Sinop 57400, Turkey

**Suleyman Sadi Seferoglu**, Department of Computer Education and Instructional Technology, Faculty of  
Education, Hacettepe University, Ankara 06800, Turkey

### Suggested Citation:

Surmelioglu, Y. & Seferoglu, S. S. (2019). An examination of digital footprint awareness and digital experiences of  
higher education students. *World Journal on Educational Technology: Current Issues*. 11(1), 48–64.

Received from November 23; revised from December 13; accepted from January 11

Selection and peer review under responsibility of Prof. Dr. Servet Bayram, Yeditepe University, Turkey.

©2019 SciencePark Research, Organization & Counseling. All rights reserved.

### Abstract

Rapid changes are occurring in life owing to information and communication technologies. During this change period, digital identities have begun to emerge. These identities are associated with actions that users perform in online environments. A digital footprint is formed with these actions. The purpose of this study is to determine the digital footprint awareness and digital footprint experiences of higher education students. In order to collect data for the study, researchers developed a data collection tool titled 'A survey for digital media use'. The study group consisted of 508 higher education students from 41 Turkish universities. Data were collected through an online-form where participation was on a volunteer basis. The findings of the research show that students have a high level of digital footprint awareness ( $\bar{X} = 4.251$ ) and a low level of digital footprint experience ( $\bar{X} = 1.907$ ).

**Keywords:** Digital footprint, digital footprint awareness, digital footprint experiences, higher education students.

---

\* ADDRESS FOR CORRESPONDENCE: **Yesim Surmelioglu**, Department of Computer Technology, Ayancik Vocational High School, Sinop University, Ayancik/Sinop 57400, Turkey. *E-mail address:* [yesimsurmelioglu@gmail.com](mailto:yesimsurmelioglu@gmail.com) / Tel.: +90-368-613-3411/6932

## 1. Introduction

Information and communication technologies are among the most important powers of the social change. Rapid changes are experienced in life owing to these technologies. Together with these changes, fundamental niche and relationship forms differentiate rapidly. Social institutions are affected in different ways in this process. This new condition has caused utilisation of new instruments and applications in schools. Utilisation of new online environments and instruments has required individuals to have new knowledge and skills and brought along new literacy concepts. These literacies have also brought along some new conditions requiring the awareness of users. One of these new conditions is the matter of digital identities, which have been formed as a result of including digital technologies in every stage of social life and are closely related to the type and content of activities conducted by users in online environments.

The word digital which has come into the lives of people is not as concrete as it is believed to be. For instance, the concept of digital can be defined as a computer language (Ispir et al., 2013). Ispir et al. (2013) indicate that the development of digital language dates back to the 19th century. In the digital language which is believed to be founded after the exploration of an arithmetic system consisting of the values 0 and 1 by the mathematician Gootfried Wilhelm; every letter and symbol has a code. All transactions are performed with codings in this language.

The concept of digital has become an important part of daily life within the context of skills to be acquired in the 21st century. A number of new words have been derived from the concept of digital, such as digital story, digital literacy, digital citizenship, digital competence and digital trash. Digital environments have begun to meet personal needs like shopping, banking, debt payments, socialisations, social sharings and games both online and off-line, especially since the common use of Internet. Thousands of records are created while performing these transactions. In this process, a user may or may not be aware of the situation. The process of creating and storing all transactions in the digital environment is handled and evaluated as 'digital footprint' in the literature.

Digital footprints were used for determining an activity conducted by an institution or individual in an online environment before. However, they have become more inclusive and begun to be used for prints left by institutions or individuals in online interactions in the course of time (Bodhani, 2012). Lambiotte and Kosinski (2014) who also have a perspective like the concept of digital footprint indicate that individuals leave their numerical footprints in electronic databases with their online or off-line activities and these electronic records are called digital footprints. In the literature, digital footprints are also defined as evaluation of computer proofs (Sommer, 1998), opportunities and difficulties brought out for online social researches (Golder, 2014) and records of interaction between humans and the cyber world (Chen et al., 2017).

According to the literature concerning digital footprint, there are two types of footprints as passive and active, while passive prints are left interacting with an infrastructure that provides input to location records such as a mobile telephone network, active prints are made individually by users when they use location data in photographs, messages and sensory measurements (Girardin, Calabrese, Dal Fiore, Ratti & Blat, 2008).

These footprints are collected and analysed to reveal human behaviour models and society's dynamics. In this process, large-scale social and community data processing technologies have conceived a new research area called social and community intelligence (SCI) investigating 'digital footprints' for the purpose of revealing individual, group and social models (Zhang, Guo, Li & Yu, 2010). SCI research aims to reveal individual and group behaviours, social interactions and society's dynamics by examining people's web applications, static infrastructure and digital footprints that are left while in interaction with mobile and wearable devices (Zhang, Guo & Yu, 2011).

Studies on digital footprints show that certain people can be pursued from their digital footprints, which may allow us to reach considerable personal information such as their world view, political

view, religious belief, personality characteristics, education and address (Garfinkel, 2010; Kosinski, Stillwell & Graepel, 2013; Madden, Fox, Smith & Vitak, 2007). This condition indicates that individuals witness a variety of experiences in the digital environment. An experience (Turkish Language Society (TLS), 2018) is defined as what a person gets after the things she or he experiences, sees, hears and acquires. A digital footprint experience is also defined as what a person gets after the things she or he sees, hears and acquires in a digital environment and an experience concerning the print left by every article, sound, image and information left, shared and clicked by the person in the digital environment either consciously or unconsciously. Social sharings that are made in the name of a person beyond her or his knowledge, opening a web site in her or his name, reawakening her or his former sharings in digital environments, encountering a previous search procedure on any subject as an advertisement afterwards, disclosing profiles that are created and kept private and revealing sharings that are hidden from others can be given as examples to this situation.

According to the literature, young individuals use the technology more intensely than estimated (Bennett, Maton & Kervin, 2008; Margaryan, Littlejohn & Vojt, 2011; Tapscott, 2008; Yli-Renko, Autio & Sapienza, 2001). According to this determination, it is possible to state that digital footprints are mainly left by young users. In this context, it can be asserted that it is important to raise digital footprint awareness primarily in young users. According to some studies on digital footprints, working groups usually consist of young individuals. For example, Camacho, Minelli and Grosbeck (2012) have worked with higher education students, whereas Ozbek, Coklar and Gunduz (2016) with high school students.

