

## Full Length Article

## Understanding the impact of social media usage among organizations

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## ABSTRACT

This study investigates the antecedents and impact of social media usage in organizations. This study uses the technology, organization, and environment framework and includes certain antecedent factors that are specific to social media usage in organizations. The items to measure different purposes of social media usage in organizations were developed, which contribute to the enhancement of social media usage measurement. This study develops and tests an integrated model that contributes to the scholarly research on social media and information systems. The study also helps organizations to understand the benefits of social media usage and provides a justification for investments in social media by organizations.

## 1. Introduction

Organizational usage of social media is changing organizational communication and public relations. Social media enables open communication, which helps organizations to understand customer needs and motivates them to respond proactively and efficiently to those needs [1]. For any technology to be successful and to have an impact on organizational performance, it has to be properly adopted by organizations. As many organizations invest in social media, it is important to identify the factors that are associated with the successful adoption of these technologies. Past theoretical and empirical evidence revealed that the technology, organization, and environment (TOE) framework has been a popular model in examining various information systems (IS) issues. Empirical findings from the studies that used the TOE framework confirmed that it is a valuable framework with which to understand the adoption of IT innovation [2]. Previous studies using the TOE framework have investigated many factors and found these factors as antecedents for various IS usage [3]. But unlike any other IT innovations or Internet-based systems, social media is a more open and public-oriented system, which has both advantages and disadvantages. Hence, there may be other technological, organizational, and environmental factors that are more specific to social media that might affect its adoption in organizations.

To fill these gaps in the literature and to develop an overarching framework that delineates the antecedents and benefits of social media usage in organizations, we rely on the TOE framework. This research aims to study the factors associated with the technological, organizational, and environmental context that relates to social media usage in organizations as the extent to which social media benefits organizations

is still not clear. Therefore, this study also investigates the benefits associated with social media usage in organizations. Moreover, most of the previous IS studies measured system usage including social media usage based on frequency and duration of use only [4]. There have been calls to examine the usage construct in detail and investigate different patterns of IS usage behaviors in organizations [5]. However, Henri et al. [6] stated that theoretical advances in this regard are still insufficient. Therefore, this study aims to develop measures for social media usage using the system-centered method, which could measure different purposes of social media usage in organizations.

## 2. Theoretical background and hypothesis development

## 2.1. Technology–organization–environment framework

The TOE framework identifies three context groups: technological, organizational, and environmental. The technological context describes both existing technologies in use and also the new technologies that are relevant to the firm. Next, the organizational context refers to the characteristics of the organization in terms of its scope and size. The environmental context is the arena in which a firm conducts its business, referring to its industry, competitors, and dealings with the government. The TOE framework explains the adoption of innovation, and it provides a useful analytical framework that can be used for studying the adoption and assimilation of different types of IT innovation. The TOE framework is consistent with the diffusion of innovation (DOI) theory, but the TOE framework includes a new component: the environment context. Thus, it explains the intra-firm innovation adoption much better. Hence, the TOE framework is considered a more complete

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model to study IT adoption at firm level [7].

A considerable number of empirical studies have focused on various IS domains using the TOE framework. Thong [8] explained IS adoption and the purpose of using TOE as their research framework. On the other hand, Pan and Jang [9] explained enterprise resource planning (ERP) adoption. Using the TOE framework, researchers have identified various factors that are associated with technology adoption. For instance, Chau and Tam [10] studied the adoption of open systems using the TOE framework and explained three factors that affect the adoption of open systems. These factors are the characteristics of the innovation, organizational technology, and external environment. Similarly, a study by Kuan and Chau [11] confirmed the utility of the TOE framework in adopting complex IS innovations. The framework was also used to explain e-business adoption [12,13] and use [14,13,15]. They found that technological readiness, financial resources, global scope, and regulatory environment contribute strongly to e-business value. Jean et al. [16] integrated the TOE framework with the contingency theory and RBV theory to examine the determinants of electronic collaboration (E-collaboration) and its outcomes for suppliers with regard to their international customers. Previous studies show that the TOE framework has consistent empirical support and has a solid theoretical basis [7]. Various factors have been previously investigated under the TOE framework. But in this study, along with some general TOE components, we also incorporate specific factors that are unique to social media and investigate their impact on social media usage.

## 2.2. Antecedents of social media usage

Apart from the general TOE factors that are used in previous studies, interactivity and entrepreneurial orientation were also considered as important factors in social media usage and thus included in the study. Table 1 shows the antecedents of social media usage incorporated in this study and the underlying theories.

## 2.3. Relationship between technological factors and social media usage

Technological factors are the perceived characteristics of the technology to be adopted [39]. On the basis of the DOI theory, as suggested by Rogers [40], relative advantage focuses on the advantage that is expected from the usage of a particular technology. The usage of social media is expected to provide various benefits to organizations, including informational benefits such as ease of obtaining data input from media users like customers and competitors. It helps to form new business, enhance existing business, enhance selling merchandise, increase the number of connections, and improve customer relations, among others [41]. Thus, the relative advantages that social media usage is expected to provide might have a positive impact on the likelihood of organizations using the technology. Similarly, compatibility is another technological characteristic suggested by DOI as a driver of the decision to adopt a new system [40]. When a technology is consistent with the existing technology, infrastructure, culture, values, and preferred work practices of the firm, then it is more likely to be used. Several prior studies found that more compatible technology is more likely to be adopted [42,43,17].

Therefore, this study investigates the impact of relative advantage and compatibility on social media usage in organizations. Hence, to test the relationships, the following hypotheses were formulated:

**H1.** Relative advantage of social media is positively associated with social media usage.

**H2.** Compatibility of social media is positively associated with social media usage.

Apart from the innovation attributes suggested by Rogers [40], the cost of IS adoption is considered to be an important technological factor for IS adoption [19–22]. Cost is conceptualized in this study as the perceived cost-effectiveness of social media. Studies have found cost-effectiveness to be an important variable in the adoption of new technologies [19,21]. In terms of social media, firms can engage in a timely and direct end-consumer contact at relatively low cost, and higher levels of efficiency can be achieved when compared with traditional communication tools. This cost-effective nature of social media attracts not only large multinational organizations but also small- and medium-sized organizations and even nonprofit and governmental agencies [44]. Therefore, cost-effectiveness of social media can be considered as one of the important factors that are associated with social media usage in organizations and thus included in the technological context of the TOE framework for further investigation. So, the following hypothesis is postulated as follows:

**H3.** The cost-effectiveness of social media is positively associated with social media usage.

Previous research has investigated trust in various dimensions and found that the greater the trust in a technology, the more likely it is to be adopted in an organization [23,24,45,25]. The authors have also investigated different types of trust in their studies. The more suitable one for this research would be institution-based trust. McKnight et al. [46] described two types of institution-based trust: situational normality and structural assurance. Situational normality refers to the belief that success is anticipated because the situation is normal, whereas structural assurances refer to belief that favorable outcomes are likely because of contextual structures, such as contracts, regulations, and guarantees. In the social media context, organizations post a lot of information about their organization, products, services, and other promotional activities. So there might be need for structural assurance in order to use social media technologies in organizations. Therefore, the impact of structural assurance on social media usage is examined in this study. Based on that, the following hypothesis is proposed:

**H4.** Structural assurance is positively associated with social media usage.

Interactive innovations or technologies are more likely and quickly adopted by its users [47]. The crucial role played by interactivity in the e-commerce realm and other WWW technologies has motivated both academics and practitioners to enhance their understanding of the interactivity concept and to employ it effectively [48]. Social media is considered as an interactive media. It enables two-way communication

