INTERNET SKILLS: A SCALE ADAPTATION STUDY[*]

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Abstract

This study aims to adapt the Internet Skills Scale, originally developed by Van Deursen et al. in 2016 to the Turkish cultural context and to examine its psychometric properties. The original scale comprises 35 items across five factors. To explore the factor structure in the Turkish context, exploratory factor analysis was conducted with data from 307 internet users. The original 5-factor structure was reduced to four factors due to the analysis. It was determined that all factors explained 68.4% of the variance. Confirmatory factor analysis was conducted with 300 participants to test the suitability of the resulting 4-factor structure for Turkish culture. Confirmatory factor analysis results supported the 4-factor structure, and the fit indices indicated acceptable, good, and excellent model fit. Convergent and discriminant validity analyses were also conducted to assess construct validity, and the results were found to be within acceptable ranges. Based on the findings, the 20-item version of the scale was confirmed to be valid and reliable for use within the Turkish context.

Keywords: internet skills; scale adaptation; confirmatory factor analysis; exploratory factor analysis; validity; reliability.

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İNTERNET BECERİLERİ: BİR ÖLÇEK UYARLAMA ÇALIŞMASI

Öz

Bu çalışmanın amacı Van Deursen vd. tarafından 2016 yılında geliştirilen İnternet Becerileri Ölçeğini Türk kültürüne uyarlamak ve ilgili ölçeğin psikometrik özelliklerini sınamaktır. Orijinal ölçek 35 madde ve beş faktörlü bir yapıya sahiptir. Ölçeğin faktör yapısını Türkiye örnekleminde incelemek amacıyla İnternet kullanıcısı olan 307 kişi ile açımlayıcı faktör analizi gerçekleştirilmiştir. Gerçekleştirilen analiz sonucunda orijinal ölçekte beş faktörden oluşan yapının dört faktör altında toplandığı görülmüştür. Tüm faktörlerin varyansın %68.4'ünü açıkladığı belirlenmiştir. Ortaya çıkan dört faktörlü yapının Türk kültürüne uygunluğunu test etmek amacıyla 300 kişi ile doğrulayıcı faktör analizi gerçekleştirilmiştir. Analiz sonucunda dört faktörlü yapının korunduğu görülmüştür. DFA sonucunda elde edilen uyum indekslerinin kabul edilebilir, iyi ve mükemmel uyum aralığında oldukları belirlenmiştir. Yapı geçerliliğini belirlemek için birleşim geçerliği ve ayrışım geçerliği analiz sonuçlarının da uygun aralıklarda olduğu tespit edilmiştir. Elde edilen bulgular sonucunda 20 maddeden oluşan formun Türk kültürüne uygunluğu kanıtlanmış ve ölçeğin Türkçe formunun geçerliği ve güvenirliği sağlanmıştır.

Anahtar Kelimeler: internet becerileri; ölçek uyarlama; doğrulayıcı faktör analizi; açımlayıcı faktör analizi; geçerlik; güvenirlik.

Geniş Özet

Bu çalışmada Van Deursen vd. (2016) tarafından geliştirilen İnternet Becerileri Ölçeğinin (İBÖ) 18-60 yaş arası bireyler için Türk kültürüne uyarlanması ve ölçeğin psikometrik özelliklerinin incelenmesi amaçlanmıştır. Çalışma evreni İnternet kullanan bireylerden oluşmaktadır. Orijinal çalışmanın örneklemi 16-61 yaş aralığındaki bireylerdir. Bu çalışmanın örneklemini ise 18-60 yaş aralığındaki bireyler oluşturmaktadır. Çalışma rastgele olmayan örnekleme yöntemlerinden uygun örnekleme yöntemiyle tasarlanmıştır. Bu yöntemde ulaşılabilir ve gönüllü olan kişiler kolayca çalışmaya dâhil edilmektedir (Johnson ve Christensen, 2014). Bu doğrultuda Açımlayıcı Faktör Analizi (AFA) ve Doğrulayıcı Faktör Analizi (DFA) için iki ayrı örneklemden veri toplanmış ve örneklemlere ait bilgiler sırasıyla açıklanmıştır.

Çalışmanın birinci aşamasında AFA için İnternet kullanıcısı olan 307 kişi örnekleme dâhil edilmiştir. Katılımcıların 209'u kadın ve 98'i erkektir. Katılımcıların %40.7'si 18-25, %27.7'si 26-35, %23.8'i 36-45, %7.8'i ise 46 ve üstü yaşındadır. Katılımcıların çoğunluğunun (%68.7) eğitim düzeyi lisanstır. Diğer eğitim düzeylerine göre dağılım ise şu şekildedir: yüksek lisans (%12.4), ön lisans (%7.5), lise ve doktora (%4.6), ilkokul (%1.6), ortaokul (%0.7). En fazla sahip olunan teknoloji (%97.1) akıllı telefon, en az sahip olunan teknoloji (%25.1) ise akıllı saattir. Katılımcıların çoğunluğu (%45.3) İnternet'i günlük 1-4 saat kullanmaktadır.

Çalışmanın ikinci aşamasında DFA için İnternet kullanıcısı olan 300 kişi örnekleme dâhil edilmiştir. Katılımcıların 228'i kadın ve 72'si erkektir. Katılımcıların %28'i 18-25, %41'i 26-35, %25.7'si 36-45, %5.3'ü ise 46 ve üstü yaşındadır. Katılımcıların çoğunluğunun (%54.7) eğitim düzeyi lisanstır. Diğer eğitim düzeylerine göre dağılım ise şu şekildedir: yüksek lisans (%14.0),

ön lisans (%13.3), lise (%9.7), doktora (%7.3) ve ilkokul (%1.0). En fazla sahip olunan teknoloji (%98.7) akıllı telefon, en az sahip olunan teknoloji (%32.3) ise masaüstü bilgisayardır. Katılımcıların çoğunluğu (%49.3) İnternet'i günlük 1-4 saat kullanmaktadır.