In their study, Camacho et al. (2012) centred on critical questions concerning the exploration of factors affecting the perception of digital identity by higher education students, as well as personal development and social relations. They also suggested that knowing the way of shaping an identity will enable students to understand the nature of their social and cultural experiences better. The article embraces epistemological perspective subjects like identity building, impression management, friendship, network structure and confidentiality consciousness. An undergraduate student may have the knowledge and skill of producing content on any subject and transmitting that content easily to another location in an online environment. The student might be competent to produce a digital content and send that content to some locations. However, this condition might be related with her or his awareness of responsibilities about the operation of this process or being guided correctly. The research study by Camacho et al. (2012) with 135 undergraduate students draws attention to critical questions about digital identity, personal development, social relations and lifelong learning. The study contains important results concerning how a digital environment shapes identities of students and how students perceive the situation.

In a study by Ozbek et al. (2016), it was aimed to determine digital footprint awareness and experiences of high school students. A total of 316 high school students participated in the study. As a result of the study, it was seen that the students had higher levels of digital footprint awareness and lower levels of negative experiences on this matter. Even though gender is not considered important in terms of digital footprint awareness, it was concluded that variable of gender was important in terms of digital footprint experiences. Accordingly, it was seen that men had greater negative experiences in the digital context. In addition, while the Internet use self-sufficiency is not important for the two dimensions, education which is among the primary Internet use purposes is an important factor only in terms of digital footprint awareness. It was observed that students using Internet for educational purposes had higher levels of digital footprint awareness.

### **1.1. Importance of the study**

As the time spent in digital environments increases, transactions and sharings in digital environments gradually increase. Thus, the studies being conducted lay stress on the necessity of using digital tools safely (Costa, Sousa, Rogado & Henriques, 2017; Krasna, Bratina & Bedrac, 2011).

According to the results of these studies, the youth use the technology more than other age groups (Bennett et al., 2008; Margaryan et al., 2011; Tapscott, 2008; Yli-Renko et al., 2001). In the light of these determinations, it is believed that the study is important because it reveals the digital footprint awareness and digital footprint experiences of higher education students and makes suggestions about increasing their awareness levels. On the other hand, in the literature, examining the effects of digital technologies in social life, it is indicated that online availability of the youth in digital environments and their footprints has a potential of affecting their future. Considering this determination and lower awareness levels of the students, it is possible to state that the study will make important contributions to the literature.

### **1.2. Purpose of the study**

The study aims to determine digital footprint awareness and digital footprint experiences of higher education students. In order to attain that goal, the following questions are tried to be answered:

- What is the status of digital footprint awareness of higher education students?
- What is the status of digital footprint experiences of higher education students?
- How do digital footprint awareness and experiences of higher education students vary according to their;
  - Gender,
  - Age,
  - Class level,
  - Place where they have lived for the longest time,
  - Time they spend daily in digital environments,
  - Level of self-sufficiency for using online tools,
  - Department in the university?
- In which online tools do higher education students leave their digital footprints the most and the least?

## **2. Method**

The study which aims to determine digital footprint awareness and digital footprint experiences of higher education students is a causative comparison study. In a causative comparison study, researchers try to determine the reasons or results of present differences between individuals or groups (Fraenkel, Wallen & Hyun, 2003).

### **2.1. Working group**

Working group of the study consists of higher education students. A total of 542 individuals from 41 universities participated in the study based on voluntariness. However, 34 extreme values were omitted to normalise the data and the analyses were conducted on the basis of 508 participants. Among the universities of the participants, the prominent ones are Sinop University 36.2% (184 students), Hacettepe University 18.5% (94 students), Balikesir University 12.8% (65 students), Mustafa Kemal University 8.9% (45 students) and other universities 23.6% (120 students). 40.4% (205) of the participant students attend vocational schools, 33.3% (169) faculty of education, 15% (76) graduate education, 5.1% (26) faculty of science and letters and 6.2% (32) other departments. Table 1 shows distributions concerning demographic characteristics of the students who participated in the study.

**Table 1. Distributions concerning demographic characteristics of the participants**

Variables	Options	f	%
Gender	Female	331	65.3
	Male	176	34.7
	Total	507	100
Age	15–18	34	6.7
	19–22	328	64.6
	23–26	69	13.6
	27–32	46	9.1
	33 and older	31	6.1
	Total	508	100
Class	Freshman (1 year)	136	26.8
	Sophomore (2 year)	179	35.2
	Junior (3 year)	43	8.5
	Senior (4 year)	46	9.1
	Graduate student	76	15.0
	Graduate (alumni)	27	5.3
	Total	508	100
Place where they have lived for the longest time	Village	59	11.6
	Town	18	3.5
	County Town	154	30.3
	City Center	117	23.0
	Metropolis	160	31.5
	Total	508	100

Among 507 individuals who specified their gender in the study, 65.3% (331) are female and 34.7% (176) male. It is seen that among 508 individuals who participated in the study, 64.6% (328) are in the age range of 19–22. Examining the class level, it is seen that sophomore (2 Class) students have the highest participation rate with 35.2% (179), which is followed, respectively, by freshman (1 Class) students with 26.8% (136) and grad students with 15.0% (76).

Examining the data in Table 2, it is seen that 38% (193) of the participant students consider themselves ‘completely sufficient’ for using online tools.

**Table 2. Distributions concerning feeling sufficient for using online tools**

Variables	Options	f	%
Level of feeling sufficient for using online tools	Not sufficient at all	21	4.1
	Not sufficient	25	4.9
	Moderately sufficient	111	21.9
	Sufficient	158	31.1
	Completely sufficient	193	38.0
	Total	508	100

Examining the participants’ statuses of using online tools, it was seen that some of them chose to use more than one tools. Table 3 shows frequency and percentage values of the tools being used. Accordingly, considering the highest use value, it is seen that 78.54% (399) of the participants use smart phones, which is followed, respectively, by laptop computers (66.73%), desktop computers (37.0%) and tablets (26.96%).