**Table 1**  
Antecedents and Underlying Theories.

Antecedents	Theories/References
Relative Advantage, Compatibility	Based on Diffusion of Innovation Theory/Wang et al. [17], Ramdani et al. [18]
Cost-Effectiveness	Theory not mentioned/Chong and Chan [19], Ghobakhloo et al. [20], Premkumar and Roberts [21], Tan et al. [22]
Structural Assurance	Based on Institutional Trust/Chong and Ooi [23], Choudhury and Karahanna [24], Ortega Egea and Román González [45]; Tung et al. [25]
Interactivity	Based on Usability Factors/Agarwal and Venkatesh [26], Lee and Kozar [27],
Top Management Support	Theory not mentioned/Low et al. [3], Ifinedo [28] and Scupola [29]
Entrepreneurial Orientation	Resource-Based View Theory/Elliott and Boshoff [30], Mostafa et al. [31], Colton et al. [32]
Institutional Pressure	Institutional Theory/DiMaggio and Powell [33], Purvis et al. [34], Chatterjee et al. [35], Teo et al. [36], Ke et al. [37], Liu et al. [38]

rather than one-directional transmissions or distributions of information to an audience [49]. Social-networking platforms, including Facebook, YouTube, and Twitter, have become pervasive; e-business sites have rushed to integrate these social networking features into their websites, enabling enhanced interactive communications between consumers, or between consumers and organizations [27]. Adding social networking features also augments site credibility. The interactivity factor has not been studied previously under the technological context of the TOE framework. However, considering the interactive nature of social media, this study includes the interactivity factor and investigates its impact on the usage of social media in organizations. Therefore, to empirically test this relationship, the hypothesis is stated as follows:

**H5.** Interactivity of social media is positively associated with social media usage.

#### 2.4. Relationship between organizational factors and social media usage

Literature on innovation assimilation largely views top management as the agency responsible for changing the norms, values, and culture within an organization; in turn, this enables other organizational members to adapt to the new technological artifact Purvis et al., 2010. Social media is like a “double-edged sword” as it provides many advantages; there are also some disadvantages, which might cause hesitation in top management’s choice to use social media. Some of the issues related to social media include social media usage by employees, which might affect productivity, as employees waste time on social media sites. Also, reputation management is critical when using social media, and dissatisfied customers or employees can post negative information about an organization that might affect its reputation [50,51]. Moreover, social media usage in an organization also requires continuous monitoring and proper staff to update the information on the site, so proper resources should be provided for the successful usage of social media. Considering all these issues, top management’s support can be an important factor for the use of social media, and it is thus included under the organizational context of the TOE framework to study its association with social media usage. Therefore, the following hypothesis is formulated:

**H6.** Top management’s support is positively associated with social media usage in organizations.

Based on a resource-based view theory, entrepreneurial orientation is considered as an important asset for firms competing in an electronic environment [32]. Entrepreneurial orientation is defined as the methods, practices, and decision-making styles managers use to act entrepreneurially. In terms of innovativeness, it is proposed that firms with a high entrepreneurial orientation eagerly embark upon experimentation, support new ideas, and depart from existing practices. The risk-taking element is linked to the company’s propensity to engage in projects that have uncertain outcomes or high profits and losses [52]. Social media is a technology that has greatly developed in recent years and is treated as an interactive technological resource [53]. For technologies like social media, which demand open and two-way communication, managers should act entrepreneurially and organizations must be ready to face both positive and negative consequences from audiences. Therefore, entrepreneurial orientation of an organization is an important factor for social media usage. Previous studies using the TOE framework have not studied the impact of entrepreneurial orientation under an organizational context. Thus, for this study, entrepreneurial orientation was included under the organizational context to study its impact on social media usage.

**H7.** The entrepreneurial orientation of the firm is positively associated with social media usage.

#### 2.5. Relationship between environmental factors and social media usage

An important component of the TOE framework is the inclusion of an environmental context, which is not included in other firm-level IS adoption theories like DOI. For the environmental context, institutional theory seems to be an appropriate theory in this study. Institutional theory emphasizes that environmental forces, such as institutional pressures, drive organizations to adopt innovations [54]. Institutional pressure refers to the pressure that emanates from institutional environments that can induce firms to adopt shared norms and routines [33]. The agents that may exert pressures include a firm’s key customers, suppliers, competitors, and the government [37]. Several studies have taken an institutional approach to study Internet technologies’ adoption and usage [34–38]. Even regarding social media, it is possible to state that firms are likely to be induced to use social media due to external pressures. Therefore, institutional pressure is included in the environmental context of the TOE framework to study its association with social media usage. Thus, the following hypothesis is formulated:

**H8.** Institutional pressures are positively associated with social media usage.

#### 2.6. Social media usage and organizational impact

Besides noting the antecedents of social media usage, the study also analyzed the impact of social media usage on organizations. Previous studies have investigated the relationship between system use and its impact on performance and have found significant results. For instance, it was found that higher Internet usage increased the impact it would have on organizations in terms of increased revenue, enhanced relationships, and reductions in cost and time [55]. [56], in their attempt to study E-marketing, found that an Internet marketing tool is positively associated with the firm’s performance. In the context of social media, literature claims that social media can have a dramatic impact on organizations in digital advertising and promotion, handling customer service issues, mining innovative ideas, and building customer relations [57]. Therefore, when organizations use social media effectively for various tasks, like marketing, customer relations, and information searching, it is likely to have a positive impact on the organization, especially in terms of cost reductions, improvements in customer relations, and enhanced accessibility of information. This can be empirically tested by developing the hypothesis as follows:

**H9.** Social media usage will have a positive impact on organizations.

Fig. 1 portrays the research model with the nine hypotheses advanced in this research.

### 3. Research methods

#### 3.1. Sample and procedure

In order to identify the sample for this study, a list of Malaysian business organizations was created from various sources like the Kuala Lumpur Stock Exchange (list of public-listed organizations), SME Corporation (list of small- and medium-sized enterprises), MSC Malaysia (list of MSC status companies), MARTRADE, the national trade promotion agency of Malaysia (listed companies), and top 1000 Companies Directory. Overall, a list of 9918 organizations was retrieved. Among those, only 7910 organizations were included in the study because of various issues with the website.

Among the 7910 websites researched, only 664 organizations were using some kind of social media. Of the 664 organizations, only 567 organizations with official social media presence were included for the data collection. After identifying the organizations that use social media, survey method was employed to collect data using the cross-sectional design. The online questionnaire was created using the Survey