İki bölümden oluşan veri toplama aracının birinci bölümü araştırmacılar tarafından geliştirilmiştir. Birinci bölümde cinsiyet, yaş, eğitim düzeyi, sahip olunan teknoloji, günlük İnternet kullanım süresi gibi ifadelerin yer aldığı sorular yer almaktadır. İkinci bölümde ise Türk kültürüne uyarlamak amacıyla Van Deursen vd. (2016) tarafından geliştirilen İBÖ kullanılmıştır. 5'li likert tipindeki ölçekte katılım düzeyleri "benim için çok doğru (5)" ile "benim için hiç doğru değil (1)" arasında derecelendirilmiştir. Beş boyuttan oluşan ölçeğin uzun formu 35 maddeden, kısa formu ise 23 maddeden oluşmaktadır. Uzun formda yer alan boyutlarda; operasyonel 10, bilgi arama ve yaratıcı 8, sosyal 6 ve mobil 3 maddeden oluşurken kısa formda yer olan boyutlarda; operasyonel, bilgi arama, sosyal ve yaratıcı 5, mobil ise 3 maddeden oluşmaktadır. Ölçeğin uzun formundan en yüksek 175, en düşük 35 puan alınabilirken kısa formundan en yüksek 115, en düşük 23 puan alınabilmektedir. Faktörlerin Cronbach Alfa katsayıları; "Operasyonel", "Bilgi Arama" ve "Yaratıcı" için .92; "Sosyal" için .88 ve "Mobil" için .94 olarak belirlenmiştir. Van Deursen vd. (2016) farklı becerileri ayırt etmenin ve bu becerileri ayrıntılarıyla incelemenin söz konusu olduğu çalışmalarda ölçeğin uzun formuna yer verilmesi gerektiğini belirtmiştir. Bu doğrultuda çalışmada farklı becerilerin Türk kültüründeki potansiyel çeşitliliğini ortaya koymak için ölçeğin uzun formu kullanılmıştır.

Ölçeği Türk kültürüne uyarlama sürecinde öncelikle orijinal ölçeği geliştiren Van Deursen vd. (2016)'den e-posta aracılığıyla gerekli izinler alınmıştır. İngilizce olan ölçeği Türkçeye uyarlamak için sırasıyla çeviri, geri çeviri ve pilot uygulama aşamaları takip edilmiştir. Birinci aşamada ölçek maddeleri orijinal dil olan İngilizceden hedef dil olan Türkçeye dil uzmanı tarafından çevrilmiştir. İlk çevirinin ardından maddeler incelenerek geri çeviri yapılmıştır. Türkçeye çevrilen maddeler üç İngilizce dil uzmanı, iki Türkçe dil uzmanı ve dört öğretim teknolojileri uzmanı tarafından incelenmiştir. İncelemenin ardından maddelerde gerekli görülen düzeltmeler yapılmıştır. 18-60 yaşındaki 15 kişi ile bir pilot çalışma gerçekleştirilerek maddelerin anlaşılır olup olmadığı katılımcılara sorulmuş, alınan dönütlere göre forma son hâli verilmiştir.

Verilerin istatistiksel çözümlemesi için sırasıyla AFA ve DFA gerçekleştirilmiştir. İlk aşamada ölçeğin yapı geçerliğini sağlamak için 307 kişiden elde edilen veri seti incelenmiştir. Bu veriler üzerinde gerekli düzenlemeler yapılarak veri setindeki uç değerleri belirlemek için maddelerin kutu grafiklerine bakılmıştır. Normallik varsayımı için ise histogram grafikleri, çarpıklık ve basıklık katsayıları irdelenmiştir. Bu aşamada elde edilen veriler SPSS programı kullanılarak AFA'ya tabi tutulmuştur. İkinci aşamada ölçeğin İnternet becerilerini ölçüp ölçmediğini ortaya koymak için 300 kişiden elde edilen veriler AMOS programında DFA'ya tabi tutulmuştur. İBÖ'nün öngörülen dört faktörlü kuramsal yapısını sınamak için yapı geçerliğine yönelik sırasıyla birleşim ve ayrışım geçerlikleri değerlendirilmiştir.

İBÖ'nün yapı geçerliğini belirlemek ve faktör yapısını ortaya koymak için AFA yapılmıştır. Analiz yapmadan önce çalışmaya katılım sağlayan 307 kişiye ait verilere Kaiser-Meyer-Olkin (KMO) ve Bartlett's test of Sphericity testleri uygulanmıştır. KMO değerinin .50'den büyük olması örneklemin yeterli olduğunu, Bartlett's test of Sphericity değerinin anlamlı olması ise maddeler arasındaki korelasyonu belirtmektedir (Field, 2024). Ölçeğin, KMO sonucu .95'tir. Bu sonuç örneklemin yeterli olduğunu göstermektedir. Barlett sonucu ise $\chi^2(595)=11063.106$, p<0.05'tir. Bu sonuç maddeler arasındaki korelasyonun yeterli olduğuna işaret etmektedir. Maksimum olabilirlik (maximum likelihood) yöntemi ile yapılan faktör analizi, 35 madde

üzerinde doğrudan eğik döndürme (direct oblimin) ile gerçekleştirilmiştir. Verideki her bir faktörün öz değerlerini elde etmek için gerçekleştirilen analizin ardından orijinal ölçekte beş faktörden oluşan yapının dört faktör altında toplandığı görülmüştür. Dört faktör Kaiser (1970)'in belirlediği kriter olan 1'in üzerinde öz değerlere sahiptir ve tüm faktörlerin varyansın %68.4'ünü açıklamaktadır. Aynı faktörde kümelenen maddeler: Operasyonel, Bilgi Arama, Yaratıcı ve Sosyal faktörlerini temsil etmektedir. Operasyonel faktörü varyansın %46.2'sini, bilgi arama faktörü %12.8'ini, yaratıcı faktörü %6.6'sını ve sosyal faktörü %2.8'ini açıklamaktadır.

Ölçek çalışmalarında DFA yapmak için AFA yapılan veri setinden farklı bir veri seti kullanılmalıdır (Schumacker ve Lomax, 2010). Bu sebeple DFA için AFA veri setinden bağımsız bir veri seti oluşturulmuştur. Analiz öncesinde veri setinin DFA için uygunluğunu tespit etmek amacıyla Tabachnick ve Fidell (2020)'in önerdiği kriterler (normallik, doğrusallık) kullanılarak varsayımlar incelenmiştir. İlk aşamada 35 madde ile gerçekleştirilen DFA sonuçlarının uyum iyiliği değerlerini karşılamadığı belirlenmiştir. Bu aşamada maddelerin basıklık ve çarpıklık değerleri için +2, -2 aralığı baz alınmış, yük değerleri .50'den düşük olan maddeler analiz dışında bırakılmıştır. Bazı uyum iyiliği değerlerinin istenen aralıkta olmaması sebebiyle modifikasyon indeksleri incelenmiş ve yapılan analiz sonucunda iki modifikasyon önerisinin modele önemli katkı sağlayabileceği belirlenmiştir. Modifikasyon işlemi ardından yapılan DFA sonucunda χ^2/sd değeri 2.059 hesaplanmıştır. Analiz sonucunda elde edilen uyum iyiliği değerlerinin de tavsiye edilen aralıkta olduğu belirlenmiştir. Dolayısıyla yapılan birinci düzey DFA sonucunda dört faktörlü yapının kabul edilebilir uyum değerlerine sahip olduğu sonucuna ulaşılmıştır.

