

How Do Instagram Messages Affect the Use of Renewable Energy? -- Application of an Extended Information Adoption Model

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ABSTRACT. As social media can play an important role in creating awareness of the need to mitigate climate change and of the benefits of renewable energy (RE), we examined the influences of social media on attitudes to renewable energy, including intention to use it. This study is novel in two ways: it simultaneously considers message characteristics and message-receiver perceptions as factors influencing the acceptance of renewable energy; and it is also the first study to use an extended information adoption model to evaluate the impact of Instagram on information adoption and the intention to use renewable energy sources. Our questionnaire, based on the theory of information adoption, included items on attitude toward information and trust in Instagram, and was randomly distributed online among followers of renewable energy pages on Instagram. A total of 173 people completed the questionnaire. Structural equation modeling showed that quality of argument had a positive and direct effect on the perceived usefulness of information. Source credibility as a peripheral path also indirectly increased perceived usefulness by changing attitude toward information. Moreover, perceived usefulness had a direct impact on information adoption and increased information adoption through trust of the materials.

Keywords: trust in Instagram, information adoption, social media, renewable energy, perceived usefulness.

1. Introduction

Greenhouse gas emissions and climate change are major concerns of the 21st century (Panwar et al., 2011). The Center of Global Development (2015) estimated that in 2011 developing countries and developed countries produced about 63 and 37%, respectively, of the world's total carbon dioxide emissions (Hasan et al., 2020). Energy-related carbon dioxide emissions account for two-thirds of greenhouse gases. Transitioning from the use of fossil fuels to low-carbon solutions through technological innovation, especially in the field of renewable energy (RE), is one way of reducing greenhouse gas emissions (Gielen et al., 2019; Rochyadi-Reetz et al., 2019; Yaghoubi et al., 2019).

By 2050, RE will play an important role in limiting global long-term average temperature increases to between 2.0 and 2.4 °C (or even to below 2 °C) by reducing global carbon dioxide emissions by 50% (Bhattacharya et al., 2016; Gielen et al., 2019). In terms of energy security, RE can meet up to two-

thirds of the total global demand for energy. Yet despite these benefits, the transition to RE is not happening fast enough (Gielen et al., 2019), in particular in developing countries such as Iran (Yazdanpanah et al., 2021). Although in Iran the potential of solar energy is particularly high, only a small percentage of the country's energy needs are supplied by it (Yazdanpanah et al., 2021). Najafi et al. (2015) noted that 99% of energy is produced from fossil fuels, including oil and gas, while only 1% comes from RE sources.

To expand the use of RE, the main challenge is not simply to implement supportive policies or remove technological and economic barriers, but to promote acceptance of RE among consumers (Bozorgparvar et al., 2018; Elmustapha et al., 2018), namely by encouraging consumers to make a voluntary switch to green products (Hartmann et al., 2016). Perceptions of risk, environmental awareness, and knowledge have an important influence on environmental behavior (Fung et al., 2010; Arlt et al., 2011; Parkins et al., 2018; Boazar et al., 2020; Zobeidi et al., 2021b). Qazi et al. (2019) found that support for RE technologies increases along with environmental concerns, especially regarding climate change. Increased awareness of the damage to the environment caused by, say, emissions of carbon dioxide, nitrogen oxide, and chlorofluorocarbons thus increases public interest in environmentally friendly technologies (Omer et al.,

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2009).

The media is the most important source of information on RE, including discussions and arguments about it (Rochyadi-Reetz et al., 2019); it has a special role in activating perceptual processes, increasing knowledge, and changing individuals' attitudes, for example, about RE and acceptance of it (Arlt et al., 2011; Hynes and Wilson, 2016). Salmela and Varho (2006) have argued that acceptance of green household electricity increases with the availability of media information about the various forms of electricity generation, especially their environmental impacts. Growth in knowledge, whether intentional or unintentional, equal or unequal, is an important consequence of media use and can lead to environmentally friendly behaviors or mitigation efforts. Thus, communication about the environment by the media is, and is expected to be, very important in transmitting knowledge, establishing values, and even demonstrating various practical possibilities.

The media influences public opinion, both positively and negatively, by acting as a frame for information, and can thus shape attitudes toward different policies, including specific RE technologies and policies, such as biofuels (Delshad and Raymond, 2013). Frames are arguments that emphasize different aspects of a subject - the media focuses attention on certain information and events and then places them within a meaningful context. Rochyadi-Reetz et al. (2019) point out that framing is an important issue in reviewing media coverage about RE, as it refers to selecting several aspects of perceived reality and highlighting them in a way that improves the definition of a particular issue or provides causal interpretation and ethical evaluation or recommendations. Rochyadi-Reetz et al. (2019) further point out that media coverage can be in four dimensions: environmental (including the problems and benefits of using RE), social (such as social conflicts), technical, and economic.

There are many different types of media, but the 21st century is witnessing an explosion in messages transmitted through Internet-based sites, including social media. These messages can have a major impact on environmental behavior, including knowledge of environmental problems, and opinions and attitudes toward how best to respond to environmental challenges. Social media influences people's willingness to pay more for green products and less for polluting ones (Bedard and Tolmie, 2018; Jain et al., 2020). It also widely influences consumer behavior, attitudes, perceptions, and purchasing decisions, from the pre-purchase information acquisition phase to the post-purchase behavior phase (Sema, 2013). Han and Cheng (2020) found that the use of social media to obtain environmental information has a greater impact than traditional media on pro-environmental behaviors. In addition, social media-based campaigns can also quickly sway public opinion and mobilize public support or opposition, which in turn exerts political influence and may shape regulatory policies (Li et al., 2019).