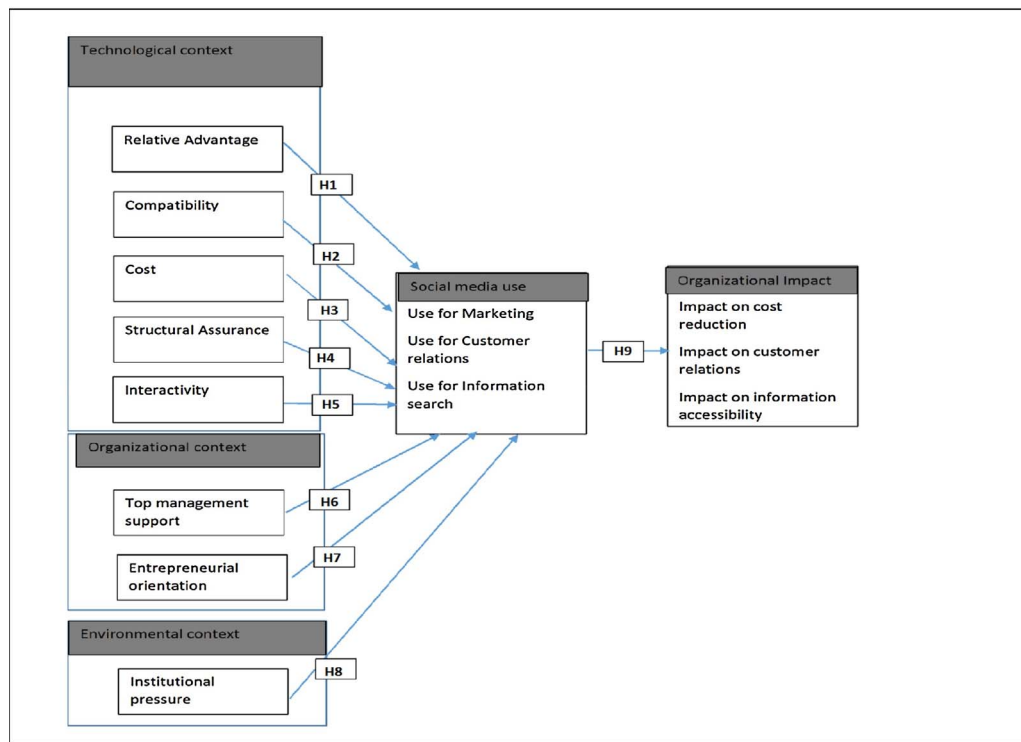


Fig. 1. Research Model with Hypotheses.

**Table 2**  
Analysis of Non-Response Bias and Common Method Bias.

Factors	Non-Response Bias			Common Method Bias
	Early respondents (n = 40)	Late respondents (n = 40)	Significance (p-value)	Full Collinearity VIF
Social media usage	6.39	6.36	0.994	1.757
Interactivity	8.81	4.08	0.162	1.439
Cost-effectiveness	4.22	6.44	0.352	1.128
Relative advantage	4.01	6.43	0.312	1.964
Compatibility	3.94	3.90	0.778	2.442
Structural assurance	3.36	5.97	0.277	1.040
Top management support	3.69	3.75	0.677	1.890
Institutional pressure	5.87	3.45	0.312	2.053
Entrepreneurial orientation	3.18	3.12	0.993	1.615
Organizational impact	6.67	6.54	0.972	1.843

Monkey website. The survey link was emailed to the management in charge of social media in the organizations, after speaking with them via telephone and obtaining their consent to participate in the survey. After reminders were provided, 174 responses were received, showing a response rate of 26%.

### 3.2. Measures

Measures for most of the factors were adapted from previous research. The items and their sources are given in [Appendix A](#). A five-point Likert scale was used, as it is easier for respondents and takes less time to complete than open-ended questions [58]. The items for the factor of social media usage were newly developed in the study. Social media usage includes the use of Facebook, Twitter, and other social media tools for various purposes in the organization. Moreover, this study also categorizes social media usage into three sub-constructs, such as social media used for information searching, social media used for marketing and branding, and social media used for building customer relations.

Content validity was undertaken to ascertain whether the content of the questionnaire was appropriate and relevant to the study's purpose.

The result showed that all the items developed for the social media usage factor were valid, with CVIs ranging from 0.87 (7/8) to 1.00 (8/8). Similarly, the items of all the other factors used in the study were found to be valid and retained for further investigation. The reliability test results showed that all the factors have high rates of Cronbach's alpha (above 0.7). Therefore, the questionnaire was considered as reliable, as suggested by [59].

### 3.3. Non-response bias and common method bias

There are several methods available to control for non-response bias, such as ignoring non-respondents, comparing respondents to the general population, comparing respondents to non-respondents, comparing early to late respondents, and "double-dipping" non-respondents [60]. This study uses the method that compares early to late respondents. The respondents are defined as either early or late respondents based on the first and last 40 questionnaires received [61]. A comparison of means on all the measured factors was performed to test for response bias using a *t*-test. In this study, the results of the *t*-test (Refer [Table 2](#)) show that the significance values for all the factors are above 0.05, so it can be concluded that there are no statistically



significant differences between the means for these two groups.

In order to test for common method bias (CMB), Harman's single factor test and the full collinearity test were conducted. For Harman's single factor test, exploratory factor analysis (EFA) results revealed that six factors with an Eigen value greater than 1.0 were extracted in both rotated and unrotated principal component analysis. The six factors together represented 63% of the total variance, with variance for each of the six factors at 14.35, 13.08, 10.06, 8.90, 8.54, and 8.35 (unrotated), and 14.35, 13.08, 10.06, 8.90, 8.57, and 8.31 (rotated). Therefore, the results show no sign of any single factor that accounts for the majority of covariance, thus confirming that the data are free from CMB. To reconfirm the results, a more sophisticated full collinearity test was conducted using WarpPLS software.

[62] suggested the full collinearity test for the identification of common method variance. The full collinearity test is a comprehensive procedure for simultaneous assessment of both vertical collinearity (predictor–predictor collinearity) and lateral collinearity (predictor–criterion collinearity) [63]. As part of the full collinearity test, variance inflation factors (VIFs) were generated for all latent variables in the model using WarpPLS 5.0 software. If all the VIFs resulting from a full collinearity test are equal to, or lower than, 3.3, the model can be considered free of CMB [63,62]. In this study, all the VIFs (Refer Table 2) are lower than 3.3; therefore, CMB is not a problem in the model. Table 2 shows the results for non-response bias and CMB.

#### 4. Data analysis

As the initial step of analysis, a web content analysis was conducted among the 664 organizations that were using social media. The result showed that Facebook was the most popular social media tool. Nearly 91% of the organizations were using Facebook, followed by Twitter, which was used by 49% of the organizations. The initial web content analysis helped to identify the organizations that are using social media. Then, a questionnaire survey method was used to collect data. Overall, 174 responses were received. Of the 174 responses, three were incomplete. The remaining 171 questionnaires were retained for further analysis. Twenty-six organizations that responded to the survey were from the manufacturing industry, while the remaining 145 (84.8%) were from service industries. The majority of the organizations that responded to the survey are small (44.4%), with fewer than 50 employees, followed by very large organizations (24.6%) with more than 500 employees. More than half (53%) of the organizations had been using social media in their organization for more than 2 years. It is therefore possible to study the impact of social media usage on organizational performance for these long-term users. Similarly, more than half (58%) of the organizations respond to customer queries or post information on social media within a day.

##### 4.1. Assessment of measures

The two main assessments of measurements in quantitative research are reliability and validity. Appendix B shows the results of tests of the internal consistency and reliability of measures. The  $\alpha$ -value for most of the factors was above 0.7. One item regarding entrepreneurial orientation, "Innovation in our organization is perceived as too risky and is resisted," was deleted to increase reliability. To check for validity, EFA was performed. Then, principal component analysis with varimax rotation was undertaken. In order to access the suitability of the data for EFA, the Kaiser-Meyer-Olkin (KMO) should not be below 0.5. The KMO result for this study is 0.89,0 which is considered optimal for performing EFA. Bartlett's test result showed that the significance level is at 0.000 and hence is good as it is below 0.05. The results of EFA showed that most items' factor loadings were greater than 0.50, and each loads strongly on the associated factors, confirming convergent and discriminant validity. However, two items were removed from the study because of low factor loadings. An item to determine relative

advantage, "Social media allows for better advertising and marketing" (with a loading of 0.487), and an item to determine social media usage, "Social media is used to reach new customers" (with a loading of 0.457), were removed from the study as the loadings were below the 0.50 threshold.