**Table 3. Distributions concerning online tools used while connecting to online environments**

Variables	Options	f	%
Online tools used	Smart phone	399	78.54
	Laptop computer (such as notebook, netbook)	339	66.73
	Desktop computer	188	37.00
	Tablet	137	26.96
	Do not use any computer	25	4.92
	Smart watch	3	0.59
	Smart TV	3	0.59
	Smart board	1	0.19
	Raspberry Pi	1	0.19
	Occupational tools (such as machine)	1	0.19

Table 4 shows distributions concerning the frequency of using environments with an Internet connection. The rate of individuals who connect to Internet via smart phone is 58.9% (299), which is remarkable and followed by home Internet with 40.4% (205).

**Table 4. Distributions concerning the frequency of using environments with an Internet connection**

Frequency of using environments with an Internet connection	Never	25%	50%	75%	100%	Total
Home	6.1 (31)	12.0 (61)	17.3 (88)	24.2 (123)	40.4 (205)	100 (508)
School	11.6 (59)	25.4 (129)	31.1 (158)	18.7 (95)	13.2 (67)	100 (508)
Workplace	60.8 (309)	13.0 (66)	9.6 (49)	6.7 (34)	9.8 (50)	100 (508)
Cafe	26.4 (134)	32.9 (167)	17.7 (90)	10.2 (52)	12.8 (65)	100 (508)
Dormitory	54.1 (275)	3.3 (17)	10.2 (52)	12.0 (61)	20.3 (103)	100 (508)
Operator (smart phone)	1.0 (5)	3.9 (20)	14.4 (73)	21.9 (111)	58.9 (299)	100 (508)

Table 5 shows distributions concerning the participants' duration of daily computer or Internet use. According to the data in this table, 32.1% (163) of the participants use computer or connect to Internet for 4–6 hours a day.

**Table 5. Distribution of the data concerning the duration of daily computer/Internet use**

Variables	Options	f	%
Duration of daily computer/Internet use	None	7	1.4
	Less than 1 hour	34	6.7
	1–3 hours	107	21.1
	4–6 hours	163	32.1
	7–9 hours	117	23.0
	10 hours and above	80	15.7
	Total	508	100

## 2.2. Collection of the data

In order to collect the data in this research study, two different data collection tools were developed by the researchers. The first of these data collection tools is *Personal Information Form*. The first section of this form includes questions about: 'gender, age, university, academy/faculty/institute, department, class, level of self-sufficiency for using online tools, place where they have lived for the longest time and online tools being used'. The second section titled 'Statuses of Connecting to Internet' includes two questions about environments where an Internet

connection is made and duration of daily Internet use. The third section titled 'Statuses of Using Online Tools' includes 10 items.

The second data collection tool used in the study is titled *Survey for Statuses of Higher Education Students to Use Digital Environments*. Developed by the researchers; the survey consists of two sections. The first section of the survey titled 'Transactions Performed in Digital Environments' includes 12 questions aiming to determine digital footprint awareness of students. The second section of the survey titled 'Digital Environment Experiences' includes 16 items aiming to determine digital footprint experiences of students.

While developing the survey, the relevant literature was utilised for style and content (Camacho et al., 2012; Madden et al., 2007; Ozbek et al., 2016; Simsek & Yazar, 2016). After forming an item pool for the survey, opinions and suggestions were received from four domain experts concerning the survey and then various arrangements were made on the survey items according to the feedback received. In this process, statements of the items were made more clear according to the feedback received and new items were added. In the second stage, opinions and suggestions were received from five different domain experts concerning the survey. Various arrangements were made on the items according to the criticism received. In conclusion, the survey was finalised after being controlled by an assessment expert.

In this context, a survey form consisting of totally 28 items was created (12 items for digital footprint awareness and 16 items for digital footprint experience). A pilot application was conducted by applying the survey form to 10 students. The scale items were expressed as five point likert type. While digital footprint awareness was expressed as 'Strongly Disagree', 'Disagree', 'Moderately Agree', 'Agree' and 'Strongly Agree', digital footprint experience was expressed as 'Never', 'Seldomly', 'Sometimes', 'Usually' and 'Always'. The survey was conveyed to higher education students in an online environment.

### **2.3. Analysis of the data**

In the data analysis process, primarily the relevant items were collected and the normality assumption was checked. Extreme values were omitted from the data set in order to provide the normality assumption. Digital footprint awareness and experiences were examined with frequency, percentage, mean and standard deviation, whereas the effect of digital footprint awareness and experiences according to gender was evaluated with *t*-test. One-way analysis of variance (ANOVA) was used for analysing the differentiation of digital footprint awareness and experiences according to age, class level, place where they have lived for the longest time, the time spent daily in digital environments, level of self-sufficiency for using online tools and department in the university. In addition, TUKEY test was conducted for examining the distribution of groups that were determined to differentiate according to ANOVA results. The question, 'in which online tools do higher education students leave their digital footprints the most?' was examined with frequency and percentage values.

In the interpretation, the data concerning digital footprint awareness and experiences consisting of five-point Likert items were used. The five-point Likert items were interpreted based on three evaluation criteria as low, medium and high. Accordingly, the three evaluation criteria were evaluated in line with a scoring of 1–5: low level of awareness or experience for the interval of 1.00–2.33, medium level (partially) for the interval of 2.34–3.66 and high level for the interval of 3.67–5.00. The significance level was taken as 0.05. The quantitative data acquired in the study were analysed using a computer-based analysis program.

### **3. Findings and discussion**

Findings were presented in a way to answer the study questions determined according to the purpose of the study separately and respectively.

### 3.1. Digital footprint awareness of students

The first research question of the study was determined to be *What is the status of digital footprint awareness of higher education students?* In order to answer that question, the frequency (*f*), percentage (%), mean ( $\bar{x}$ ) and standard deviation (*Ss*) of the data acquired from a survey of 12 items were calculated. The data concerning digital footprint awareness is presented in Table 6. In the table, the grading is made as 1 = Strongly Disagree, 2 = Disagree, 3 = Moderately Agree, 4 = Agree and 5 = Strongly Agree.

