

# A Meta-analysis of the Relationship between Service Innovation and Firm Performance

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**Abstract.** Although the influence of service innovation on firm performance has been widely concerned by scholars, empirical studies show different results. Based on the empirical research results of 77 independent samples, this paper conducted a meta analysis to study the relationship between service innovation and firm performance, and to identify some contextual factors affecting this relationship. The results show that service innovation has a significant positive correlation with firm performance, and the relationship between them is greatly influenced by national culture and other factors.

## Introduction

In recent years, service innovation has received widespread attention from scholars and entrepreneurs in different fields, and research results have been increasing year by year [1]. Twitter and IBM constantly improve their competitive position by focusing on customer service. IKEA also redefines its business by creating new customer experiences.

As an important type of innovation developed on the basis of Schumpeter's innovation theory, the definition of service innovation still presents a diversified and overlapping situation [2]. Although there are many differences in the concept, scholars still pay close attention to its application value. Service innovation is considered to be a driving force for the rapid development of the industry and an extremely important role for economic development [3], and an important means for the sustainable development of enterprises [4]. In theory, service innovation can increase the added value of enterprise products and create greater benefits for enterprises [5], but the research on the relationship between service innovation and firm performance has contradictory results. Some studies have shown that service innovation can have a direct and significant positive effect on firm performance [6], while other studies believe that service innovation has little effect on firm performance [7].

Therefore, although scholars agree with the value of service innovation, there is no unified conclusion on whether it can improve corporate performance. This paper uses meta-analysis to quantitatively evaluate existing research, and obtains more general conclusions by correcting samples and measurement errors, and provides reference for enterprises.

## Research Design

### Data Collection and Encoding

This study systematically searches Chinese and English literature in the field of service innovation through electronic databases. The database includes: CNKI, Springer Link, Emerald, Elsevier Science, Taylor, SAGE Premier, John Wiley etc. A total of 77 journal articles meeting the requirements are obtained, including 54 English documents and 23 Chinese documents.

In this paper, the original data table is produced, and the included literature is collected from the research description item and the effect value statistics item. The research description includes the source of the literature such as title, author, publication date, and journal name. It also includes research feature information such as industry, scale and cultural dimensions. The effect value statistics include sample capacity, service innovation dimension, performance dimension and correlation coefficient (r), and path

coefficient. According to the coding standard, this study produced effect values for  $k = 77$  independent samples, including  $N = 25457$  subjects, the size of the independent sample is 51-7325 people, sample distribution during 2004-2007.

### Data Analysis

This article uses StataSE12.0 for meta-analysis. The process has three main parts: First, select and calculate the effect indicators. Based on the coding table, the effect values are calculated in units of each independent sample, and each independent sample is coded once. If multiple independent samples are included, multiple encodings are performed accordingly. According to Lipsey et al., the same independent sample studied with different innovative measurement tools is coded only once and the effect values are averaged. Fisher's Z and standard deviation are used in the calculation of the combined effect value. Second, study data main effect analysis and statistical model selection. Heterogeneity test is one of the main points of main effect analysis. It is based on Q statistic. If Q is statistically significant, it means that these effect values are a heterogeneous distribution, and random effects model should be used. Finally, adjust the regulation effect analysis and regression test.

## Results

### Main Effects and Homogeneity Analysis

Table1 shows the overall effect value and homogeneity test results of the meta-analysis of the relationship between service and firm performance. It can be seen from  $Q=1635.96$  ( $P<0.001$ ) that each effect value is heterogeneous;  $I^2(I\text{-squared})=95.4\%$ , indicating that 95.4% of the observed variation is caused by the difference of real effect values, only 4.6%. Observation of variation is caused by random errors.  $Tau^2(Tau\text{-squared})=0.0644$ , there is 6.4% inter-study variation can be used as the weight calculation. Since the fixed effect model is the random effect model when  $Tau^2=0$ , in summary. In summary, when exploring the strength of the relationship between service innovation and firm performance, the random effect model should be used to calculate the overall utility value.