Ölçeğin yapı geçerliğini irdelemek için aynı yapıyı ölçen değişkenler arasındaki ilişkinin derecesini ortaya koymak amacıyla birleşim geçerliği, gizil değişkenler arasındaki ayrışmayı belirlemek amacıyla ayrışım geçerliği (Koeske, 1994) çalışmaları yapılmıştır. Birleşim geçerliği analizi sonucunda her bir faktöre ait Birleşme Güvenirliği (BG) değerinin .70'in üstünde olduğu, ayrışım geçerliği analizi sonucunda ise Ortalama Açıklanan Varyans (OAV) değerinin kareökünün .50'den büyük ve faktör korelasyon katsayılarından yüksek olduğu görülmüştür. Gerçekleştirilen AFA ve birinci düzey DFA sonucunda elde edilen bulgular, 20 maddeden oluşan formun Türk kültürüne uygunluğunu kanıtlamıştır. Uyarlanan bu ölçek, Türkiye'de 18-60 yaş aralığındaki İnternet kullanıcıların sahip oldukları İnternet becerilerini belirleyip veriye dayalı geliştirilmesi, düzenlenmesi ya da iyileştirilmesi düşünülen yenilikçi adımlara öncülük edebilir.

Introduction

Globalization and the rapidly evolving Internet have made it a vital technology that enhances human life by enabling quick and easy access to information and services. Internet usage continues to grow. According to the We Are Social (2023) report, global Internet usage increased by 1.9% over the past year, reaching 64.4%. In terms of country rankings, China is the country with the most Internet users, while Türkiye is in 14th with 71 million users (Statista, 2023a). Additionally, the Turkish Statistical Institute [TSI](2023) reported that 87.1% of Turkey's population are internet users. These figures underscore the growing importance of the Internet in everyday life and its role in fostering digital engagement globally.

Technological advancements have shifted many daily activities online, including purchasing services like travel, ticketing, and accommodations. Education, healthcare, and

banking are also increasingly accessible through the Internet. Internet banking is now widely popular, providing users with various benefits (Statista, 2023b). New technologies such as Artificial Intelligence, the Internet of Things (IoT), and cloud technologies are further transforming online interactions, especially with Web 4.0 (Ersöz, 2020). The Internet is a vital resource for accessing and sharing information to solve everyday problems (Soroya et al., 2021). As a result, strong Internet skills are now considered essential (Van Deursen & Van Dijk, 2011; Van Laar et al., 2020).

The Internet is no longer merely a set of protocols for data transmission; it now includes network content, social practices, and user skills (Haigh et al., 2015). Focusing only on the technical aspects neglects user actions (Abbate, 2000). User experiences are shaped by their social environments, personal capabilities, and physical limitations (Abbate, 2017). To navigate the Internet effectively, individuals must possess Internet skills (Önder, 2021). These include using search engines, navigating web pages, adjusting browser settings, selecting search results, and creating search queries (Mota & Cilento, 2020).

Various terms such as "digital skills," "e-skills," and "digital literacy" are often used interchangeably to refer to Internet skills (Scheerder et al., 2017). Similarly, "digital literacy", "computer literacy," and "media literacy" describe Internet literacy, which means having the ability to use computers and the Internet effectively. Literacy generally means being able to read, write, and understand information (Ala-Mutka, 2011; Bawden, 2001). Specifically, Internet literacy is the ability to use and manage online resources (Ala-Mutka, 2011). Internet skills are essential for leveraging the Internet effectively (Bauer & Ahooei, 2018). It is important to distinguish between Internet knowledge and Internet skills. Knowledge involves understanding concepts, while skills are about practical application (Mota & Cliento, 2020). As Güneş and Deveci (2022) emphasize, skills can be developed through practice and applied across various contexts.

Many studies measuring Internet skills encounter challenges due to the absence of clearly defined levels of task difficulty. As a result, the findings tend to reflect how much people use the Internet rather than how skilled they are (Van Deursen & Van Dijk, 2010). Additionally, many of these studies focus only on the technical aspects of Internet usage (Hargittai & Hsieh, 2012; Potosky, 2007). To effectively measure Internet skills, a comprehensive scale should encompass a broad range of abilities: understanding and using online content, information navigation skills, communication, and socio-emotional skills (Helsper, 2008; Potosky, 2007; Van Deursen & Van Dijk, 2010; Van Dijk & Van Deursen, 2014). Internet skills are crucial predictors of how individuals engage with the Internet (Johansson et al., 2021). Using the Internet requires different abilities, such as searching for information, communicating, and creating content. Therefore, not all Internet users have the necessary skills for effective online interaction. Given the importance of these skills in shaping online behavior, it is essential to develop reliable and valid measurement tools that can be applied across different populations (Van Deursen et al., 2016).

Van Deursen and Van Dijk (2009a, 2009b, 2010) identified four dimensions of Internet skills: operational, formal, information, and strategic. Helsper and Eynon (2013) established four skill categories: technical, social, critical, and creative. Van Dijk and Van Deursen (2014) further expanded this framework by including communication and content creation skills. Van Deursen et al. (2016) developed the Internet Skills Scale (ISS) in five areas: operational, information navigation, social, creative, and mobile skills.

Operational Skills: These are the basic technical skills required for using the Internet, such as entering a web address into a browser and navigating between different web pages. Information Navigation Skills: This refers to the ability to find, select, and evaluate various sources of information available online. Social Skills: This involves online communication and interaction skills, which encompass the ability to communicate and interact effectively online, including evaluating and managing online relationships. Creative Skills: These skills involve creating content that meets acceptable quality standards for publication or sharing with others online. Mobile Skills: This includes being able to use mobile devices proficiently to access and navigate online content (Van Deursen et al., 2016).