##### 4.2. Hypothesis testing

This study uses the partial least squares (PLS) technique to validate measurements and test the hypothesis. PLS is a structural equation modeling technique that allows for formative, as well as reflective indicators [64]. For this study, PLS is appropriate, as the research model contains second-order reflective-formative constructs (Type II). Social media usage is modeled as a reflective-formative construct. Social media can be used by organizations for various purposes, including advertising, building customer relations, and searching for information. These tasks are different from one another and do not necessarily correlate. The lower order constructs are measured by reflective indicators, whereas the higher-order construct is measured by three formative sub-constructs, namely social media usage for marketing, usage for customer relations, and usage for information searching.

##### 4.3. Assessment of the measurement model

For this study, assessment of the measurement model is based on the evaluation criteria for reflective models, except for the second-order social media usage construct, which will be evaluated based on the criteria for formative measurement models. An item is retained in the measurement model if it has significant outer loadings. The indicator's outer loadings should be higher than 0.708 [65]. Most of the indicators' outer loadings are above the threshold value of 0.708. Loadings of some indicators were below 0.7. However, removal of these indicators did not change AVE or composite reliability, and therefore, they were retained in the study. The values of composite reliability and AVE are reported in Table 3. Results show that the values of the composite reliability are greater than 0.6 and AVE is greater than 0.5 for all the reflective constructs, so construct reliability and convergent validity are achieved.

The next evaluation criterion is discriminant validity. One criterion for discriminant validity is that factor loadings of each item should be greater than the cross-loadings of items of other constructs [66,67]. The result (Appendix D) showed that the cross-loadings of the constructs are stronger on their respective factors than on other constructs. The Fornell-Larcker criterion indicated that the square root of AVE for the constructs is greater than values for inter-construct correlation. This confirms discriminant validity. The correlation and the square root of

**Table 3**  
Construct Reliability and Convergent Validity.

Constructs	AVE	Composite Reliability
Cost-effectiveness	0.6699	0.8588
Coercive pressure	0.7489	0.8991
Compatibility	0.7550	0.9023
Impact on cost reduction	0.5674	0.7846
Impact on customer relations	0.6655	0.8562
Impact on information accessibility	0.8048	0.9251
Innovativeness	0.6322	0.8727
Interactivity	0.6244	0.8329
Mimetic pressure	0.8533	0.9458
Relative advantage	0.5737	0.8892
Risk taking	0.7551	0.9023
Structural assurance	0.8673	0.9513
Top management support	0.6698	0.8902
Usage for marketing	0.5627	0.7934
Usage for customer relations	0.7043	0.9225
Usage for information search	0.6194	0.8295

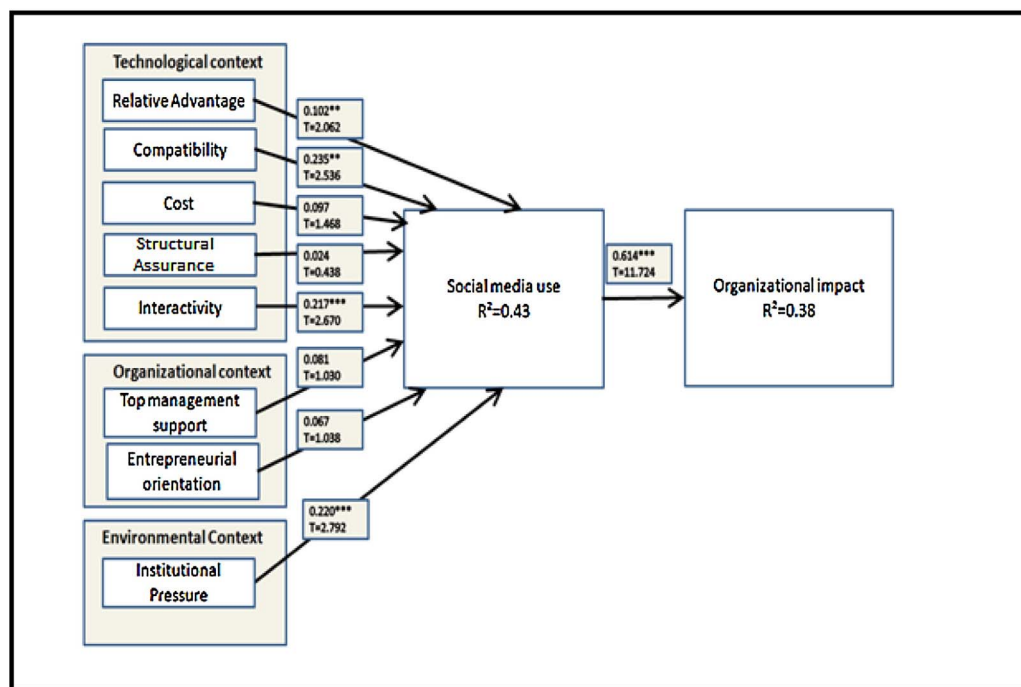


Fig. 2. The Structural Model.

AVE values along with mean and standard deviation of all the variables are presented in Appendix C. The next paragraphs present the evaluation of second-order constructs.

Drawing on past literature, the constructs of institutional pressure, entrepreneurial orientation, and organizational impact are modeled as second-order reflective–reflective constructs (Type I). The lower order constructs were reflectively measured constructs themselves that can be distinguished from each other but are correlated [68]. Similarly, the higher order constructs were measured by reflective lower order constructs. This study used a two-stage approach. The AVE values of all the second-order constructs are well above the cutoff value of 0.5. All the composite reliability values are above the threshold of 0.70, supporting internal consistency reliability. The outer loadings of the indicators of second-order constructs were well above the critical value of 0.70. The only exception was impact2 (0.659). However, since the value was above 0.65 and the criteria for composite reliability and convergent validity were met, impact2 was retained for further analysis.

The validity of formative constructs is assessed by checking multicollinearity and the significance of weights. The VIF values for the formative constructs, usage for marketing (1.514), usage for customer relations (1.573), and usage for information search (1.523) are below 10 and tolerance values were also found to be higher than 0.1; thus, no sign of multicollinearity was found for social media usage constructs. Another important criterion for evaluating the formative indicator and

its relevance is by reading its outer weight. The results of the outer weights showed that all the formative indicators were found to be significant.

#### 4.4. Assessment of the structural model

The main criteria to assess the structural models are the  $R^2$  of endogenous latent values.  $R^2$  values of 0.67, 0.33, or 0.19 for endogenous latent variables in the inner path model were described as substantial, moderate, or weak by [69]. This study finds that  $R^2$  values for the endogenous latent variables “social media usage” and “organizational impact” were 0.43 and 0.38, respectively, which is moderate. The results for the path coefficients and  $t$ -values showed that relative advantage, interactivity, compatibility, and institutional pressure, all with  $t$ -values greater than 1.96, are positively associated with social media usage in organizations. Similarly, social media usage with a  $t$ -value greater than 2.67 has a significant impact on organizations in terms of cost reduction, improvement in customer relations and service, and enhancement in information accessibility. Fig. 2 shows the structural model with  $t$ -values, and a summary of the hypotheses testing is summarized in Table 4.