Studies on communication platforms and social media have provided insights into the opportunities offered by social media platforms to explore the social perceptions of energy issues and their dynamics. The studies support the notion that social media is playing a growing role in shaping public opinion regarding

renewable energy: this should probably be more widely acknowledged by institutions, people, and governments who could benefit from having insights into information of this kind (Russell et al., 2015). There are limited studies on media and RE. These have examined the role of media from the perspective of cognitive processes such as risk perception, intention to purchase RE, (Hartmann et al., 2016; Zobeidi et al., 2021a; Vespa et al., 2022a, 2022b) and more limited studies that analyze the posts and tweets on RE (Russell et al., 2015). For example, Vespa et al., (2022a, 2022b) show that posts related to solar energy, wind energy, and geothermal energy arouse emotions, while posts related to biomes involve predominantly cognitive processes (Vespa et al., 2022a, 2022b). Zobeidi et al. (2021a) alludes to trust in social media, using the Extended Parallel Process Model to investigate the factors influencing the intention to use RE. However, as no studies have addressed the characteristics and structure of social media messages, it is still unclear what kind of social media information influences the acceptance of RE, how, and why not all RE messages are accepted. There is thus a research gap on: i) the need to investigate the influence of message characteristics (e.g., quality of the argument and credibility of the source) and ii) the perception of the message-receivers (attitude, perceived usefulness, ease, and trust in the media) on the adoption of RE. The present study focuses on the characteristics of messages and peoples' perceptions of social media and examines the acceptance of messages from the perspective of the intention to use RE.

To the best of our knowledge, no study in the field of RE has used the information adoption model (IAM). We use this model to investigate the effects of social media messages on individuals' adoption of information about RE and intention to use it. This study supports environmental activists, other stakeholders, and ultimately marketers in considering what may be the desirable characteristics of an effective message and to adjust the message in such a way as to have the greatest impact on the readers' or audience's perceptions.

2. Background

2.1. Social Media and Environmental Behavior

Over the past two decades, social media has become an important and all-encompassing cultural and economic phenomenon (Studen and Tiberius, 2020). Although the concept of social media is broad, social networking sites and content communities such as Facebook, Twitter, Instagram, Flickr, and Weibo often provide useful information for those wishing to study human interactions (Toivonen et al., 2019). Users of social networks prefer to view images rather than read posts with text, which is why Instagram, an image-based social networking service (SNS), has been gaining in popularity over Facebook among teens and young adults.

Instagram was introduced in October 2010 as a photo- and video-sharing social media application, and its potential has grown thanks to the ever-increasing popularity of smartphones. As it conveys information in short messages with high visual value, Instagram is also an excellent way for companies and brands to

send quick messages and photos to their target audience (Reiter et al., 2017). As Pittman and Reich (2016) argue, an Instagram picture may be worth more than a thousand Twitter words. As trends change from the use of text-oriented to image-intensive social networks, Instagram is at the forefront (Lee et al., 2021). The social networks have a large number of users and are growing every day (Sema, 2013). Instagram, in particular, is one of the most popular social networks in Iran, with 24 million users (30% of the total population of Iran).

Globalization and economic growth have led to fundamental changes in patterns of consumption and production and have created a technological revolution in social media use among young consumers. Social media platforms have become a credible means of communicating with consumers and, for example, shaping consumers' intention to buy (Jain et al., 2020). In recent years, social media has shaped social and personal norms and attitudes through the rapid and intensive sharing of images and information (Hynes and Wilson, 2016; Han and Cheng, 2020).

There are many competing theories about how social media influences behavior (Zhao et al., 2009; Boulianne, 2015). For decades, adoption theories have been used widely to explain how people make decisions about whether to carry out a given activity (Rabjohn et al., 2008). The IAM (Sussman and Siegal, 2003), which is based on the elaboration likelihood model (ELM; Petty and Cacioppo, 1986) and the technology acceptance model (TAM; Davis, 1989), is one of the most widely used acceptance theories. This model has been used by researchers to study various topics, for example, e-book acceptance (Lee, 2013), consumer willingness to pay or buy (Cheung, 2014; Erkan and Evans, 2016), acceptance of information from travel websites (Tseng and Wang, 2015), selection of a study destination (Shu and Scott, 2014), and other subjects.

2.2. Theoretical Background and Hypotheses

We propose an integrated theoretical model to identify determinants of the acceptance of information about RE from Instagram pages that provide RE content. This model is based on the theoretical framework of the IAM but is extended by two new constructs: attitude toward information and trust in Instagram. The IAM has been widely used in socio-psychological research to explain how people process information and to examine factors that affect information adoption. Acceptance of information means the extent to which people accept content that is meaningful to them after evaluating its validity (Tseng and Wang, 2015). The IAM was designed by Sussman and Siegal (2003) based on the ELM (Petty and Cacioppo, 1986) and the TAM.