ISS was developed using a comprehensive process that included several key steps. These involved a literature review, cognitive interviews in the Netherlands and the UK to ensure cross-cultural validity, a pilot study to assess internal validity, and analyses to evaluate both internal and external validity. Previous scales that measured Internet skills often faced issues such as oversimplification, conceptual ambiguity and reporting (Helsper & Eynon, 2013; Van Deursen & Van Dijk, 2009; 2010). In contrast, the ISS is grounded in a robust conceptual framework and underwent multiple validation stages, establishing it as a reliable tool that addresses these prior limitations (Van Deursen et al., 2016). This scale has been used in the Global Kids Online project, which involves researchers from the fields of technology, media, and communication, to explore the "skills" dimension of children's internet experiences (Global Kids Online, 2025a). Moreover, the scale continues to be used for data collection in the Global Kids Online project and is being implemented in various countries (Global Kids Online, 2025b; Mota & Cilento, 2020; Yasmine et al., 2025). It is recommended that the scale be applied to other cultures to truly test its cross-cultural validity (Van Deursen et al., 2014). For this reason, an adaptation study on the scale was recently conducted in Slovenia (Grošelj et al., 2021). In this context, the study aimed to adapt ISS developed by Van Deursen et al. (2016) to Turkish culture. No scale measuring Internet skills was found in the national literature. Since the scale is theoretically strong, has wide content validity, and can measure many sub-skills as well as basic skills, this adaptation is expected to provide valuable insights, address a gap in the national literature, and support future research. It can also help identify gaps in Internet skills among individuals and guide necessary improvements.

Method

The study aimed to adapt the ISS, Van Deursen et al. (2016) developed for individuals aged 18-60 to Turkish culture and examine the scale's psychometric properties.

Population and Sample

The study involved Internet users aged between 18-60, selected through convenience sampling. This method allows for the rapid inclusion of accessible individuals and volunteers (Johnson & Christensen, 2014). The original study sample consists of individuals aged from 16 to 61 years. According to Comrey (1988), a sample size of 200 participants is generally sufficient for standard factor analyses with fewer than 40 items. Streiner (1994) suggested five individuals per indicator like Gorsuch (1974) but he indicated that the sample size should not be less than 100. According to Rouquette, and Falissard (2011), if one's aim is to reveal the factor structure, under the hypothesis that the underlying common factor model is true, a minimum of 300 subjects is generally acceptable in the conditions encountered in the field of psychiatry. Data were collected from two separate samples for Exploratory Factor Analysis

(EFA) and Confirmatory Factor Analysis (CFA). Ethical approval was obtained from the Recep Tayyip Erdoğan University Social Sciences and Humanities Ethics Board on 22/11/2023, decision number 2023/347.

EFA Sample

In the first phase of the study, the sample for the EFA consisted of 307 Internet users. Table 1 presents these participants' demographic properties: 209 were female, and 98 were male. The age distribution was as follows: 40.7% were aged 18-25 years, 27.7% were 26-35 years, 23.8% were 36-45 years, and 7.8% were 46 years or older. In terms of education level, most participants (68.7%) had completed an undergraduate degree. The other education levels included master's degrees (12.4%), associate degrees (7.5%), high school and doctoral degrees (4.6% each), primary school (1.6%), and secondary school (0.7%). Regarding technology ownership, the vast majority (97.1%) of participants owned a smartphone, whereas only 25.1% owned a smartwatch. Additionally, most participants (45.3%) reported using the Internet for 1-4 hours daily.

CFA Sample

In the second stage of the study, a sample of 300 Internet users were selected for CFA. The participants included 228 females and 72 males. Participants' ages varied, with 28% aged 18-25, 41% aged 26-35, 25.7% aged 36-45, and 5.3% aged 46 and above. Regarding education, the majority (54.7%) held an undergraduate degree, while other educational levels included master's degrees (14.0%), associate degrees (13.3%), high school (9.7%), doctoral degrees (7.3%), and primary school education (1.0%). Regarding technology ownership, 98.7% of participants owned a smartphone, making it the most common device, while desktop computers were the least owned, at 32.3%. Most participants (49.3%) reported daily Internet use of 1–4 hours.

Table 1. Demographic Information

Variable		EFA sample		CFA sample	
		n	%	n	%
Gender	Female	209	68.1	228	76.0
	Male	98	31.9	72	24.0
Age	18-25	125	40.7	84	28.0
	26-35	85	27.7	123	41.0
	36-45	73	23.8	77	25.7
	46 and above	24	7.8	16	5.3
Education level	Primary School	5	1.6	3	1.0
	Secondary School	2	0.7	-	-
	High School	14	4.6	29	9.7
	Associate degree	23	7.5	40	13.3
	Undergraduate	211	68.7	164	54.7
	Master's degree	38	12.4	42	14.0
	PhD	14	4.6	22	7.3
Owned technology	Laptop	251	81.8	240	80.0
	Desktop	87	28.3	97	32.3
	Tablet PC	94	30.6	99	33.0
	Smartphone	298	97.1	296	98.7
	Smart watch	77	25.1	107	35.7
Daily internet usage time	1-4 hours	139	45.3	148	49.3
	5-8 hours	128	41.7	110	36.7
	9-12 hours	38	12.4	32	10.7
	13 hours or more	2	0.7	10	3.3

Data Collection Tools

The researchers developed a two-section data collection tool. The first section included demographic questions on gender, age, education level, technology ownership, and daily internet usage. The second section contained the ISS, originally developed by Van Deursen et al. (2016) and adapted for Turkish culture. It employs a 5-point Likert scale ranging from "very true for me (5)" to "not true for me at all (1)." The long form of the scale has 35 items distributed across five dimensions: 10 operational items, 8 information navigation and creative items, 6 social items, and 3 mobile items. The short form has 23 items, with 5 operational, 5 information navigation, 5 social and creative, and 3 mobile items.

The long-form scores range from 35 to 175, while the short-form scores range from 23 to 115. The Cronbach's Alpha coefficients for the original scale are .92 for "Operational," "Information Navigation," and "Creative," .88 for "Social," and .94 for "Mobile." Van Deursen et al. (2016) recommend using the long form in studies to differentiate and examine skills in detail. Thus, this study utilized the long form to reveal the potential diversity of different skills in Turkish culture.