The next section describes the differences in the research model when controlling for variables such as industry, organization size, and organization age. Since the respondents were from different industries,

**Table 4**  
Summary of Hypotheses Testing.

Hypothesis	Beta	T-value	Result
H1: Relative advantage of social media is positively associated with social media usage	0.235**	2.536	Supported
H2: Compatibility of social media is positively associated with social media usage	0.097	1.468	Not Supported
H3: Cost-effectiveness of social media is positively associated with social media usage.	0.024	0.438	Not Supported
H4: Structural assurance in social media is positively associated with social media usage	0.217***	2.670	Supported
H5: Interactivity of social media is positively associated with social media usage in organizations	0.081	1.030	Not Supported
H6: Top management support is positively associated with social media usage in organizations	0.067	1.038	Not Supported
H7: Entrepreneurial orientation of the firm is positively associated with social media usage	0.220***	2.792	Supported
H8: Institutional pressures are positively associated with social media usage	0.102**	2.062	Supported
H9: Social media usage will have a positive impact on organizations	0.614***	11.724	Supported

\*\*\*  $p < 0.01$  ( $> 2.58$ ).

\*\*  $p < 0.05$  ( $> 1.96$ ),  $p < 0.10$  ( $> 1.645$ ).

**Table 5**  
Results including the Control Model.

Constructs	Path coefficients		
	Full Model	Theoretical Model	Control Model
Relative advantage	0.101**	0.102**	
Compatibility	0.235**	0.235**	
Cost efficiency	0.098	0.097	
Structural assurance	0.025	0.024	
Interactivity	0.217***	0.217***	
Top management support	0.081	0.081	
Entrepreneurial orientation	0.067	0.067	
Institutional pressure	0.219***	0.220***	
Social media usage	0.601***	0.614***	
Industry	0.052		0.053
Organization size	0.064		0.023
Organization age	−0.144		−0.207
Variance explained by organization impact ( $R^2$ )	37.7%	39.6%	4.2%

\*\*\*  $p < 0.01$  ( $> 2.58$ ).

\*\*  $p < 0.05$  ( $> 1.96$ ),  $p < 0.10$  ( $> 1.645$ ).

it is important to control for industry. Similarly, organizational size was used as a control variable. In addition, years in operation may also affect the results, so organizational age was also included as a control variable. Following the study of [70], three models were used: the full model, the theoretical model, and the control model. These three models were estimated to provide a basis for assessing the true impact of the variables and to rule out alternative explanations [36]. Comparison between the full model and the control model shows that the full model explains a substantive incremental variance of 33.5%. In contrast, the incremental variance explained by comparing the full model and the theoretical model amounted to a mere 1.9%. Since the difference is small, the results suggest that the theoretical model was adequate to explain a large proportion of the variance in organizational impact derived from social media usage.

Table 5 lists the path coefficients of all the variables, including control variables. Examining the theoretical model and the full model revealed that five hypotheses—regarding interactivity and usage, relative advantage and usage, compatibility and usage, institutional pressure and usage, and finally social media usage and impact—were significant in both cases, indicating strong support for the model. Moreover, it was also found that, of the three control variables, the age of the organization had a significant negative impact on organizational performance. The other variables were not significant.

## 5. Discussion

This study provides a clear understanding of the antecedents and benefits of social media usage and provides a holistic view of social media usage in organizations from different industries and of different sizes, creating the opportunity to transfer these results to other contexts.

The findings of the antecedents of social media usage revealed that relative advantage is positively associated with organizational usage of social media ( $P < 0.05$ ). This can be interpreted as the expected benefits from social media usage will impact the organization to use social media. The result on relative advantage was consistent with the previous studies, which argued that relative advantage is an important factor in the adoption of any new technology [42,3,18]. Similarly, the compatibility of social media was identified as a significant factor that is positively associated with social media usage in organizations ( $P < 0.05$ ). Anyone with an Internet connection can use social media like Facebook or Twitter. Thus, social media is highly compatible with the existing infrastructure as the technology is very simple and easily adoptable by any organization. The result of compatibility was

consistent with previous studies, which found that compatibility is a significant factor in the adoption of technology [42,17].

The interactivity of social media is also an important factor that determines the use of social media in organizations ( $P < 0.01$ ). The interactive nature of social media enables two-way communication with the public, which motivates organizations to use it. Interactive innovations provide two-way communication and speed up the adoption process because they attract users quickly [71,47]. The result was consistent with the previous studies, which suggested that interactivity of the technology has a strong effect on technology adoption [27,72].

Another important determinant of social media usage is institutional pressure that came from the external environment ( $P < 0.05$ ). Pressure from various external parties, including competitors and customers, has a positive effect on the usage of social media. The findings were consistent with previous studies, which argued that institutional pressure is an important determinant of technology adoption [37,73,36]. Factors such as cost-effectiveness and structural assurance were found not to be significant in relation to social media usage. The study result on cost is consistent with previous studies [74,22]. In general, social media is considered cost-effective, but there may be costs in terms of employing dedicated staff to continuously monitor, update, and respond to customer queries. Moreover, running a campaign on social media also incurs costs. This study revealed that cost-effectiveness is not a significant factor in organizational usage of social media.

Another factor that turned out to be non-significant in social media usage is institutional trust, which is the structural assurance. This result was consistent with the study of Wu and Liu [75]. It may be that structural assurance is an important factor for e-commerce adoption or for technology that involves transactions. At present, social media is used mainly to interact with customers and advertise products and services. Very few organizations in Malaysia currently use social media for sales activities that involve transactions. Therefore, structural assurance may not be a significant factor for social media adoption at this moment. Moreover, the cost associated with the initial adoption of social media is very low, so the organization may adopt social media without considering the structural assurance factor. On the other hand, social media service providers like Facebook and Twitter are well known all over the world and the features of these sites are quite consistent and common to all users, so structural assurance may not be an issue. Therefore, the study result suggests that structural assurance is not a significant factor for social media usage in organizations.

Moreover, top management's support is not a significant factor for social media adoption. This result contradicts the findings of most previous studies, which state that top management support is an important determinant of technology adoption [19,28,18,3,29]. The result is, however, consistent with the study by Wang et al. [17], which found that top management's support is not a significant factor for technology adoption.

The last insignificant factor was the entrepreneurial orientation of the firm. The results demonstrate that entrepreneurial orientation was not a significant factor for social media usage in organizations. Few studies have investigated the direct relationship between entrepreneurial orientation and technology adoption, but Urban [76], in his study, found that entrepreneurial orientation was not significantly associated with technology adoption by the organization. Another study that examined the role of entrepreneurial orientation in e-tailing found that entrepreneurial orientation does not have a positive impact on brand strength in e-tailing [32]. As social media does not involve a big investment or a significant risk, the disposition to take risks and act entrepreneurially may have no effect. Moreover, organizations do not need to be very innovative to use social media. Even a sole proprietor who has a small business and sells basic goods may use social media to advertise his or her products and services. Therefore, the entrepreneurial orientation of the firm may not play an important role in social media usage in organizations.

The result of this study also shows that social media usage has a very strong positive impact on an organization's performance ( $P < 0.01$ ), in terms of cost reduction, enhanced customer relations, and improved information accessibility. The result is consistent with a previous study conducted by Parveen et al. [77] on social media. The result is also consistent with previous findings that found positive relationships between technology usage and firm performance [55,78,56]. Social media provides interactive communication with current and potential future customers, and this benefits the organization in terms of enhanced customer relations. The interactive nature of social media creates two-way communication between organizations and the public, which has helped them to improve their relationships. Also, many organizations have started to advertise their products and services on their corporate social media pages. Social media has the capacity to reach larger audiences at minimal cost and time. Therefore, organizations can see immediate returns on limited investment in marketing and customer service activities. Organizations are also able to access a lot of information about customers and competitors through social media. They can understand customer choices, needs, demands, and frustrations. Social media also helps to retrieve more information about the organization's competitors, their activities, their tactics, and their brand sentiments, which helps them to enhance their products and services in order to achieve greater impact on organizational performance [79].