According to the ELM, there are two routes - the central and peripheral - through which individuals can receive a message. The central route refers to the core of the message (Erkan and Evans, 2016) and requires individuals to think critically about subject-related arguments in the message and to scrutinize the relative competence and relevance of the arguments before making conscious judgments about the target behavior (Bhattacharjee and Sanford, 2006). It is the quality of the argument in a communication that is the central guide in the information

process. The quality of argument represents a central direction and is an effective central guide for message acceptance (Sussman and Siegal, 2003; Shen et al., 2013). Clearly, argument quality refers to the persuasive power of arguments embedded in a message (Rabjohn et al., 2008). Previous studies have used various components of information quality, such as relevance, timeliness, or currentness, accuracy and comprehensiveness, trustworthiness, completeness, and format, to measure argument quality (Wixom and Todd, 2005; Rabjohn et al., 2008; Shen et al., 2013; Hur et al., 2017; Lee et al., 2021). The peripheral route relates to topics that are indirectly related to the message core (Erkan and Evans, 2016). Source credibility is a representative peripheral cue. Source credibility refers to the fact that the information provider (not the media) is perceived as an expert and as reliable or trustworthy (Kim and Kim, 2014). It relates to the recipient's perception of the validity of the source of the message. It also reflects how reliable the recipients deem the information source to be (Rabjohn et al., 2008). As source credibility does not reflect anything about the message itself, it is considered a peripheral route (Rabjohn et al., 2008). Cheung et al. (2009) found a significant relationship between information quality (relevance and comprehensiveness) and the usefulness of information within online communities. Sussman and Siegal (2003) argued that although the central and peripheral routes (the main factors of the ELM) are able to predict the relative influence of various factors on the probability of adopting information, they ignore the impact of the usefulness of information in the process. Therefore, Sussman and Siegal (2003) modified the ELM by adding perceived usefulness from the TAM. They put forward two arguments for considering perceived usefulness as a mediating variable between the constructs of argument quality and source validity and the outcome (e.g., the intention to perform a particular behavior). First, the TAM generally explains greater variance in acceptance than the ELM. Second, perceived usefulness is even more closely related to the acceptance of information than argument quality and source credibility. Therefore, in the IAM (Sussman and Siegal, 2003) the perceived usefulness of information is the main predictor of information adoption, and it is affected by both argument quality and source credibility.

Jin et al. (2009) indicated that information quality is an important predictor of perceived usefulness and influences satisfaction indirectly via the usefulness of information. Tseng and Wang (2015) found an effect of information quality on the usefulness of information. According to research by Lee et al. (2021), food content quality and source credibility on Instagram can influence the usefulness of food content. Kang and Namkung (2019) found that information quality and source credibility can affect the perceived usefulness of digital marketing. Song et al. (2021) show that argument quality and source credibility have a positive effect on the perceived usefulness of word-of-mouth in electronics, with the perceived usefulness of information being the degree to which one believes that using a particular system increases one's performance (Cheung et al., 2008). According to the IAM, central and peripheral guides influence information adoption through the perceived usefulness of information. We thus propose two hypotheses as follows:

- Hypothesis 1: The argument quality of RE information on Instagram positively affects the perceived usefulness of information.
- Hypothesis 2: The source credibility of RE information on Instagram positively affects the perceived usefulness of information.

Various studies have tried to explain more variance in information adoption by expanding the IAM. Here, we used attitude toward information and trust in Instagram to develop the theory of information adoption. Attitude, from Fishbein and Ajzen's (1975) theory of reasoned behavior, is the first variable we added to the IAM. Attitude refers to people's general evaluation of themselves, other people, objects, and issues (Petty and Cacioppo, 1986). Petty and Cacioppo (1986) pointed out that both the central and the peripheral route can lead to a change in people's attitudes and consequently a change in behavior. Angst and Agarwal (2009) tried to use information adoption models to predict attitude change. Indeed, messages from a credible source, if well framed, can improve attitudes toward the messages themselves, intention, and environmentally friendly activities (Kim and Kim, 2014). Hsu (2021) found that the perceived electronic word-of-mouth credibility of online reviews could be used to explain the effects of attitude toward online reviews. Studies by Erkan (2016) and Erkan and Evans (2016) showed that attitudes toward information can affect perceived usefulness. For example, consumers with positive attitudes toward electronic word of mouth are more likely to find the information conveyed useful and adoptable.

According to the theory of planned behavior (Fishbein and Ajzen, 1975), attitude is an important determinant of intention. Bhattacharjee and Premkumar (2004) showed that attitudes are key drivers of the use of information technology. Any change in beliefs or attitudes will likely have a corresponding impact on, and may even reverse, users' continuance intention and behavior (Savari et al., 2021). Many studies have confirmed the impact of attitudes on intentions to use RE or save energy (Park and Ohm, 2014; Chen et al, 2015; Halder et al., 2016; Tan et al., 2017; Zobeidi et al., 2021a). Kanchanatanee et al. (2014) found that a person's attitude toward using e-marketing was a powerful factor affecting their intention to use it. Ullah et al. (2020) found that attitude had a positive on technology adoption in energy sector. We thus expect the following:

- Hypothesis 3: The argument quality of RE information on Instagram positively affects attitude toward information.
- Hypothesis 4: The source credibility of RE information on Instagram positively affects attitude toward information.
- Hypothesis 5: Attitude toward information positively affects the perceived usefulness of information.
- Hypothesis 6: Attitude toward information affects information adoption.