Data Collection Process

Data was collected online through Google Forms between December 2023 and February 2024. The online form was sent to people who are active computer users and have internet access.

In adapting the scale to Turkish culture, we obtained the necessary permissions from Van Deursen et al. (2016), who originally developed the scale via email. The adaptation process involved several stages, including translation, back translation, and piloting. In the first stage, a language expert translated the scale items from English into Turkish. After this initial translation, the items were analyzed and then back-translated. The translated items were reviewed by three English language experts, two Turkish language experts, and four instructional technology experts. An expert opinion form was employed, enabling reviewers to evaluate not only linguistic equivalence but also the cultural appropriateness and clarity of each item within the Turkish context. Based on their feedback, necessary revisions were made to the items. Following this, a pilot study was conducted with 15 participants aged between 18 to 60. Items were revised according to their feedback. To enhance understandability and cultural relevance, "Instagram" replaced "Tumblr," and "X" replaced "Twitter." Additionally, since the term "browser" carries multiple meanings in Turkish, specific examples such as "Google Chrome" and "Yandex" were explicitly included in relevant items.

Data Analysis

Firstly, EFA and CFA were conducted to statistically analyze the data. In the first phase, the dataset consisting of responses from 307 participants was analyzed to ensure the construct validity of the scale. The data were initially screened, necessary adjustments were made, and box plots were examined to identify any outliers. Additionally, normality was assessed by reviewing histograms and analyzing skewness and kurtosis coefficients. It is important to note that the items related to the information navigation factor were reverse-coded, as they were originally designed as reverse-scored items. Following these preparations, EFA was conducted using SPSS software. In the second phase, CFA was performed using data from 300 participants via AMOS software. This analysis aimed to determine whether the scale effectively measures internet skills. To test the four-dimensional theoretical structure proposed for the ISS, both convergent and discriminant validity were evaluated to confirm construct validity.

Findings

In line with the purpose of the study, the data collection process was carried out in two stages. The data obtained in the first stage was used for EFA, and the data obtained in the second stage was used for CFA. In this section, the analysis results are summarized in tables, and the content of each table is presented in detail.

Findings for Exploratory Factor Analysis

EFA was conducted to determine the construct validity of ISS and to reveal its factor structure. Before analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's test of Sphericity tests were applied to the data of 307 people who participated in the study. A KMO value greater than .50 indicates that the sample is sufficient, and a significant Bartlett's test of Sphericity value indicates the correlation between the items (Field, 2024). The KMO result of the scale is .95, which shows that the sample is sufficient. Bartlett's result is [χ^2(595)=11063.106, p<0.05]. This result indicates that the correlation between the items is sufficient. Factor analysis using the maximum likelihood method was performed with direct oblimin rotation on 35 items. Direct oblimin is another type of oblique rotation that aims to produce factors with perfect simple structure, i.e., factors with cross-loadings near zero or equal to zero (Castro et al., 2015). Cooper (2019) suggested oblique rotation as a rotation method because it is uncertain

whether the factors will be related to each other. Fabrigar and Wegener (2012) suggested oblique rotation as a rotation method because it better reflects the data. After the analysis performed to obtain the eigenvalues of each factor in the data, it was seen that the structure consisting of five factors in the original scale was gathered under four factors. Four factors with eigenvalues equal to or greater than one were observed in the scree plot (Figure 1).
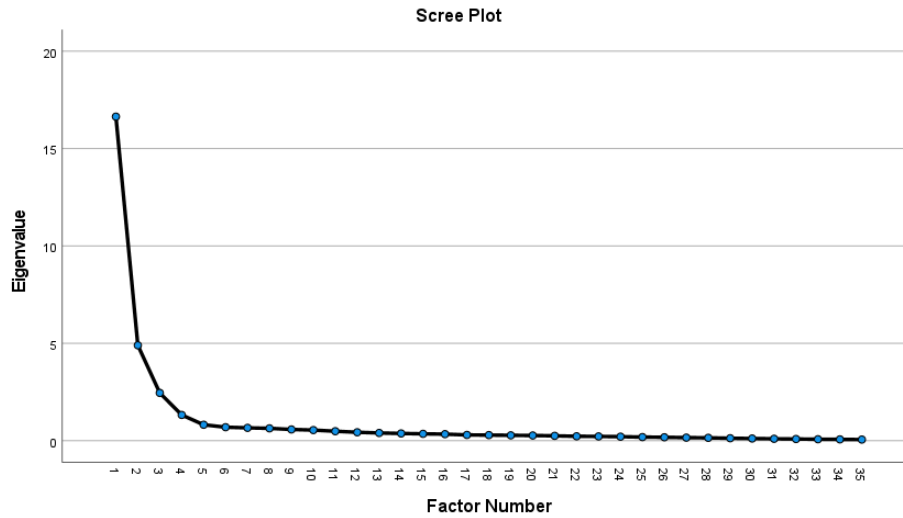
Figure 1. Scree plot

The four factors have eigenvalues above 1, the criterion set by Kaiser (1970) and explain 68.4% of the variance of all factors. Items clustered in the same factor represent Operational, Information Navigation, Creative, and Social factors. The operational factor explains 46.2% of the variance, the information navigation factor explains 12.8%, the creative factor explains 6.6%, and the social factor explains 2.8%. Factor structures, factor-loading values, explained variance, and eigenvalues obtained from statistical analysis are presented in Table 2.