**Table 6. Distribution of answers concerning digital footprint awareness**

Items		1	2	3	4	5	Total	$\bar{x}$	Ss
1. Before sharing a comment or an article in digital environments, I check what I have written in terms of style many times and then share it.	%	2.8	1.4	10.2	31.5	54.1	100	4.33	0.917
	<i>F</i>	14	7	52	160	275	508		
2. Before sharing a comment or an article in digital environments, I check what I have written in terms of spelling many times and then share it.	%	2.4	3.0	18.7	35.0	40.9	100	4.09	0.959
	<i>F</i>	12	15	95	178	208	508		
3. I am aware that information about myself in digital environments can be encountered in my school, professional or private life.	%	1.2	3.0	8.1	33.5	54.3	100	4.37	0.845
	<i>F</i>	6	15	41	170	276	508		
4. I play it safe when I share information in digital environments because they may be encountered in my professional or private life in the future.	%	1.6	3.5	15.2	29.5	50.2	100	4.23	0.941
	<i>F</i>	8	18	77	150	255	508		
5. I know that all kinds of transactions that I perform in digital environments will be recorded.	%	1.0	3.0	8.1	31.7	56.3	100	4.39	0.835
	<i>F</i>	5	15	41	161	286	508		
6. I am aware that none of the transactions that I perform in digital environments may remain anonymous.	%	1.0	3.9	8.1	31.1	55.9	100	4.37	0.866
	<i>F</i>	5	20	41	158	284	508		
7. I am aware that my information/sharings may be found by other people in environments like Internet cafe and shared computer laboratories.	%	1.2	3.1	6.5	28.9	60.2	100	4.44	0.842
	<i>F</i>	6	16	33	147	306	508		
8. I take necessary precautions so that other people will not see or use my personal information in digital environments.	%	1.0	2.2	6.5	30.1	60.2	100	4.46	0.792
	<i>F</i>	5	11	33	153	306	508		
9. I am aware of privacy settings of online tools (for example; social networks, online chat, etc.).	%	0.4	2.0	6.5	26.8	64.4	100	4.53	0.739
	<i>F</i>	2	10	33	136	327	508		
10. I use privacy settings of online tools (for example; social networks, online chat, etc.).	%	1.6	2.4	5.5	28.5	62.0	100	4.47	0.832
	<i>F</i>	8	12	28	145	315	508		
11. I always check and arrange privacy settings of online tools (for example; social networks, online chat, etc.).	%	2.2	4.5	14.8	32.9	45.7	100	4.15	0.979
	<i>F</i>	11	23	75	167	232	508		
12. I am aware of the concept of digital footprint.	%	23.2	11.8	16.1	22.0	26.8	100	3.17	1.521
	<i>F</i>	118	60	82	112	136	508		
Average of digital footprint awareness:								4.251	0.923



The data in Table 6 show that higher education students who participated in the survey had higher levels of digital footprint awareness ( $\bar{x} = 4.251$ ). Examining the data, it was seen that a great majority of students who participated in the survey had digital footprint awareness. On the other hand, they moderately agreed with the item, 'I am aware of the concept of digital footprint' ( $\bar{x} = 3.17$ ). Examining the data of this question, it is possible to deduce that the concept of 'digital footprint' is not used or known by society so much. In a number of studies being conducted, it has been concluded that individuals who use Internet have higher levels of digital footprint awareness (Camacho et al., 2012; Madden et al., 2007; Ozbek et al., 2016). Considering from this point of view, it is understood that the data of this study coincide with similar data of studies in the literature.

### 3.2. Digital footprint experiences of students

The second research question of the study was determined to be, *What is the status of digital footprint experiences of higher education students?* In order to answer that question, the data were analysed with frequency (*f*), percentage (%), mean ( $\bar{x}$ ) and standard deviation (Ss). Table 7 shows data concerning digital footprint experiences (1 = Never, 2 = Seldomly, 3 = Sometimes, 4 = Usually, 5 = Always).

**Table 7. Distribution of answers concerning digital footprint experiences**

Items		1	2	3	4	5	Total	$\bar{x}$	Ss
1. Some people had opened an account in digital environments in my name beyond my knowledge.	%	70.1	16.1	9.1	3.5	1.2	100	1.50	0.887
	<i>f</i>	356	82	46	18	6	508		
2. Some people had shared something in digital environments in my name beyond my knowledge.	%	62.4	22.4	10.8	3.0	1.4	100	1.58	0.896
	<i>f</i>	317	114	55	15	7	508		
3. I have had a hard time due to my sharings in digital environments.	%	71.5	15.6	8.7	3.0	1.4	100	1.47	0.875
	<i>f</i>	363	79	44	15	7	508		
4. I have regretted some of my sharings in digital environments.	%	50.0	25.2	19.9	2.8	2.2	100	1.82	0.986
	<i>f</i>	254	128	101	14	11	508		
5. I have had an uneasiness because my past experiences were revealed in digital environments.	%	64.6	18.7	11.0	4.1	1.6	100	1.59	0.949
	<i>f</i>	328	95	56	21	8	508		
6. There have been times when I realised that my relatives had found out my profiles that I had created in secret in digital environments.	%	75.0	13.0	8.1	2.2	1.8	100	1.43	0.866
	<i>f</i>	381	66	41	11	9	508		
7. I have had quarrels with my family because my personal information was revealed in digital environments.	%	78.7	10.6	7.5	1.8	1.4	100	1.36	0.809
	<i>f</i>	400	54	38	9	7	508		
8. I have had problems because my personal information had been found out by people with whom I communicated in digital environments.	%	82.1	8.9	5.9	2.6	0.6	100	1.31	0.746
	<i>f</i>	417	45	30	13	3	508		
9. I have faced legal sanctions due to my sharings in digital environments.	%	92.3	3.1	3.0	0.8	0.8	100	1.15	0.571
	<i>f</i>	469	16	15	4	4	508		
10. Contents of search results in digital environments are encountered as advertisements in digital environments.	%	41.1	8.9	14.4	15.4	20.3	100	2.65	1.606
	<i>f</i>	209	45	73	78	103	508		
11. I am concerned that the contents that I upload in digital environments will affect my family life negatively.	%	77.4	10.8	6.1	3.1	2.6	100	1.43	0.930
	<i>f</i>	393	55	31	16	13	508		
12. I am concerned that the contents that I	%	69.5	14.0	8.7	5.1	2.8	100	1.58	1.028