## 6. Theoretical contribution

The literature on information technology provides few examples of studies examining the determinants of IT use and the extent of IT use and firm performance in an integrative model [80]. During the past few years, studies have been conducted to investigate the antecedents and consequences of various IT systems [81,82,78]. But in the context of social media, there is a lack of studies that investigate organizational usage of social media in an integrated model [83,84]. Therefore, the current study, which uses an integrative model, examines the determinants of social media use, the extent of social media use, and its impact on organizational performance.

This study investigated various factors to study their association with social media usage. Previous studies that used the TOE framework have mostly used general technological factors to study the adoption of the technology. This study used social media-specific variables, such as social media interactivity and cost-effectiveness, to study their association with social media usage. Similarly, for an organizational context, previous studies used descriptive measures, such as the firm's size and scope, centralization, formalization, complexity of managerial structure, quality of human resources, and the amount of internal slack resources. This study, rather than considering the descriptive measures, investigated the impact of entrepreneurial orientations of the firm on technology usage. Apart from the commonly used factors, interactivity and entrepreneurial orientation were added to the TOE framework to enhance it and make it more appropriate for use in the study of social media technologies and upcoming new technologies that are highly collaborative and interactive.

Previous research has suggested that system usage can be measured using a system-centered approach, measuring tasks for which the IS are used [85]; but still, most studies of IS measure usage are based only on frequency and duration of use [4]. Simply measuring the amount of time a system is used does not capture completely the relationship between usage and the realization of expected results [86]. Therefore, this study developed the measures for social media usage based on various purposes for which it can be used. It categorized the usage construct into three sub-constructs and measured various purposes of usage, such as social media use for information searching, social media use for marketing, and social media use for customer service. Thus, this

study contributed to the enhancement of the measurement of usage, especially in the social media context. The study also clearly identifies and categorizes the impact of social media usage on organizations in terms of cost reductions in marketing and customer service, enhanced customer relations, and improved information accessibility. Therefore, future research can investigate the impact of social media usage based on the categorization of the impact factors identified in this study and extend the results to different contexts.

## 7. Practical contribution

Because of the debate about the positive and negative aspects of social media, most organizations are confused about its adoption. This study provides a detailed sketch of the impact factors that enable managers and decision-makers to understand the real importance of social media. It facilitates their understanding that proper and effective use of social media will improve the performance of the organization in various areas, as suggested by the study. For instance, the study findings show that social media has a positive impact on organizations in terms of cost reduction in marketing and customer service activities. Similarly, effective use of social media also improves relationships with customers and makes them loyal customers. Finally, social media has enhanced information accessibility about customers and competitors. The proof provided by the study on the benefits of social media motivates top management to provide initial and continuous support for the use of social media in organizations. The identified antecedents of social media usage provide a clearer understanding for decision-makers so that they can concentrate on the important factors that are positively associated with social media usage. Moreover, this study reports the various purposes for which the social media can be used successfully. Organizations can understand the various usages of social media that improve the performance of the organization and choose those that are suitable for their business.

## 8. Limitations and future research

In order to investigate social media usage and its impact, only certain factors were included in the study. In a broader context, there may be other antecedents and impact factors. Therefore, the inclusion of only certain factors in the study may be considered a limitation. Nonetheless, the EFA results indicated that the factors included in the study explain 74% of the variance. The concentration on only a few social media tools can also be considered a limitation, but the results of the Web content analysis showed that only tools such as Facebook and Twitter were commonly used by Malaysian organizations. Since few empirical studies have examined the impact of social media usage on organizational performance, there are many paths for extending this research and more directions for future research to be considered. This study investigated the usage of social media considering social media tools in general. Since each social media tool has unique features and provides different benefits, future studies could concentrate on one social media tool in particular and investigate it in detail, which might provide a more complete understanding of the impact of that particular tool on organizations. Future studies should be conducted to compare the results between different countries for validation purposes. Similarly, there may be other social media impact factors that are important for other geographical contexts. Future studies should include those factors and investigate it in different country settings.

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## Appendix A. Measures and Sources

*Relative advantage*—Indicate your level of agreement on your initial perception that using social media will provide various benefits to your organization such as:

No.	Items	Source
1.	Increase in business opportunities	To and Ngai [87], Soponthummapharn [88] and Ghobakhloo et al. [20]
2.	Improvement in customer service	
3.	Improvement in customer relations	
4.	Enhancement in competitiveness	
5.	Analyze customer requirements more efficiently	
6.	Allows for better advertising and marketing	
7.	Enhances the company's image	

### *Social Media Compatibility*

No.	Items	Source
1.	Social media adoption is compatible with our information technology infrastructure	Rogers [47], Teo et al. [89], Teo and Pian [90]
2.	Social media adoption is consistent with our organizational beliefs and values.	
3.	Social media adoption is consistent with our business strategy	

### *Cost-Effectiveness*

No.	Items	Source
1.	Social media is more cost-effective than other types of marketing or customer service technologies.	Chong and Chan [19]
2.	Organization can avoid unnecessary cost and time by using social media.	
3.	Social media saves costs related to time and effort in marketing, branding, and customer service.	

### *Structural Assurance*

No.	Items	Source
1.	The social media sites (e.g., Facebook, Twitter) that my organization uses provide enough safeguards to make us feel comfortable using it to post our organization's information.	Chai et al. [91]
2.	The social media sites (e.g., Facebook, Twitter) that my organization uses provide a robust and safe environment in which to transact our information.	
3.	Our organization feel assured that legal and technological structures adequately protect us from problems on the social media.	

### *Social Media Interactivity*

No.	Social Media Interactivity	Source
1.	Interactive features of the social media sites that my organization use (e.g., Facebook and Twitter) are vivid and evoke responses.	Lee and Kozar [27]
2.	The social media sites provide features for interactive communication with our customers.	
3.	The social media sites provide an appropriate amount of interactive features (e.g., graphics, pop-up windows, animation, music, voices).	
4.	The social media sites contain components to help the interaction between it and consumers.	

*Top Management Support*

No.	Items	Source
1.	Top management considers social media adoption as important to the organization.	Teo & Pian [90]
2.	Top management effectively communicates its support for the use of social media	Chong & Chan [19]
3.	Top management is likely to invest funds in social media technology	Wang et al. [17]
4.	Top management had established goals and standards to monitor the social media usage in organization.	Liang et al. [73]

*Entrepreneurial Orientation*

No.	Items	Source
1.	To seek the sales growth, our company is willing to execute some risky projects	Lin, Peng, and Kao [95]
2.	Even though the costs for some projects are high, under some conditions, our company will still launch those projects	
3.	Our company can accept the uncertainties existing in the projects	
4.	Our company frequently tries out new ideas	
5.	Our company seeks out new ways to do things	
6.	Our company is creative in its methods of operation	
7.	Our company is often the first to do marketing for new products and services	
8.	Innovation in our company is perceived as too risky and is resisted.	

*Institutional Pressure*

No.	Items	Source
1.	Our main customers that matter to us believe that we should use social media.	Teo et al. [36], Khalifa and Davison [92], Liu et al. [38]
2.	We may not retain our important customers without social media	
3.	Our main suppliers that matter to us believe that we should use social media	
4.	Our suppliers that are crucial to us wish us to use social media.	
5.	Our main competitors that have adopted social media benefited greatly.	
6.	Our main competitors that have adopted social media are perceived favorably by customers.	