Table 1. ISS factor analysis findings

No	Factors and items	Factor Loading	Explained Variance	Eigenvalue
No	Operational (O)		46.2	16.18
1	I know how to open downloaded files	0.81		
2	I know how to download/save a photo I found online	0.86		
3	I know how to use shortcut keys (e.g. CTRL-C for copy, CTRL-S for save)	0.65		
4	I know how to open a new tab in my browser	0.89		
5	I know how to bookmark a website	0.81		
6	I know where to click to go to a different webpage	0.91		
7	I know how to complete online forms	0.87		
8	I know how to upload files	0.68		
9	I know how to adjust privacy settings	0.51		
10	I know how to connect to a WIFI network	0.82		
11	I know how to install apps on a mobile device	0.42		
12	I know how to download apps to my mobile device	0.52		
	Information Navigation (IN)		12.8	4.50
1	I find it hard to decide what the best keywords are to use for online searches. (R)	0.58		
2	I find it hard to find a website I visited before. (R)	0.71		
3	I get tired when looking for information online. (R)	0.77		

4	Sometimes I end up on websites without knowing how I got there. (R)	0.72		
5	I find the way in which many websites are designed confusing. (R)	0.80		
6	All the different website layouts make working with the internet difficult for me. (R)	0.81		
7	I should take a course on finding information online. (R)	0.76		
8	Sometimes I find it hard to verify information I have retrieved. (R)	0.71		
	Creative (C)		6.6	2.30
1	I know how to create something new from existing online images, music or video	0.50		
2	I know how to make basic changes to the content that others have produced	0.71		
3	I know how to design a website	0.84		
4	I know which different types of licences apply to online content	0.88		
5	I would feel confident putting video content I have created online	0.74		
6	I know which apps/software are safe to download	0.70		
7	I am confident about writing a comment on a blog, website or forum	0.62		
8	I would feel confident writing and commenting online	0.49		
9	I know how to keep track of the costs of mobile app use	0.50		
	Social (S)		2.8	1.00
1	I know which information I should and shouldn't share online.	0.65		
2	I know when I should and shouldn't share information online.	0.59		
3	I am careful to make my comments and behaviours appropriate to the situation I find myself in online.	0.62		
4	I know how to change who I share content with (e.g. friends, friends of friends or public)	0.56		
5	I know how to remove friends from my contact lists.	0.52		
6	I feel comfortable deciding who to follow online (e.g. Instagram or X)	0.53		

R: It shows that the relevant substances are inverse substances.

As seen in Table 2, the Operational factor consists of 12 items (items 1-12), the Information Navigation factor consists of 8 items (items 13-20), Creative factor consists of 9 items (items 21-29), and Social factor consists of 6 items (items 30-35). Factor loadings were found to be at least .42. Field (2024) stated that factors of .40 and above are considered ideal. Accordingly, the items on the scale contribute significantly to these factors. It shows that the relevant items are inverse.

Findings for Confirmatory Factor Analysis

CFA was conducted to verify the predicted theoretical structure of the ISS. The basic structure of the scale was initially determined through previous empirical analyses and theoretical justifications, which was then confirmed through a detailed examination via CFA (Kline, 2011). Following EFA, the factor structure of the ISS—comprising four sub-dimensions and a total of 35 items—was tested using the AMOS 24 software. However, the goodness-of-fit indices obtained from the CFA did not fall within the recommended range. Specifically, the results were as follows: (χ^2[554, N=300]=1878.258; p<.05; χ^2/df=3.390; RMSEA=.09; CFI=.80;

GFI=.72). Consequently, items with kurtosis and skewness values outside the range of -2 to +2, and those with factor loading values below .50 (Hair et al., 2010), were deemed unreliable and removed from the analysis. Additionally, items O3, O4, O6, O9, O10, O11, O12, IN1, C1, C7, C8, C9, S4, S5, and S6—identified as negatively impacting the model fit (Gürbüz, 2019) were also excluded from the analysis.

The items were removed from the model, and the data was reevaluated. Since the data exhibited a normal distribution, the maximum likelihood method was preferred for the analysis (Brown, 2015). In this context, the scale's factor structure, consisting of four sub-dimensions and 20 items, was analyzed. It was found that the goodness-of-fit indices obtained did not fall within the recommended range: [χ^2(164, N=300) = 413.703; p < .05; χ^2/df = 2.523; RMSEA = .07; CFI = .92; GFI = .87]. As a result, modification indices were examined. The analysis indicated that modifications between items IN5 and IN6, as well as C5 and C6, would significantly improve the χ^2/df value. When multiple modifications are necessary, it is advisable to implement them sequentially (Çokluk et al., 2016). Therefore, the analysis was repeated, starting with the items identified as having a significant contribution. The updated goodness-of-fit indices from this analysis are presented in Table 3.

Table 3. Goodness-of-Fit Indices for Confirmatory Factor Analysis

Model Fit Indices	Model Value	Recommended Value	Reference	Evaluation
χ^2/df	2.059	≤3	Kline (2011)	Perfect fit
GFI	.90	≥0.90	Hooper et al. (2008)	Good fit
AGFI	.87	≥0.85	Schermelleh-Engel et al. (2003)	Acceptable fit
RMSEA	.06	≤0.07	Steiger (2007)	Good fit
SRMR	.07	≤0.08	Brown (2015)	Good fit
NFI	.90	≥0.90	Tabachnick & Fidell (2001)	Good fit
IFI	.95	>0.90	Gürbüz (2019)	Acceptable fit
CFI	.95	≥0.95	Hu & Bentler (1999)	Perfect fit

As seen in Table 3, the goodness-of-fit indices obtained as a result of the first level CFA performed after the modification [χ^2[162, N=300]=333.532; p<.01; χ^2/df=2.059; RMSEA=.06; CFI=.95; GFI=.90; AGFI=.87; IFI=.95] shows that the proposed four-factor model is acceptable and compatible with the data. This result reveals that the study data are consistent with the four-factor structure, which is the predetermined theoretical structure of the ISS. CFA results for ISS are presented in Figure 2.
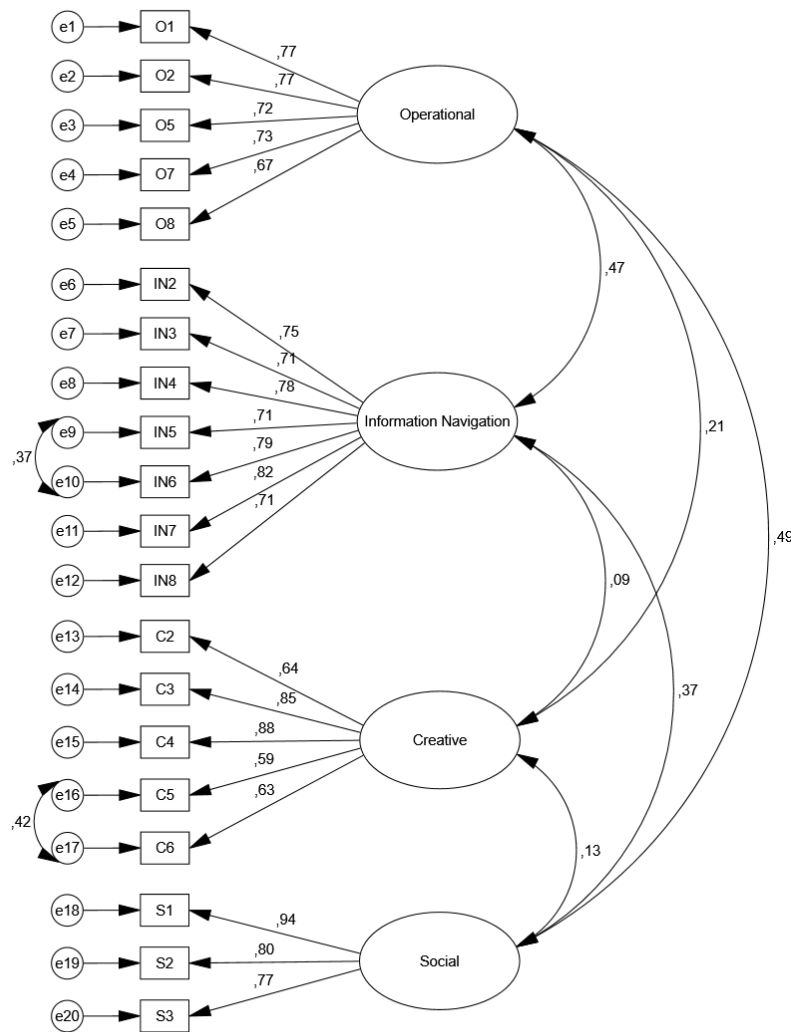
Figure 2. ISS CFA results