upload in digital environments will affect my professional life negatively.	<i>f</i>	353	71	44	26	14	508		
13. My sharings in digital environments reflect my real thoughts.	%	13.4	8.3	13.8	23.2	41.3	100	3.71	1.416
	<i>f</i>	68	42	70	118	210	508		
14. Sharings in online tools have a positive effect on me.	%	10.8	16.9	34.6	21.3	16.3	100	3.15	1.203
	<i>f</i>	55	86	176	108	83	508		
15. I believe that I have a positive effect on other people in online tools.	%	13.4	17.9	31.7	20.9	16.1	100	3.08	1.251
	<i>f</i>	68	91	161	106	82	508		
16. I am concerned that other people in online tools will have negative thoughts about me.	%	57.9	22.4	12.8	4.1	2.8	100	1.71	1.020
	<i>f</i>	294	114	65	21	14	508		
Average of digital footprint experiences:								1.9075	1.0025

Examining Table 7, it was seen that higher education students had lower levels of digital footprint experiences ( $\bar{x} = 1.9075$ ). However, experiences of at least three individuals were determined in examples given in the items. In addition, examining the data of the item 10, 'Contents of search results in digital environments are encountered as advertisements in digital environments'; it is seen that digital footprint experiences are encountered moderately ( $\bar{x} = 2.65$ ). According to the data in Table 7, the highest average was observed in the item, 'My sharings in digital environments reflect my real thoughts' ( $\bar{x} = 3.71$ ). In the study by Madden et al. (2007), it was concluded that many Internet users had no concern about the amount of online information about themselves and they also made no attempt to restrict their information. In the study by Ozbek et al. (2016), digital footprint experiences of high school students were examined and it was consequently seen that the students had lower levels of digital footprint experiences.

### 3.3. Examining digital footprint awareness and experiences of students according to their gender

The third research question of the study was determined to be, *Do digital footprint awareness and experiences of higher education students significantly vary according to their gender?* In order to answer that question, the data were analysed with *t*-test. In this context, Table 8 shows number of participants, mean, standard deviation and values *t* and *p*.

**Table 8. Distribution of data related to digital footprint awareness and experiences according to gender**

	Gender	N	$\bar{x}$	Ss	<i>t</i>	<i>p</i>
Digital footprint awareness	Female	331	50.89	7.29	-0.586	0.559
	Male	176	51.28	7.02		
Digital footprint experiences	Female	331	29.49	7.27	-3.781	0.000
	Male	176	32.47	9.00		

As is seen in Table 8, it was determined that there was no significant difference between the participants in terms of digital footprint awareness according to gender ( $t = -0.586$ ,  $p < 0.559$ ). On the other hand, there was a significant difference in their digital footprint experiences according to gender ( $t = -3.781$ ,  $p < 0.000$ ). Accordingly, it was determined that men ( $\bar{x} = 32.47$ ) had greater digital footprint experiences in digital environments than women ( $\bar{x} = 29.49$ ). Similarly, Ozbek et al. (2016) evaluated gender and found that especially men had greater digital footprint experiences.

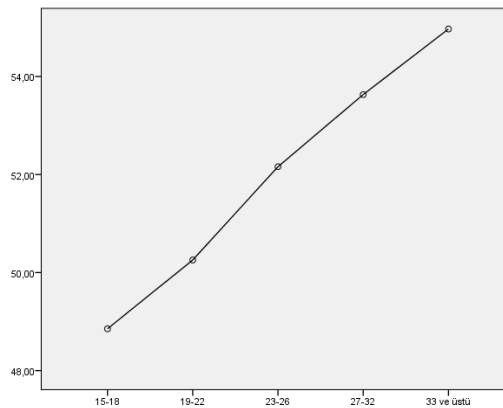
### 3.4. Examining digital footprint awareness and experiences of students according to their age

The fourth research question of the study was determined to be, *Do digital footprint awareness and experiences of higher education students significantly vary according to their age?* In order to answer that question, the data were analysed with one-way ANOVA (See Table 9).

**Table 9. Distribution of data related to digital footprint awareness and experiences according to age**

	Source of variance	Sum of squares	Degree of freedom	Average of squares	F	p
Digital footprint awareness	Intergroup	1,237.220	4	309.305	6.241	0.000
	Intragroup	24,927.684	503	49.558		
	Total	26,164.904	507			
Digital footprint experiences	Intergroup	256.049	4	64.012	0.995	0.410
	Intragroup	32,352.668	503	64.319		
	Total	32,608.717	507			

According to the data in Table 9, it is seen that age affects digital footprint awareness significantly ( $p = 0.000$ ). Figure 1 shows a histogram concerning this finding. As is seen in Figure 1, digital footprint awareness increases in parallel with the increase of age. In addition, according to the data in Table 9, digital footprint experiences do not show any significant difference according to age ( $p = 0.410$ ).



**Figure 1. Histogram of digital footprint awareness and age range**

### 3.5. Examining digital footprint awareness and experiences of students according to their class level

The fifth research question of the study was determined to be, *Do digital footprint awareness and experiences of higher education students significantly vary according to their class level?* In order to answer that question, the data were analysed with one-way ANOVA.