*Social Media Usage*

No.	Sub-constructs	Items	Source
1.	Social media used for information search	Social media is used to search for general information	Interviews
2.		Social media is used to search for competitor information	
3.		Social media is used to search for customer information	
4.	Social media used for marketing and branding	Social media is used for branding	
5.		Social media is used for advertising and promotion of company's product and services	
6.		Social media is used for conducting marketing research	
7.		Social media is used for getting referrals (Word-of-Mouth via likes, shares, and followers in Facebook, Twitter, etc.)	
8.	Social media used for building customer relations	Social media is used to develop customer relations	
9.		Social media is used to communicate with customers	
10.		Social media is used for customer service activities	
11.		Social media is used to receive customer feedback on firms existing products or services	
12.		Social media is used to receive customer feedback on new or future products or services	
13.		Social media is used to reach new customers	

## Social Media Impact

No.	Sub-constructs	Items	Source
1.	Cost reduction	Reduced the cost to communicate with customers	Apigian et al. [55], Teo and Choo [93], Molla and Heeks [96], Elliot and Boshoff [30], Mirani and Lederer [94]
2.		Reduced the cost of advertising and promotion	
3.		Reduced the cost of customer service and support	
4.	Improved customer relations and services	Enhanced customer service	
5.		Increased customer loyalty and retention	
6.	Improved information accessibility	Improved customer relationship	
7.		Enabled easier access to customer information	
8.		Enabled easier access to competitor information	
9.		Enabled easier access to market information	
10.		Enabled faster delivery of business information to customers	

## Appendix B. Reliability Analysis

Constructs	Cronbach's Alpha	Number of items	Number of items deleted
Interactivity	0.77	4	0
Relative Advantage	0.89	7	0
Compatibility	0.83	3	0
Cost-Effectiveness	0.83	3	0
Trust	0.88	3	0
Top Management Support	0.85	4	0
Entrepreneurial Orientation	0.89	8	1
Institutional Pressure	0.93	6	0
Social Media Usage	0.90	13	0
Organization Impact	0.88	10	0

## Appendix C. Mean, SD, Correlation, and Sqrt AVE values

	CE	CP	Comp	Imp1	Imp2	Imp3	Inno	Int	MP	RA	RT	SA	TMS	Usage1	Usage2	Usage3
CE	0.82															
CP	0.24	0.87														
Comp	0.25	0.53	0.87													
Imp1	0.35	0.61	0.54	0.75												
Imp2	0.20	0.41	0.54	0.37	0.82											
Imp3	0.21	0.53	0.66	0.52	0.37	0.90										
Inno	0.15	0.31	0.45	0.32	0.26	0.38	0.80									
Int	0.17	0.24	0.30	0.28	0.34	0.44	0.44	0.79								
MP	0.19	0.66	0.49	0.48	0.35	0.58	0.20	0.25	0.92							
RA	0.27	0.47	0.65	0.44	0.45	0.59	0.38	0.28	0.56	0.76						
RT	0.14	0.42	0.36	0.44	0.16	0.38	0.45	0.29	0.35	0.35	0.87					
SA	−0.01	−0.04	−0.06	−0.11	−0.03	−0.14	−0.06	−0.12	−0.09	−0.18	−0.05	0.93				
TMS	0.22	0.48	0.51	0.52	0.49	0.46	0.51	0.37	0.40	0.52	0.38	−0.15	0.82			
Usage1	0.29	0.25	0.48	0.30	0.27	0.46	0.35	0.34	0.36	0.45	0.26	−0.13	0.40	0.75		
Usage2	0.17	0.38	0.41	0.36	0.30	0.45	0.32	0.32	0.37	0.50	0.29	0.00	0.35	0.52	0.84	
Usage3	0.23	0.39	0.41	0.45	0.28	0.54	0.28	0.40	0.45	0.45	0.29	−0.03	0.39	0.52	0.52	0.79
Mean	<b>4.07</b>	<b>3.28</b>	<b>3.86</b>	<b>3.76</b>	<b>4.03</b>	<b>3.81</b>	<b>3.52</b>	<b>4.00</b>	<b>3.45</b>	<b>3.97</b>	<b>3.36</b>	<b>3.44</b>	<b>3.71</b>	<b>4.09</b>	<b>4.01</b>	<b>3.51</b>
SD	<b>0.67</b>	<b>0.80</b>	<b>0.72</b>	<b>0.82</b>	<b>0.49</b>	<b>0.74</b>	<b>0.90</b>	<b>0.66</b>	<b>0.78</b>	<b>0.63</b>	<b>0.92</b>	<b>0.81</b>	<b>0.70</b>	<b>0.65</b>	<b>0.73</b>	<b>0.63</b>

p &lt; 0.10.