Perceived usefulness is another predictor of intention. Song et al. (2021) found that perceived usefulness has a positive influence on information adoption, which in turn predicts young consumers' purchase intentions. Ullah et al. (2020) show perceived usefulness to have a positive and significant impact dur-

ing blockchain technology adoption. Masukujjaman et al (2021) reveal perceived usefulness to significantly influence RE purchase intention.

Trust in Instagram is the second variable we added to the IAM. Lippert and Davis (2006) pointed out that the effect of trust in information systems is very important. Trust is the relationship between a trustor and a trustee. The trustor is the subject that trusts a target entity, and the trustee is the entity that is trusted. In the context of social media, trust provides evidence of those with whom we can share information and from whom we can accept information without additional verification (Tang and Liu, 2015). Zobeidi et al. (2021a) pointed out that without trust, people may not believe information received from social media. Shen et al. (2013) used trust as a mediator between usefulness and information adoption. Nawi et al. (2019) found that trust in social media can affect the adoption of social media as a business platform.

Figure 1 shows the extended IAM used in this study and the constructs of attitude toward information and trust. Based on this model, we put forward the following additional hypotheses:

- Hypothesis 7: The perceived usefulness of information affects trust in Instagram.
- Hypothesis 8: The perceived usefulness of information affects information adoption.
- Hypothesis 9: Trust in Instagram affects information adoption.

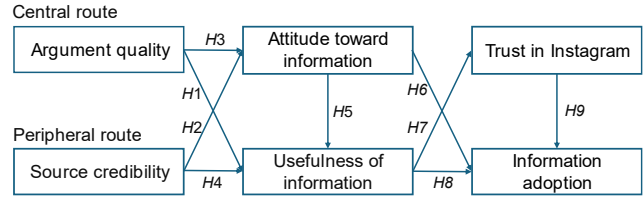


Figure 1. Research model (H represents hypothesis).

3. Methodology

3.1. Research Protocol

To investigate the characteristics of the characteristics of messages and users' perceptions (perceived usefulness, and attitude) regarding acceptance of RE information, we used an internet-based survey method. An online survey usually has advantages such as easy access to people in distant areas, the convenience of having automated data collection, and less consumption of time and effort (Wright, 2005). An online questionnaire was designed based on the extended IAM. Different questions were used to evaluate different constructs, including argument quality, source credibility, attitude toward information, the perceived usefulness of information, trust in Instagram, and information adoption. We measured all items using a 5-point Likert scale (1 = strongly disagree, 3 = neutral, 5 = strongly agree). Table 1 shows the items used to measure each variable, which were obtained from previous studies. Based on previous studies

Table 1. Survey Items and Sources

Construct and Item	t-Value	Source
Argument quality ($\alpha = 0.93$)		
RE information obtained from Instagram is complete.	10.48	Zhu et al. (2016)
RE information obtained from Instagram is comprehensive.	10.32	Hur et al. (2017)
RE information obtained from Instagram is correct.	11.00	Bhattacharjee and Sanford (2006)
There are few errors in the RE information I obtain from Instagram.	11.39	
Instagram produces the most current (recent) RE information.	11.72	Li (2015)
RE information obtained from Instagram is always up-to-date.	11.84	
RE information obtained from Instagram is well formatted.	14.66	
RE information obtained from Instagram is clearly presented on the screen.	-	
Source credibility ($\alpha = 0.86$)		
People who post messages about RE on Instagram are knowledgeable.	-	Sussman and Siegal (2003)
People who post messages about RE on Instagram are reliable.	9.58	Shen et al. (2013)
People who post messages about RE on Instagram are trustworthy.	9.55	Zhu et al. (2016)
People who post messages about RE on Instagram have a good knowledge of the topic (are experts on the topic).	9.74	Hur et al. (2017)
Attitude toward information ($\alpha = 0.86$)		
The information on Instagram about using of RE is interesting.	9.82	Erkan and Evans (2016)
The information on Instagram about using of RE is important.	9.90	
The information on Instagram about using of RE is beneficial.	10.21	
The information on Instagram about using of RE is rational.	-	
Usefulness of information ($\alpha = 0.87$)		
The information on RE on Instagram is valuable.	-	Cheung (2014)
The information on RE on Instagram is informative.	9.64	Erkan and Evans (2016)
The information on RE on Instagram is helpful.	10.84	
The information on RE on Instagram is useful.	11.23	
Trust in Instagram ($\alpha = 0.87$)		
Instagram is reliable.	-	Shen et al. (2013)
Instagram can be trusted; there are not many uncertainties.	9.35	
Anyone who trusts Instagram is helping themselves.	12.09	
I trust the information provided by Instagram.	11.53	
Information adoption ($\alpha = 0.82$)		
I intend to use RE information obtained from Instagram.	-	Tseng and Wang (2015)
I try to use RE information obtained from Instagram.	10.26	
RE information on Instagram motivates me to take action (i.e., to use RE products) in the near future.	10.27	

Note: RE represents renewable energy; t-value represents the significance level: $> +1.96$ or < -1.96 .