**Table 10. Distribution of data related to digital footprint awareness and experiences according to class level**

	Source of variance	Sum of squares	Degree of freedom	Average of squares	F	p
Digital footprint awareness	Intergroup	1,233.954	5	246.791	4.969	0.000
	Intrgroup	24,930.950	502	49.663		
	Total	26,164.904	507			
Digital footprint experiences	Intergroup	464.504	5	92.901	1.451	0.205
	Intragroup	32,144.213	502	64.032		
	Total	32,608.717	507			

According to the data in Table 10, it is seen that the value of digital footprint awareness of class level is ( $F = 4.969$ ,  $p = 0.000$ ), which shows that at least one of the differences being observed is significant. TUKEY test was conducted for the purpose of determining between which groups the differences were. The results of the TUKEY test showed that the differences were between the first year students, fourth year students and graduate students and also between the second year students and graduate students. This condition makes us think that digital footprint awareness increases in

parallel with the increase of educational level. On the other hand, according to the data in Table 10, digital footprint experiences show no significant difference according to class level ( $p = 0.205$ ).

### 3.6. Examining digital footprint awareness and experiences of students according to the place where they have lived for the longest time

The sixth research question of the study was determined to be, *Do digital footprint awareness and experiences of higher education students significantly vary according to the place where they have lived for the longest time?* In order to answer that question, the data were analysed with one-way ANOVA.

**Table 11. Distribution of data related to digital footprint awareness and experiences according to the place where they have lived for the longest time**

	Source of variance	Sum of squares	Degree of freedom	Average of squares	F	p
Digital footprint awareness	Intergroup	1,075.433	4	268.858	5.390	0.000
	Intragroup	25,089.470	503	49.880		
	Total	26,164.904	507			
Digital footprint experiences	Intergroup	14.882	4	3.720	0.057	0.994
	Intragroup	32,593.835	503	64.799		
	Total	32,608.717	507			

Examining the data in Table 11, it is seen that the value concerning the level of digital footprint awareness is significant in terms of the place where they have lived for the longest time ( $F = 5.390$ ,  $p = 0.000$ ), which shows that at least one of the differences being observed is significant. The result of the TUKEY test, which was conducted for the purpose of determining between which groups the differences were showed that the differences were between the students living in a metropolis and the students living in a village and county town. According to this finding, it is possible to infer that individuals living in a metropolis have higher levels of digital footprint awareness than individuals living in smaller dwelling units. On the other hand, according to the data in Table 11, it is seen that digital footprint experiences do not show a significant difference in terms of the place where they have lived for the longest time ( $p = 0.994$ ).

### 3.7. Examining digital footprint awareness and experiences of students according to the time spent daily in digital environments

The seventh research question of the study was determined to be, *'Do digital footprint awareness and experiences of higher education students significantly vary according to the time spent daily in digital environments?'* In order to answer that question, the data were analysed with one-way ANOVA.

**Table 12. Distribution of data related to digital footprint awareness and experiences according to the time spent daily in digital environments**

	Source of variance	Sum of squares	Degree of freedom	Average of squares	F	p
Digital footprint awareness	Intergroup	317.962	5	63.592	1.235	0.291
	Intragroup	25,846.941	502	51.488		
	Total	26,164.904	507			
Digital footprint experiences	Intergroup	947.290	5	189.458	3.004	0.011
	Intragroup	31,661.427	502	63.071		
	Total	32,608.717	507			

According to the data in Table 12, it is seen that digital footprint awareness does not show a significant difference according to the time spent daily in digital environments ( $p = 0.291$ ), whereas digital footprint experiences show a significant difference according to the time spent daily in digital environments ( $F = 3.004$ ,  $p = 0.011$ ), which shows that at least one of the differences being observed is significant. The result of the TUKEY test, which was conducted for the purpose of determining between which groups the differences were showed that the differences were between the students spending less than 1 hour a day in digital environments and the students spending 1–3 hours and also the students spending 7–9 hours and the students spending 10 hours and above. In this context, it is possible to state that the time spent daily in digital environments increases digital footprint experiences.

### 3.8. Examining digital footprint awareness and experiences of students according to the level of self-sufficiency for using online tools

The eighth research question of the study was determined to be, ‘Do digital footprint awareness and experiences of higher education students significantly vary according to the level of self-sufficiency for using online tools?’ In order to answer that question, the data were analysed with one-way ANOVA (See Table 13).

**Table 13. Distribution of data related to digital footprint awareness and experiences according to the level of self-sufficiency for using online tools**

	Source of variance	Sum of squares	Degree of freedom	Average of squares	F	p
Digital footprint awareness	Intergroup	3,935.973	4	983.993	22.266	0.000
	Intragroup	22,228.931	503	44.193		
	Total	26,164.904	507			
Digital footprint experiences	Intergroup	232.540	4	58.135	0.903	0.462
	Intragroup	32,376.177	503	64.366		
	Total	32,608.717	507			

Examining Table 13, it is seen that individuals’ level of self-sufficiency for using online tools affects digital footprint awareness ( $F = 22.266$ ,  $p = 0.000$ ). The TUKEY test was conducted for the purpose of determining between which groups the differences were. The results of the TUKEY test showed that the differences were between the students feeling completely self-sufficient, moderately self-sufficient, not self-sufficient and never self-sufficient for using online tools. In addition, there were also differences between those feeling never self-sufficient, not self-sufficient, moderately self-sufficient, self-sufficient and completely self-sufficient. Besides this result, the data in Table 13 show that digital footprint experiences do not show a significant difference according to the level of self-sufficiency for using online tools ( $p = 0.462$ ).

### 3.9. Examining digital footprint awareness and experiences of students according to their department in the university

The ninth research question of the study was determined to be, ‘Do digital footprint awareness and experiences of higher education students significantly vary according to their department in the university?’ In order to answer that question, the units of the students from whom data were collected were primarily grouped as ‘vocational school (VS), faculty and institute’. One-way ANOVA was conducted for examining the groups according to awareness and experience scales (See Table 14).

**Table 14. Distribution of data related to digital footprint awareness and experiences according to the department in the university**

	Source of variance	Sum of squares	Degree of freedom	Average of squares	F	p
Digital footprint awareness	Intergroup	1,420.928	2	710.464	14.500	0.000
	Intragroup	24,743.976	505	48.998		
	Total	26,164.904	507			
Digital footprint experiences	Intergroup	86.886	2	43.443	0.675	0.510
	Intragroup	32,521.831	505	64.400		
	Total	32,608.717	507			

Examining Table 14, it is seen that the value concerning digital footprint awareness is significant in the VS, Faculty and Institute students ( $F = 14.500$ ,  $p = 0.000$ ), which shows that at least one of the differences being observed is significant. The TUKEY test was conducted for the purpose of determining between which groups the differences were (See Table 15). In addition, examining Table 14, it is seen that the levels of digital footprint experiences of VS, Faculty and Institute students are not significant ( $F = 0.675$ ,  $p = 0.510$ ).