## Appendix D. Cross-loadings of the Indicators

	CE	CP	Comp	Imp1	Imp2	Imp3	Inno	Int	MP	RT	SA	TMS	U1	U2	U3	RA
CE1	<b>0.81</b>	0.14	0.14	0.24	0.12	0.14	0.06	0.13	0.09	0.07	−0.12	0.14	0.19	0.14	0.23	0.14
CE2	<b>0.80</b>	0.18	0.23	0.28	0.16	0.14	0.09	0.11	0.16	0.11	0.10	0.15	0.25	0.18	0.17	0.06
CE3	<b>0.85</b>	0.26	0.25	0.34	0.22	0.24	0.21	0.16	0.21	0.17	−0.02	0.25	0.27	0.11	0.18	0.03
CIP1	0.19	<b>0.79</b>	0.53	0.57	0.33	0.51	0.30	0.22	0.53	0.41	−0.07	0.47	0.28	0.35	0.31	−0.02
CIP3	0.19	<b>0.92</b>	0.45	0.52	0.42	0.42	0.22	0.18	0.60	0.33	−0.07	0.38	0.19	0.32	0.34	0.01
CIP4	0.23	<b>0.88</b>	0.39	0.47	0.32	0.43	0.28	0.23	0.58	0.35	0.02	0.38	0.17	0.31	0.36	0.02
CO1	0.25	0.37	<b>0.88</b>	0.41	0.50	0.52	0.42	0.28	0.38	0.29	−0.10	0.44	0.45	0.37	0.31	−0.04
CO2	0.24	0.45	<b>0.89</b>	0.46	0.47	0.53	0.43	0.26	0.35	0.27	0.03	0.44	0.35	0.35	0.33	−0.04
CO3	0.18	0.55	<b>0.84</b>	0.53	0.44	0.66	0.33	0.23	0.54	0.36	−0.08	0.46	0.44	0.35	0.42	−0.01
CRBF1	0.15	0.24	0.17	<b>0.43</b>	0.20	0.19	0.18	0.17	0.21	0.19	0.00	0.19	−0.04	0.17	0.19	0.15
CRBF2	0.31	0.59	0.53	<b>0.88</b>	0.33	0.46	0.25	0.23	0.49	0.41	−0.11	0.47	0.33	0.34	0.39	0.11
CRBF3	0.30	0.47	0.45	<b>0.86</b>	0.29	0.47	0.29	0.23	0.34	0.35	−0.10	0.45	0.27	0.29	0.40	0.06
CSBF4	0.24	0.30	0.48	0.28	<b>0.77</b>	0.34	0.22	0.29	0.31	0.17	0.02	0.40	0.28	0.22	0.24	0.02
CSBF5	0.11	0.34	0.35	0.23	<b>0.81</b>	0.23	0.24	0.23	0.23	0.21	0.03	0.36	0.16	0.22	0.24	0.03
CSBF6	0.14	0.37	0.49	0.38	<b>0.86</b>	0.33	0.19	0.30	0.32	0.26	−0.11	0.43	0.21	0.29	0.20	0.04
IABF10	0.18	0.41	0.61	0.45	0.30	<b>0.87</b>	0.37	0.39	0.47	0.25	−0.20	0.40	0.47	0.42	0.40	0.09
IABF8	0.17	0.50	0.56	0.47	0.34	<b>0.88</b>	0.29	0.39	0.56	0.31	−0.03	0.39	0.36	0.38	0.55	0.11
IABF9	0.22	0.52	0.60	0.49	0.36	<b>0.94</b>	0.37	0.41	0.52	0.06	−0.17	0.45	0.41	0.41	0.48	0.06
INEO4	0.11	0.25	0.30	0.21	0.28	0.24	<b>0.77</b>	0.29	0.11	0.18	0.00	0.36	0.24	0.19	0.15	0.05
INEO5	0.09	0.17	0.39	0.27	0.20	0.32	<b>0.82</b>	0.34	0.11	0.16	0.00	0.35	0.30	0.27	0.24	0.04
INEO6	0.14	0.26	0.37	0.32	0.14	0.33	<b>0.85</b>	0.34	0.18	0.38	−0.11	0.47	0.32	0.27	0.25	0.06
INEO7	0.14	0.32	0.35	0.20	0.24	0.29	<b>0.74</b>	0.40	0.23	0.26	−0.07	0.42	0.25	0.28	0.22	0.05
INF1	0.13	0.20	0.26	0.25	0.23	0.35	0.31	<b>0.80</b>	0.18	0.38	−0.11	0.35	0.23	0.22	0.35	0.02
INF2	0.06	0.20	0.24	0.19	0.29	0.32	0.38	<b>0.78</b>	0.15	0.32	−0.03	0.26	0.20	0.26	0.21	0.09
INF4	0.18	0.18	0.21	0.21	0.27	0.36	0.35	<b>0.79</b>	0.25	0.35	−0.14	0.26	0.34	0.28	0.35	0.05
MIP5	0.20	0.68	0.49	0.47	0.39	0.59	0.23	0.31	<b>0.92</b>	0.41	−0.11	0.46	0.39	0.38	0.43	0.16
MIP6	0.15	0.59	0.45	0.44	0.29	0.52	0.18	0.19	<b>0.94</b>	0.35	−0.12	0.35	0.32	0.31	0.40	0.08
MIP7	0.17	0.54	0.42	0.42	0.29	0.49	0.14	0.19	<b>0.91</b>	0.18	−0.02	0.30	0.27	0.33	0.41	0.13
RTEO1	0.14	0.42	0.34	0.45	0.21	0.35	0.41	0.25	0.37	<b>0.88</b>	−0.13	0.40	0.25	0.24	0.30	0.12
RTEO2	0.08	0.35	0.30	0.40	0.13	0.32	0.41	0.24	0.30	<b>0.89</b>	−0.03	0.37	0.18	0.29	0.24	0.15
RTEO3	0.15	0.32	0.29	0.28	0.07	0.32	0.36	0.26	0.23	<b>0.83</b>	0.06	0.21	0.26	0.22	0.21	0.04
SATR1	0.02	−0.04	−0.05	−0.09	−0.03	−0.13	−0.04	−0.10	−0.08	0.28	<b>0.97</b>	−0.14	−0.12	0.01	−0.03	0.01
SATR2	0.02	−0.04	−0.05	−0.09	−0.02	−0.13	−0.05	−0.11	−0.09	0.16	<b>0.97</b>	−0.14	−0.13	0.02	−0.02	0.02
SATR3	−0.08	−0.05	−0.07	−0.12	−0.02	−0.14	−0.09	−0.13	−0.09	0.22	<b>0.86</b>	−0.15	−0.12	−0.02	−0.04	0.08
TM1	0.14	0.34	0.46	0.39	0.45	0.41	0.44	0.35	0.35	0.35	−0.20	<b>0.83</b>	0.39	0.26	0.29	−0.01
TM2	0.21	0.39	0.47	0.52	0.42	0.42	0.45	0.31	0.33	0.27	−0.20	<b>0.83</b>	0.30	0.28	0.30	0.15
TM3	0.21	0.40	0.43	0.42	0.38	0.38	0.43	0.33	0.34	0.34	−0.05	<b>0.84</b>	0.34	0.31	0.35	0.14
TM4	0.16	0.44	0.32	0.39	0.35	0.30	0.33	0.22	0.29	0.18	−0.06	<b>0.77</b>	0.27	0.29	0.33	0.06
MU1	0.19	0.19	0.38	0.22	0.18	0.34	0.27	0.28	0.24	0.10	−0.12	0.33	<b>0.80</b>	0.40	0.34	0.02
MU2	0.19	0.13	0.31	0.10	0.19	0.25	0.21	0.21	0.18	0.31	−0.23	0.29	<b>0.67</b>	0.21	0.29	0.09
MU4	0.27	0.22	0.38	0.30	0.24	0.41	0.30	0.27	0.36	0.27	0.00	0.29	<b>0.77</b>	0.49	0.50	0.17
CRU5	0.08	0.26	0.39	0.23	0.27	0.41	0.23	0.27	0.29	0.43	0.01	0.25	0.52	<b>0.82</b>	0.39	0.12
CRU6	0.11	0.31	0.39	0.28	0.29	0.40	0.26	0.22	0.31	0.26	0.01	0.31	0.44	<b>0.86</b>	0.35	0.17
CRU7	0.21	0.38	0.33	0.41	0.26	0.41	0.31	0.30	0.33	0.30	−0.06	0.36	0.43	<b>0.82</b>	0.43	−0.05
CRU8	0.16	0.30	0.31	0.29	0.22	0.32	0.21	0.26	0.31	0.28	0.02	0.24	0.41	<b>0.88</b>	0.49	0.00
CRU9	0.15	0.33	0.30	0.30	0.22	0.33	0.33	0.30	0.29	0.22	0.05	0.27	0.36	<b>0.82</b>	0.51	−0.08
MU3	0.20	0.37	0.29	0.38	0.24	0.33	0.32	0.30	0.34	0.23	−0.14	0.34	0.50	0.38	<b>0.72</b>	−0.07
ISU12	0.14	0.29	0.31	0.36	0.18	0.45	0.07	0.29	0.40	0.24	−0.02	0.27	0.38	0.40	<b>0.81</b>	−0.05
ISU13	0.21	0.28	0.37	0.34	0.24	0.48	0.27	0.35	0.31	0.27	0.07	0.31	0.36	0.44	<b>0.83</b>	0.14
RA1	0.07	−0.06	−0.06	0.05	−0.03	−0.05	−0.02	0.10	0.03	0.06	−0.02	−0.01	0.03	−0.02	0.05	<b>0.73</b>
RA2	0.12	−0.03	−0.09	0.07	−0.07	0.03	0.03	0.05	−0.01	0.02	−0.05	−0.10	0.07	0.00	−0.02	<b>0.69</b>
RA3	0.12	−0.04	−0.12	0.09	0.02	−0.03	−0.02	0.03	0.00	0.09	−0.11	−0.12	0.13	−0.02	0.05	<b>0.77</b>
RA4	0.08	0.02	−0.01	0.10	0.06	0.03	0.07	0.16	0.01	0.17	−0.05	0.02	0.17	0.16	0.08	<b>0.86</b>
RA5	0.03	−0.05	−0.05	0.06	0.01	−0.02	0.02	0.09	−0.05	0.12	−0.08	−0.08	0.06	0.06	−0.03	<b>0.70</b>
RA6	0.07	0.05	0.02	0.13	0.09	0.13	0.09	0.16	0.08	0.17	0.03	−0.12	0.19	0.07	0.09	<b>0.78</b>

p &lt; 0.10.



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