(Sussman and Siegal, 2003; Bhattacharjee and Sanford, 2006; Tseng and Wang, 2015), we used individuals’ personal intentions to act based on information from social media to measure information adoption: “I intend to use RE information obtained from Instagram”, “I try to use RE information obtained from Instagram”, and “RE information on Instagram motivates me to take action (i.e., to RE use products) in the near future”.

3.2. Data Collection

The questionnaire was distributed to Iranian Instagram users through an online survey platform in May 2020. We examined the content of Instagram pages to select pages rich in information on RE. The RE pages were in the Persian language and regularly included posts of photos, videos, and content related to the consequences of using fossil fuels and the performance, costs, and benefits of using RE. Based on the search on Instagram, at least 20 pages with RE hashtags were identified, which were related to the government, companies, or natural persons (such as environmental activists). Among the followers of

these pages, potential respondents were randomly selected and were asked through the Instagram Direct option if they would like to answer a voluntary questionnaire; if they agreed, the URL of the questionnaire, together with an invitation with more information and a questionnaire was sent to respondents individually, using Direct, e-mail, and other social networks. There were 173 questionnaires filled out and returned, representing an average response rate of 41%. Of the respondents, 43% were men and 57% were women. They ranged in age from 13 to 60 years, with an average age of about 31 years.

3.3. Data Analysis

Structural equation modeling (SEM) with the maximum likelihood algorithm was used in AMOS to investigate the research hypotheses. SEM is a holistic approach for examining hypotheses about relationships between latent and observable constructs (Savari et al., 2022) and validating hypothetical or theoretical models (Hair et al., 2010). It involves a set of statis-

tical techniques to assess the relationship between dependent and independent constructs (Ullman and Bentler, 2012). SEM can be used to calculate measurement errors as well as to simultaneously estimate model path coefficients. Reliability can also be calculated by estimating and eliminating measurement error (Ullman and Bentler, 2012). In addition, SEM is based on standard assumptions of linearity, normality, and additivity (Bayard and Jolly, 2007).

Two widely used SEM methods include covariance-based structural equation modeling (CB-SEM) and partial least squares structural equation modeling (PLS-SEM) (Dash and Paul, 2021). A fundamental distinction between the two approaches is that CB-SEM is based on a common factor model, while PLS-SEM is based on a mixed factor model. The focus of PLS is on optimizing the prediction of endogenous constructs and not on fit, which is the focus of CB-SEM (Matthews et al., 2018). Determining when the application of any of the methods is appropriate is simple. If the focus of the research is on testing and confirming the theory, the appropriate method is CB-SEM. If, however, prediction, theory development and explanation are the focus of the research, PLS-SEM is a more appropriate method (Matthews et al., 2018). Specifically, CB-SEM follows a common factor model, assuming that observed scores from the indicators are functions of the construct itself and of measurement error. To estimate the model parameters, such as indicator loadings and path coefficients, the method uses only common variance (i.e., variance shared by the indicators of each construct). By contrast, PLS-SEM follows a composite model logic, which uses total variance and represents constructs as linear combinations of its indicators (Hair et al., 2021). Therefore, CB-SEM was used to investigate the research hypotheses.

The main data analysis was performed in two stages. First, we used confirmatory factor analysis to evaluate the reliability and validity of the constructs. All measured items were modeled as being reflective of the responsible/relevant latent constructs, and factor loadings and internal (inter-construct) correlations were carefully examined.

After having verified the measurement model, we performed SEM to test the research model based on the maximum likelihood algorithm. Bootstrapping with 2000 samples and 95%

confidence intervals (bias-corrected confidence intervals) were used to evaluate the significance of the indirect relationships in the proposed model.

3.4. Verification of the Measurement Model

Reliability and validity tests were performed to confirm the measurement model. Cronbach’s alpha was used to assess reliability. Cronbach’s alpha coefficients for variables should be greater than 0.7 (Hair et al., 2010). As shown in Table 2, values for internal consistency reliability were greater than the minimum threshold.

We evaluated multi-collinearity using correlations between each pair of independent variables. According to Bryman and Cramer (1994), if no correlation coefficient exceeds 0.7, there is no problem with multiple alignments. Moreover, if the variance inflation factors of all constructs are less than 5 and tolerance is greater than 0.1, the assumption of logical independence between the predictor variables is met. The variance inflation factors and tolerance were in the acceptable range. We also used the Durbin-Watson index to check for multi-collinearity. The acceptable range for this index is from 1.5 to 2.5. In this study, the Durbin-Watson statistic was 2.126, which is in the acceptable range; thus, we concluded that there was no multi-collinearity between the independent variables. Skewness and kurtosis statistics for all research constructs ranged from -1 to +1, indicating a normal distribution.

For convergent validity, standardized factor loadings, CR, and the average variance extracted (AVE) were used. Factor loadings should exceed 0.5, CR should be greater than 0.7 (Hair et al., 2010), and the AVE of all constructs should be greater than 0.5 (Savari and Moradi, 2022). As shown in Figure 2 and Table 2, all indicators were within acceptable ranges, which showed strong convergent validity.

Discriminant validity was assessed with squared correlations between constructs. The square of the highest correlation between each construct and the other constructs (maximum shared variance) was less than the AVE of that construct; therefore, discriminant validity was obtained (Fornell and Larcker, 1981).