**Table 15. TUKEY test distribution of the level of digital footprint awareness on the basis of VS-faculty-institute**

	A	B	A – B (difference of average)	Sig.
Digital Footprint Awareness	VS	Faculty	-2.64615*	0.000
		Institute	-4.58581*	0.000
	Faculty	VS	2.64615*	0.000
		Institute	-1.93966	0.091
	Institute	VS	4.58581*	0.000
		Faculty	1.93966	0.091

\*Difference of average according to the significant level of 0.05.

Around 205 VS, 227 faculty and 77 institute students or graduates participated in the study. Comparing digital footprint awareness of these students on the basis of VS-Faculty-Institute, it is seen that the level of awareness increases in parallel with the increase of educational level. VS students have lower levels of awareness than faculty and institute students, whereas there is no significant difference between faculty and institute students (See Table 15). The reason that there is no significant difference between the awareness of faculty and institute students might be related with lower participation of institute students.

### 3.10. Examining digital footprints of students according to their state of using online tools

The 10th research question of the study was determined to be, *In which online tools do higher education students leave their digital footprints the most and the least?* Concerning that question, a 10-item survey question was used for determining digital footprint awareness of higher education students. In order to answer that question, the data were analysed with frequency ( $f$ ), percentage (%), mean ( $\bar{x}$ ) and standard deviation ( $S_s$ ). Table 16 shows the data concerning the state of using online tools (1 = Never, 2 = Seldomly, 3 = Sometimes, 4 = Usually, 5 = Always).

**Table 16. Distributions of data concerning the state of using online tools**

Items		1	2	3	4	5	Total
1. Learning Management Systems (such as Moodle, Blackboard, Edmodo)	%	29.3	17.5	24.8	22.0	6.3	100
	<i>f</i>	149	89	126	112	32	508
2. Social networks (such as Facebook, Twitter, Instagram)	%	4.7	1.8	9.6	19.3	64.6	100
	<i>f</i>	24	9	49	98	328	508
3. Web pages (such as content, comments)	%	9.1	10.4	25.0	29.1	26.4	100
	<i>f</i>	46	53	127	148	134	508
4. Wiki	%	37.2	12.8	18.9	17.9	13.2	100
	<i>f</i>	189	65	96	91	67	508
5. Discussion Forums	%	27.6	25.8	27.4	13.2	6.1	100
	<i>f</i>	140	131	139	67	31	508
6. e-Mail (such as Gmail, Hotmail, Outlook, Yandex)	%	5.5	8.7	17.9	23.8	44.1	100
	<i>f</i>	28	44	91	121	224	508
7. Cloud document sharing environments (such as OneDrive, Dropbox, Google Drive)	%	16.1	15.9	18.3	26.2	23.4	100
	<i>f</i>	82	81	93	133	119	508
8. Network diary (Blog)	%	40.7	25.4	20.7	8.9	4.3	100
	<i>f</i>	207	129	105	45	22	508
9. Online chat tools (such as WhatsApp, Skype, Messenger)	%	1.2	2.6	5.5	11.8	78.9	100
	<i>f</i>	6	13	28	60	401	508
10. Platforms like Ekşi Sözlük, Uludağ Sözlük	%	11.2	19.3	29.5	25.2	14.8	100
	<i>f</i>	57	98	150	128	75	508

Considering the options ‘4 = Usually and 5 = Always’, which are among the data concerning online tools, in groups in Table 16, it is seen that online tools where the maximum digital footprints are left are online chat tools (90.7%), social networks (83.9%) and e-mail (67.9%), which are followed, respectively, by web pages (55.5%) and cloud document sharing environments (49.6%). On the other hand, considering the data in the options ‘1 = Never and 2 = Seldomly’ in groups, it is seen that online tools where the least digital footprints are left are network diary (66.1%), discussion forums (53.4%), wiki (50.0%) and learning management systems (46.8%). Zhang et al. (2010) suggested that digital footprints would make a great blowout in information sources like mobile technologies and social web. It is possible to state that the arrangement of online tools where footprints are left the most and the least is associated with tools being used while connecting to online environments and the media where a connection is made. According to the demographic information, the tool that is used the most while connection to online environments is smart phones and the media where a connection is made the most is also operators (smart phones).

#### 4. Conclusion and suggestions

Today’s digital environments meet personal needs via online or off-line environments. At the end of each transaction performed in digital environments, a contribution is made to the formation of some records either consciously or unconsciously. In other words, digital footprints are left. Considering from this point of view, it should be remembered that individuals have important responsibilities in this process while performing some transactions in digital environments. Thus, awareness should be raised in digital environment users so that they can use these environments consciously. On the other hand, considering the fact that digital environments are mostly used by the young population, it is possible to state that the matter of digital footprint should be overemphasised for higher education students. In this context, the study tries to determine digital footprint awareness and experiences of higher education students.

The first result of the study is that higher education students have higher levels of digital footprint awareness. On the other hand, the concept of ‘digital footprint’ is not much known and used by higher

education students. Higher education students have lower levels of experiences in digital environments. Their experiences in digital environments mainly consist of encountering searches that are made in digital environments as advertisements in different environments.

Digital footprint awareness of higher education students does not vary according to gender. On the other hand, digital footprint experiences vary according to gender and men have higher levels of experiences. In other words, men have greater experiences concerning digital footprints left in digital environments than women.

According to the evaluations concerning the variable of age, while digital footprint awareness is affected by age, digital footprint experiences are not affected by this variable. Digital footprint awareness increases in parallel with the increase of age. According to the evaluations concerning the variable of class level, while digital footprint awareness varies according to class level, digital footprint experiences are not affected by this variable. Digital footprint awareness increases in parallel with the increase of class level.