According to the measurement model presented in Figure 2, the factor loadings of the four dimensions of the model vary between .63 and .94. It was determined that the t values of the factor loadings were statistically significant. The factor loadings obtained due to CFA must be greater than .50, and the t value must be substantial (Brown, 2015). Therefore, the factorial validity of the scale adapted to Turkish culture was supported by the results of the measurement model analysis.

Convergent Validity: Construct validity assesses how accurately the items in a scale measure theoretical structures or concepts (Creswell, 2017). To establish construct validity, both the convergent and discriminant validity of the model are evaluated (Campbell & Fiske, 1959). In this context, we examined the convergent and discriminant validity of the model to establish its construct validity. Convergent validity, which is a component of construct validity, refers to the extent to which two measurements of the same concept are correlated (Hair et al., 2019). For the measurement model to demonstrate convergent validity, the Average Variance Extracted (AVE) value must exceed 0.50, and the Composite Reliability (CR) value must be greater than 0.70. Additionally, the CR value should be higher than the AVE value (Hair et al., 2014). Table 4 presents the factor loadings, AVE values, CR values, and alpha values for the ISS.

Table 4. Average variance extracted and reliability values for ISS

Factor	Item	Faactor Loading (>.50)	Average Variance Extracted (AVE)	Composite Reliability (CR) (>.70)	α Reliability
Operational (O)	O1	.77	.53	.85	.84
	O2	.77			
	O5	.72			
	O7	.73			
	O8	.67			
Information Navigation (IN)	IN2	.75	.57	.90	.90
	IN3	.71			
	IN4	.78			
	IN5	.71			
	IN6	.79			
	IN7	.82			
	IN8	.71			
Creative (C)	C2	.64	.53	.85	.86
	C3	.85			
	C4	.88			
	C5	.59			
	C6	.63			
Social (S)	S1	.94	.70	.88	.86
	S2	.80			
	S3	.77			

When Table 4 is examined, it is seen that all factors in the measurement model have high reliability (CR>.70). All AVE values of the factors meet the specified conditions (AVE>.50; CR>AVE). This finding shows that the factors have convergent validity. In other words, the scale provides convergent validity.

Discriminant Validity: Discriminant validity is achieved when the correlations between the factors in a measurement model are low, indicating that these items measure different constructs (Kline, 2011). In simpler terms, discriminant validity reflects how distinct the items associated with one factor are from those associated with other factors (Farrell, 2010). To evaluate discriminant validity, we examine several metrics: Maximum Squared Variance (MSV), Average Shared Square Variance (ASV), AVE, and the correlation values among the factors in the measurement model, as illustrated in Table 5. For discriminant validity to be confirmed, the following conditions must be satisfied: MSV should be less than AVE, ASV should be less than AVE (Hair et al., 2014), and the square root of the AVE value must be greater than the correlation values in its corresponding row and column (Fornell & Larcker, 1981).

Table 2. AVE and correlation values for the ISS

Variable	n	MSV	ASV	AVE	1	2	3	4
1. Operational (O)	300	0.24	0.17	0.53	(0.731)			
2. Information Navigation (IN)	300	0.22	0.12	0.57	0.47***	(0.752)		
3. Creative (C)	300	0.05	0.02	0.53	0.21**	0.09	(0.728)	
4. Social (S)	300	0.24	0.14	0.70	0.49***	0.37***	0.13*	(0,838)

Note: Values in parentheses indicate √AVE values.
***p<0,001; **p<0,01; *p<0,05

The MSV, ASV, and AVE values of the factors belonging to the ISS were calculated (Table 5). Accordingly, it was found that the AVE values of the factors were higher than the MSV and ASV values. At the same time, √AVE values are higher than the correlation between factors. These results show that the measurement model has discriminant validity.

Item Analysis: Item analysis was conducted to examine the properties of the items in the scale. The commonalities, corrected item-total correlations and item discrimination indices of the items are given in Table 6.

Table 6. Item analysis

Factor	Item	Communalities	Corrected Item-Total Correlation	Item Discrimination Indices
Operational (O)	O1	0.62	0.41	0.49
	O2	0.60	0.45	0.46
	O5	0.50	0.44	0.45
	O7	0.52	0.45	0.44
	O8	0.49	0.50	0.74
Information Navigation (IN)	IN2	0.55	0.53	1.46
	IN3	0.49	0.52	1.72
	IN4	0.59	0.54	1.54
	IN5	0.58	0.59	1.84
	IN6	0.68	0.63	1.96
	IN7	0.65	0.57	1.71
	IN8	0.54	0.57	1.82
Creative (C)	C2	0.47	0.50	1.87
	C3	0.70	0.37	1.88
	C4	0.76	0.36	1.73
	C5	0.45	0.46	1.53
	C6	0.47	0.49	1.48
Social (S)	S1	0.87	0.44	0.46
	S2	0.65	0.40	0.53
	S3	0.60	0.35	0.39

According to Table 6, communality values range from .45 to .87. Fabrigar and Wegener (2012) stated that a communality value above .40 is acceptable in samples of 200 and above. Field (2024) stated that corrected item-total correlation values are acceptable if they are

above .30. These values range between .35 and .63. Item discrimination indices range from .39 to 1.96.