Table 2. Correlation and Construct Validity

	SD	Mean	AQ	SC	AT	PU	TR	IA
Argument quality (AQ)	0.83	2.58	1					
Source credibility (SC)	0.75	2.69	0.65**	1				
Attitude (AT)	0.83	3.54	0.32**	0.38**	1			
Perceived usefulness (PU)	0.86	2.82	0.74**	0.59**	0.42**	1		
Trust (TR)	0.82	2.54	0.60**	0.56**	0.28**	0.54**	1	
Information adoption (IA)	0.85	2.76	0.65**	0.53**	0.42**	0.73**	0.61**	1
Coefficient alpha (α)	-	-	0.93	0.86	0.86	0.87	0.87	0.82
AVE	-	-	0.63	0.63	0.62	0.59	0.65	0.60
MSV	-	-	0.54	0.34	0.17	0.53	0.37	0.42
CR	-	-	0.93	0.87	0.86	0.85	0.88	0.82

Note: AVE, average variance extracted; MSV, maximum shared variance; CR, composite reliability; ** $p < 0.01$

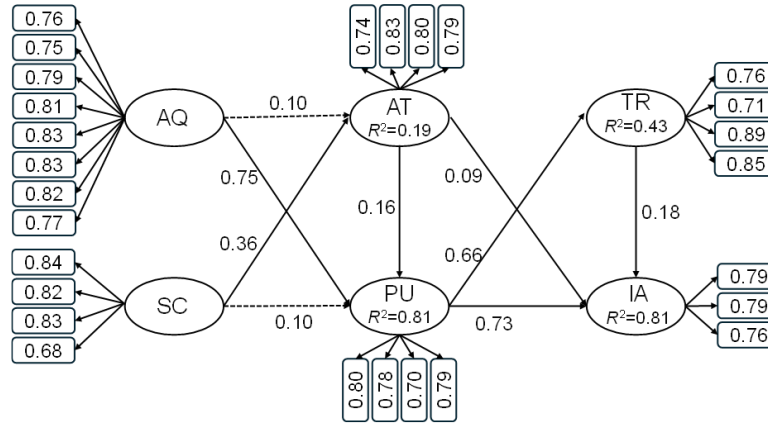


Figure 2. Research model. Factor loadings are in rectangles. AQ, argument quality; AT, attitude.

We used various fitness indices to confirm the measurement and structural models. The normed chi-square must be less than 3 to obtain a satisfactory fit (Hair et al., 2010). In addition, the comparative fit index (CFI), goodness-of-fit index (GFI), normed fit index, and Tucker-Lewis index must be greater than 0.9; values from 0.8 to 0.9 are considered marginal. Finally, an acceptable root mean square error of approximation (RMSEA) is between 0.03 and 0.08 (Hair et al., 2010).

4. Results

4.1. Correlations

There were statistically significant correlations between all constructs in the research model. Information adoption was significantly positively correlated with argument quality ($r = 0.65, p = 0.0001$), source credibility ($r = 0.53, p = 0.0001$), attitude toward information ($r = 0.42, p = 0.0001$), perceived usefulness of ($r = 0.73, p = 0.0001$), and trust in Instagram ($r = 0.61, p = 0.0001$). Means and standard deviations for the variables are shown in Table 2.

4.2. Measurement Model

The normed chi-square ($\chi^2 / df = 1.827$) was less than the minimum acceptable threshold. CFI, GFI, the incremental fit

index (IFI), and RMSEA were 0.924, 0.815, 0.925, and 0.069, respectively. Thus, the results for our measurement models generally indicated acceptable fit. As shown in Table 2, the maximum shared variance of each construct was less than its AVE in the measurement model. The constructs thus had discriminant validity.

4.3. Structural Model

The values for χ^2 / df , CFI, GFI, IFI, and RMSEA were 1.848, 0.921, 0.810, 0.922, and 0.07, respectively. All fit indicators were within the acceptable range. This proved the suitability of the structural model and enabled us to freely test the research hypotheses in the model.

The results of the hypothesis tests are shown in Table 3 and Figure 2. Argument quality directly affected perceived usefulness ($\beta = 0.787, p < 0.001$) but did not have a significant effect on attitude toward information ($\beta = 0.095, p > 0.05$). In contrast, source credibility influenced people’s attitude toward information ($\beta = 0.368, p < 0.01$) but did not significantly affect the perceived usefulness of information ($\beta = 0.126, p > 0.05$). Attitude toward information also affected perceived usefulness ($\beta = 0.181, p < 0.05$). Thus, although source credibility did not directly affect the perceived usefulness of information, it had

Table 3. Estimates of Direct Effects

	Path	Unstandardized Estimate	SE	Standardized Estimate	Critical Ratio	Sig.
	Direct effect					
H1	AQ → PU	0.787	0.106	0.748	7.449	***
H2	SC → PU	0.126	0.101	0.105	1.244	0.213
H3	AQ → AT	0.095	0.113	0.105	0.843	0.399
H4	SC → AT	0.368	0.137	0.355	2.695	0.007
H5	AT → PU	0.181	0.072	0.156	2.522	0.012
H6	PU → TR	0.662	0.090	0.659	7.354	***
H7	PU → IA	0.685	0.101	0.731	6.784	***
H8	AT → IA	0.094	0.075	0.870	6.784	***
H9	TR → IA	0.165	0.076	0.177	2.161	0.031

Note: SE, Standardized Error; Sig., significance; H, hypothesis; AQ, argument quality; PU, perceived usefulness; SC, source credibility; AT, attitude; TR, trust; IA, information adoption; *** $p < 0.001$.

an indirect effect on perceived usefulness through attitude toward information. Attitude toward information did not influence intention ($\beta = 0.094, p > 0.05$).