On the other hand, while digital footprint awareness is affected mostly by the place where they have lived for the longest time, digital footprint experiences are not affected by this variable. The students who selected metropolis as the place where they had lived for the longest time had higher levels of digital footprint awareness, while digital footprint awareness is not affected by the variable of the time spent daily in digital environments and digital footprint experiences are affected by this variable. It was determined that the students who selected 10 hours and above and 7–9 hours for the time spent daily in digital environments had greater digital footprint experiences than the students who selected less than 1 hour and 1–3 hours.

While digital footprint awareness is affected by the level of self-sufficiency for using online tools, digital footprint experiences are not affected by this variable. Accordingly, digital footprint awareness increases in parallel with the increase of the level of self-sufficiency for using online tools. Digital footprint awareness varies for VS, faculty and institute students. Institute and faculty students have higher levels of digital footprint awareness than VS students. On the other hand, digital footprint experiences do not vary for students in these three units.

Online tools, where the maximum digital footprints, are left are online chat tools, social networks, e-mail, web pages and cloud document sharing environments, whereas online tools, where the least digital footprints, are left are network diaries, discussion forums, wiki and learning management systems.

It is believed that the study will make important contributions to the digital footprint literature as it a brand new subject in the literature. In this context, the future studies can:

- Collect data from higher education students on the basis of their department and examine their digital footprint awareness or experiences according to departments.
- Examine digital footprint awareness or experiences of high school students, who are candidate higher education students, according to the types of high schools.
- Examine digital footprint awareness or experiences in terms of different variables.

## References

- Bennett, S., Maton, K. & Kervin, L. (2008). The 'digital natives' debate: a critical review of the evidence. *British Journal of Educational Technology*, 39(5), 775–786.
- Bodhani, A. (2012). Digital footprints step up. *Engineering & Technology*, 7(1), 82–83.
- Camacho, M., Minelli, J. & Grosseck, G. (2012). Self and identity: raising undergraduate students' awareness on their digital footprints. *Procedia-Social and Behavioral Sciences*, 46, 3176–3181.



Surmelioglu, Y. & Seferoglu, S. S. (2019). An examination of digital footprint awareness and digital experiences of higher education students. *World Journal on Educational Technology: Current Issues*, 11(1), 48–64.

- Chen, C., Chen, X., Wang, L., Ma, X., Wang, Z., Liu, K. & Zhou, Z. (2017). MA-SSR: a memetic algorithm for skyline scenic routes planning leveraging heterogeneous user-generated digital footprints. *IEEE Transactions on Vehicular Technology*, 66(7), 5723–5736.
- Costa, C., Sousa, C., Rogado, J. & Henriques, S. (2017). Playing digital security: youth voices on their digital rights. *International Journal of Game-Based Learning (IJGBL)*, 7(3), 11–25.
- Fraenkel, J. R., Wallen, N. E. & Hyun, H. H. (2003). *How to design and evaluate research in education* (pp. 366–386). McGraw-Hill Higher Education.
- Garfinkel, S. L. (2010). Digital forensics research: the next 10 years. *Digital Investigation*, 7, 64–73.
- Girardin, F., Calabrese, F., Dal Fiore, F., Ratti, C. & Blat, J. (2008). Digital footprinting: uncovering tourists with user-generated content. *IEEE Pervasive Computing*, 7(4).
- Golder, S. A. & Macy, M. W. (2014). Digital footprints: opportunities and challenges for online social research. *Annual Review of Sociology*, 40.
- Ispir, B., Birsen, H., Binark, F. M., Ozata, F. Z., Bayraktutan, G., Ozturk, M. C. & Ayman, M. (2013). *Digital communication and the new media*. Eskisehir, Turkey: Web-Ofset.
- Kosinski, M., Stillwell, D. & Graepel, T. (2013). Private traits and attributes are predictable from digital records of human behavior. *Proceedings of the National Academy of Sciences*, 110(15), 5802–5805.
- Krasna, M., Bratina, T. & Bedrac, B. (2011). Digital competences in education-digital security. In *INTED 2011 Proceedings* (pp. 1634–1641). IATED.
- Lambiotte, R. & Kosinski, M. (2014). Tracking the digital footprints of personality. *Proceedings of the IEEE*, 102(12), 1934–1939.
- Madden, M., Fox, S., Smith, A. & Vitak, J. (2007). *Digital footprints: online identity management and search in the age of transparency*. Pew/Internet & American Life Project, December 16, 2007.
- Margaryan, A., Littlejohn, A. & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. *Computers & Education*, 56(2), 429–440.
- Ozbek, Y., Coklar, A. N. & Gunduz, S. (2016). Determining the digital footprint awareness and experiences of high school students. In *10th International Computer and Instructional Technologies Symposium (ICITS)* (pp. 596–604). Rize, Turkey: ICITS Proceedings Book.
- Simsek, O. & Yazar, T. (2016). Education Technology Standards Self-Efficacy (ETSSE) Scale: a validity and reliability study. *Eurasian Journal of Educational Research*, 16(63).
- Sommer, P. (1998). Digital footprints: assessing computer evidence. *Criminal Law Review*, 12, 61–78.
- Tapscott, D. (2008). *Grown up digital: How the next generation is changing your world*. New York, NY: McGraw-Hill.
- Turkish Language Society (TLS). (2018). *Current Turkish Dictionary*. Retrieved January 18, 2018, from [http://www.tdk.gov.tr/index.php?option=com\\_gts&arama=gts&guid=TDK.GTS.5a608f5a9003f1.44803668](http://www.tdk.gov.tr/index.php?option=com_gts&arama=gts&guid=TDK.GTS.5a608f5a9003f1.44803668)
- Yli-Renko, H., Autio, E. & Sapienza, H. J. (2001). Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. *Strategic Management Journal*, 22(6–7), 587–613.
- Zhang, D., Guo, B. & Yu, Z. (2011). The emergence of social and community intelligence. *Computer*, 44(7), 21–28.
- Zhang, D., Guo, B., Li, B. & Yu, Z. (2010). Extracting social and community intelligence from digital footprints: an emerging research area. *Ubiquitous Intelligence and Computing*, 4–18.