Discussion, Conclusion, and Suggestions

Within the scope of the study, the ISS developed by Van Deursen et al. (2016) was adapted to Turkish culture. The adapted scale version measures users' Internet skills in terms of Operational, Information Navigation, Creative, and Social skills.

It is recommended that EFA be conducted first for consistent results in scale adaptation (Orçan, 2018). In this study, we conducted EFA on the original scale within a Turkish sample, which revealed a reduction from the original five-factor structure to four factors, explaining a total variance of 68.4%. The factor loadings for items within these factors ranged from .42 to .91. In contrast, the original scale's five factors accounted for 66% of the variance, with item loadings above .60 (Van Deursen et al., 2016). Previous studies from the Netherlands and the UK also identified five significant factors in their EFAs. Notably, Van Deursen et al. (2016) found that Mobile skills aligned with the Creative factor, while in the Netherlands, they were categorized under the Operational and Information Navigation factors. Given the prevalence of mobile platforms, it was suggested that items related to these skills should be adjusted or integrated. In this study, items under the Mobile factor were similarly grouped into the Operational and Information Navigation factors. Consequently, the scale maintained the exact total of 35 items as the original version, distributed across four factors: Operational (12 items), Information Navigation (8 items), Creative (9 items), and Social (6 items).

To effectively conduct CFA in scale studies, it is crucial to utilize a distinct data set that differs from the one used in EFA (Schumacker & Lomax, 2010). Consequently, we developed an independent data set explicitly tailored for the CFA process. Prior to the analysis, we rigorously assessed the assumptions of normality and linearity, as recommended by Tabachnick and Fidell (2020), to ensure that the data set was impeccably suited for CFA. Initially, the CFA results, derived from an extensive set of 35 items, did not meet the necessary goodness-of-fit criteria. During this critical phase, we adopted a strict standard, considering kurtosis and skewness values only within the range of +2 to -2. Furthermore, we excluded any items with loadings below .50 from the analysis to enhance the integrity of our findings. The items removed include: - O4: "I know how to open a new tab in my browser (Google Chrome, Yandex, etc.)." - O6: "I know where to click to go to a different web page." - O10: "I know how to connect to a Wi-Fi network (wireless network)." - IS1: "I have difficulty deciding which keywords are the most appropriate when navigating the Internet." - C7: "I can easily comment on a website, blog, or forum." - C8: "I feel confident when writing and commenting on the Internet." - S6: "I can easily decide who to follow on the Internet (e.g., Instagram or Twitter)." This revised approach underscores the rigor and precision of our methodology, reinforcing the credibility and reliability of our CFA findings. In examining critical factors such as cultural differences, the extensive accessibility of the Internet, rapid technological advancements, and the growing prevalence of mobile technology—which collectively enhance user experiences— it became evident that a significant majority of participants rated these factors with a score of 5. Consequently, given that the initial items failed to meet the normality assumption and their factor loadings fell below 0.50, we made the decisive choice to remove 15 items from the measurement model and re-conduct the analysis. Upon review, we found that some goodness-of-fit indices did not align with the desired benchmarks, prompting a thorough examination of modification indices. This analysis revealed two strategic modifications that

could substantially increase the model's performance. Following these adjustments, CFA yielded a χ^2/df value of 2.059, with goodness-of-fit indices meeting recommended thresholds. Thus, the results from the first-level CFA confidently affirm that the four-factor structure demonstrates strong and acceptable fit values.

To assess the construct validity of the scale, we conducted convergent validity studies to determine the relationship between variables measuring the same construct, as well as discriminant validity studies to differentiate between latent variables (Koeske, 1994). The analysis of convergent validity revealed that the CR value for each factor was above 0.70. Meanwhile, the discriminant validity analysis showed that the square root of the AVE value was greater than 0.50 and exceeded the factor correlation coefficients. The results obtained from the EFA and the first-level CFA confirmed that the 20-item scale is appropriate for Turkish culture.

As a result, this study confirmed the validity and reliability of the Turkish version of the ISS. The adapted scale enables the assessment of individuals' competencies in the digital environment and covers the basic use of digital tools, online information access and verification processes, digital content production, and online interaction and communication competencies. This multidimensional structure makes the scale not only limited to measuring individual skills but also a powerful tool that can be used in the development of educational policies and the planning of practices to increase digital literacy. In a digitalized world, the importance of Internet skills is increasing daily. This adapted scale can assess the Internet skills of users aged 18 to 60 in Turkey and facilitate innovative approaches to develop, regulate, or enhance those skills based on collected data. Consequently, screening studies can be carried out within the sociocultural context to analyze the scale's impact on Turkish culture. Additionally, a comparative analysis of the data obtained from Turkey and other countries where the scale has been adapted and applied could be conducted, paving the way for international studies. Generalizable results can be achieved by conducting research with a large sample that includes various demographic variables. This adaptation study focuses on individuals aged 18 to 60, which creates uncertainty regarding the Internet skills of individuals over 60 in the Turkish context. Therefore, it is essential to adapt the original scale for Turkish culture specifically for Internet users over 60, aiming to evaluate their Internet skills. This will enable an understanding of the Internet proficiency of the older age group as well. Furthermore, the original scale has a lower age limit of 16. Given this context, a scale adaptation or development study could also be undertaken to measure the Internet skills of users under the age of 16.

Limitations

In this study, internet skills are limited by considering four dimensions: operational, information navigation, creative, and social. The study is limited by the heterogeneity of the demographic characteristics of the participants. The number of participants aged 46 and above in the study is relatively low compared to other age groups. Additionally, the proportion of undergraduates is significantly higher than that of other educational groups. As a result, the demographic distributions show notable disparities. Since there are significant changes in internet skills according to education level and age in Türkiye, future studies can be conducted by taking specific age groups and education groups into account.

All rules included in the "Directive for Scientific Research and Publication Ethics in Higher Education Institutions" have been adhered to, and none of the "Actions Contrary to Scientific

Research and Publication Ethics" included in the second section of the Directive have been implemented.

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