The findings also showed that the perceived usefulness of information directly affected trust in Instagram ($\beta = 0.662, p < 0.01$) and information adoption ($\beta = 0.685, p < 0.01$). Trust also had a significant direct effect on information adoption ($\beta = 0.65, p < 0.031$). Thus, trust played the role of mediator between the perceived usefulness of information and information adoption. Perceived usefulness had a significant indirect effect on information adoption. The information acceptance model developed here predicted 81% of the variance in perceived usefulness, 43% of the variance in trust, and 81% of the variance in information adoption.

5. Discussion

In this study, we identified the main dimensions of information adoption in the context of RE. Working from the IAM and the literature review, we developed a research model that included several factors that affect the adoption of RE information. The findings of the present study have theoretical implications for research as well as practice. The research framework predicted 81% of the variance in perceived usefulness, 43% of the variance in trust, and 81% of the variance in information adoption.

The findings of the study provide a clear answer to the research question about how message-related and receiver perception-related factors affect the acceptance of information from Instagram about RE and the intention to use this information. The findings showed that the structure and quality of the messages, including the completeness and comprehensiveness of the information, correctness, update and format of messages, and the validity and reliability of the sources can affect the acceptance of the messages. The perceived usefulness of messages on Instagram and the attitude toward information can affect acceptance of information - both directly and indirectly through the mediation of trust in Instagram. In fact, if people trust their information source, their attitude and perceived usefulness of that source will have a greater impact on information acceptance.

5.1. Implications for Theory

In this study, argument quality directly affected the perceived usefulness of information. This finding is consistent with the belief that the persuasive power of information messages reflects the value perceived by the user (Bhattacharjee and Sanford, 2006). Here, argument quality refers to the completeness, form, currentness, and accuracy of information. The more users think that messages on RE on Instagram are complete, appropriate, up-to-date, and accurate, the greater the perceived usefulness, of the messages will be, which confirms the results of previous research (Bhattacharjee and Sanford, 2006; Cheung, 2014; Shu and Scott, 2014).

Unlike argument quality, which did not have an effect on attitude, source credibility influenced people's attitude toward information. People who think that the person or organization

that provided the post is expert, knowledgeable, or trustworthy will likely have a more favorable attitude toward the information. In this regard, Kim and Kim (2014) showed that source credibility in relation to green messages (in hotels, for example) can shape people's attitudes. Our findings also showed that source credibility did not have a significant direct effect on perceived usefulness, which is contrary to past results (Erkan and Evans, 2016; Zhu et al., 2016). We found that attitude toward information affected perceived usefulness. Therefore, we conclude that increasing the credibility of information sources and people posting on Instagram in relation to RE does not directly increase the perceived usefulness of information but indirectly affects usefulness via attitude toward information.

The fact that the perceived usefulness of information directly affected information adoption is consistent with other findings (Cheung et al., 2008; Lee, 2013; Shen et al., 2013). In fact, people who, in general, think that information on social media is very useful, profitable, and valuable are more likely to accept and use information that is provided to them about RE.

The findings also showed that the perceived usefulness of information directly affected trust in Instagram. Trust, in turn, had a significant direct impact on information adoption. Thus, trust acts as a mediator between the perceived usefulness of information and information adoption, which is consistent with our findings (Shen et al., 2013). Hmielowski et al. (2014) argued that trust in information is an important factor that supports efforts around climate change mitigation. In other words, increasing the perceived usefulness of RE information among Instagram users leads to increased trust in Instagram and thus increased acceptance of information.

In general, argument quality and source credibility affect information adoption, although the two paths of influence are different. Ayeh (2015) showed that trustworthiness (one of the components of argument quality) increases the intention of TripAdvisor users via attitude and perceived usefulness. Erkan and Evans (2016) also found that components of argument quality and source credibility, along with attitudes toward information, affect information adoption through the perceived usefulness of information.

In terms of research implications, we developed an extended model based on existing theoretical and conceptual frameworks to explain the effects of different dimensions of information acceptance in relation to renewable energy on users' perceptions of the perceived usefulness of information, which in turn shapes the adoption and intention to use RE.

The extended IAM in this study had high explanatory power for perceived usefulness, trust in Instagram, and information adoption. The research model predicted 81% of the variance in perceived usefulness, 43% of the variance in trust, and 81% of the variance in information adoption. This suggests that research theory can be used to explain information acceptance and the intention to use RE. In addition, this research shows that attitude toward information, which has been largely neglected in studies of information adoption, is influenced by source credibility and, in turn, affects perceived usefulness.

5.2. Empirical Implications

This study has significant implications for policymakers and volunteer environmental activists who wish to use social media to encourage pro-environmental activity. Given the impact of argument quality on information adoption, accurate information needs to be provided to the audience because misinformation and disinformation can only create suspicion and fear among people (Chen et al., 2015). In fact, although the openness of social networking platforms enables and motivates people to communicate freely through the internet, it also poses problems. For example, fake news and incorrect information are spread by users who do not carefully examine the evidence and the facts. Such misinformation and disinformation can be devastating on social media because they undermine trust (Wu et al., 2016). Given the ease of publishing information on social media sites such as Instagram, some online information will inevitably decrease (Rabjohn et al., 2008). Managers and policymakers can encourage people to use RE by carefully considering the quality of their argument and information and using credible sources. By analyzing the content of social media in a country, it is possible to reconstruct information on RE. In terms of argument quality, using accurate, well-formatted, and up-to-date information (e.g., information on the potential benefits of using RE, the risks of climate change and greenhouse gas emissions, the costs of using RE) can significantly increase users' acceptance of information. In addition, to increase source credibility, the administrators of RE pages need to try to gain trust, avoid posting questionable content, and add references to the content they publish about RE.

As trust and perceived usefulness are the most important predictors of message acceptance, managers can increase information adoption by increasing users' belief that social networks can be systems with strong and specialized information sources.

6. Conclusion

We investigated the effects of RE-related message characteristics and receivers on the acceptance of information among social media users. In particular, we examined the impact of argument quality (central route) and source credibility (peripheral route) on the acceptance of information obtained from social media.

The results of this study show that both the central and peripheral routes are powerful pathways for influencing users to accept environmental information related to RE, although they differ slightly in the ways in which they affect perceptions. Argument quality significantly increases information acceptance indirectly through the perceived usefulness of information and trust in Instagram. Source credibility indirectly affects information acceptance through attitude toward information, perceived usefulness, and trust in Instagram. These findings suggest that the proposed model is a suitable framework for increasing information acceptance from social media. In the central path, users participate in thoughtful processes of reasoning embedded in messages related to RE, whereas the peripheral path includes the credibility and reliability of information sources. Results re-

vealed that argument quality and attitude directly affected perceived usefulness, while source credibility influenced people's attitude. Hence, source credibility has an indirect effect on perceived usefulness through attitude toward information. Trust plays a significant role as mediator between the perceived usefulness of information and information adoption. Finally, perceived usefulness had a significant direct and indirect effect on information adoption.

The findings of this research can be generalized from several dimensions: i) from the social aspect, they can be extended to social networks other than Instagram, including Facebook and Twitter; ii) geography-wise, they can be generalized to the majority of Middle Eastern countries due to the similarities in socio-cultural and environmental issues; and iii) they can be generalized to other environmental behaviors such as climate change mitigation action and adoption of modern technologies.

This study, having been expanded by the constructs of attitude and trust in social media as two powerful perception-based constructs in communication, has made a significant contribution to using the IAM in RE technology adoption. This project is also among one of the few studies to analyze the social functions offered by Instagram in shaping people's perceived usefulness of information and attitude. The research was carried out in Iran, a country with extensive oil and fossil resources, where such research is rarely conducted. Coming from a rarely reported area can have an important impact on the advancement of framing social media information in direct technology development. The findings of this research can be used for most countries in the Middle East, which are similar geographically, economically, and culturally. The findings of this study will help environmental activists, other stakeholders, and ultimately marketers better understand how social media influences consumers' formation of environmental behaviors and their use of information. The results will be very instructive for increasing pro-environmental behaviors in the age of social media. This study contributes to expanding the knowledge about the application of IAM theory in combination with these two message characteristics in RE. It paves the way for the application of theories of integration to the use of social media in environmental behavior.

7. Limitations and Future Studies

Although this study has meaningful implications for examining the factors that influence the adoption of information from social media, it has many limitations. Because of time constraints, the statistical sample was relatively small. In addition, the target population included only Iranians, which may limit the generalizability of the findings to other regions and countries. Moreover, the study was conducted among Instagram users; other social networks may have different effects on people's perceptions - people may have more or less trust in them, resulting in a different effect being seen regarding trust on information adoption. Testing the proposed framework of this research with more samples, in other places or countries, and among users of other social networks can be a basis for future research.

Although this study showed that attitude toward information

affects its perceived usefulness, in theory there are not many studies to support this link. To the best of our knowledge, only Erkan (2016) and Erkan and Evans (2016) have examined this relationship, which is a serious theoretical limitation of this study. Furthermore, as the perceived usefulness of information has a significant positive effect on the intention to use RE and information adoption, companies and environmental organizations need to emphasize the social, environmental, and financial benefits of increased use of RE on social media.

Two points especially need to be considered by Iranians, whose acceptance of RE by residential consumers is extremely low. Those posting environmental information on Instagram should improve the quality of their information and credibility of their sources. Trust in social media needs to increase - because of increasing information and rumors in Iranian society, trust in information sources has decreased. Strengthening information and trust can help with the acceptance of RE.

In addition, the results of examinations of this framework on different social media in the field of RE can contribute valuable insights for theory and management. It is suggested that future researchers extend the research model by adding more variables or applying the current variables in other fields, especially in other environmental contexts. Finally, this study used a self-report questionnaire, and therefore information adoption here reflects participants' subjective understanding of information acceptance and their intention to accept information from Instagram. In future research, it will be necessary to measure the acceptance of information objectively and directly.

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