From the results of the stochastic model in Table 1, it can be seen that the correlation coefficient between service innovation and firm performance is  $r=0.462$ , ( $p<0.001$ ), and the degree of correlation is relatively large. The 95% confidence interval is  $r=0.402$  to  $r=0.467$ , and the interval does not contain 0, indicating that the average effect value is statistically significant at the level specified by the confidence interval. It can be concluded that service innovation is significantly positively correlated with corporate performance.

Table1 Meta-analysis overall effect and homogeneity test

Method	$r$	95% CI		Asymmetric		$Q$	$Tau^2$	$I^2$
		Lower	Upper	Z_value	P_value			
Fixed	0.377	0.365	0.389	63.112	0.000	1635.96	0.0644	95.4%
Random	0.462	0.402	0.521	15.229	0.000			

### Culture Dimension Effects

To test for regulatory effects, major subgroup analysis and regression analysis. The specific results are shown in Table 2 and Table 3. Cultural dimensions include four sub-groups of power distance, individualism, uncertainty avoidance, and long-term orientation. From the results in Table 2, it can be seen that the Fail-safe N value is greater than 500, and the results of the four groups are relatively stable. The relationship values of the eight sub-groups in the cultural dimension are positive and significant. The correlation coefficients of low uncertainty avoidance ( $r=0.555$ ) and low individualism (0.531) are higher and significant.

Table2 Subgroup analysis

Moderator	K	N	r	95% Conf. Interval	Z	Q	I <sup>2</sup>	Tau <sup>2</sup>	Fail-safe N
Total	77	25457	0.462	[0.402,0.521]	15.23***	1635.96***	95.4%	0.0644	2281
Power Distance									
High Power Distance	17	13015	0.502	[ 0.421,0.583 ]	12.14***	1124.22***	95.0%	0.0905	1623
Low Power Distance	57	11828	0.350	[ 0.247,0.454]	6.63***	186.81***	91.4%	0.0411	2016
Others	3	614	0.310	[ 0.280,0.340]	20.28***	2.40	16.8%	0.0002	544
Individualism									
High Individualism	22	4957	0.316	[ 0.225,0.406]	6.81***	217.71***	90.4%	0.0402	2078
Low Individualism	52	19886	0.531	[ 0.448,0.615]	12.47***	1026.52***	95.0%	0.0876	9866
Others	3	614	0.310	[0.280,0.340]	20.28***	2.40	16.8%	0.0002	544
Uncertainty Avoidance									
High Uncertainty Avoidance	38	16318	0.386	[ 0.304,0.468]	9.23***	499.66***	92.6%	0.0591	1003
Low Uncertainty Avoidance	36	8525	0.555	[ 0.441,0.670]	9.53**	1007.65***	96.5%	0.1163	9715
Others	3	614	0.310	[ 0.280,0.340]	20.28***	2.40	16.8%	0.0002	544
Long-Term Orientation									
High Long-Term Orientation	46	18531	0.475	[0.388,0.561]	10.79***	862.96***	94.8%	0.0820	6566
Low Long-Term Orientation	28	6312	0.458	[0.343,0.574 ]	7.76***	585.59***	95.4%	0.0911	6775
Others	3	614	0.310	[0.280,0.340]	20.28***	2.40	16.8%	0.0002	544
Industry Type									
Service Industry	55	11891	0.477	[0.392,0.561]	11.01***	1111.82***	95.1%	0.0968	3032
Manufacturing	17	12039	0.463	[0.348,0.577]	7.94***	260.17***	93.9%	0.0135	4183
Mixed Industry	5	1527	0.271	[0.145,0.397]	4.22***	49.18***	91.9%	0.0535	492
Enterprise Scale									
Large-Scale	15	11681	0.418	[0.321,0.515]	8.46***	121.83***	88.5%	0.0316	2313
Medium And Small-Scale	33	7433	0.449	[0.357,0.542]	9.52***	444.38***	92.8%	0.0654	1024
Others	29	6343	0.499	[0.393,0.605]	9.19***	979.80***	97.1%	0.0802	3336
Variable Measure									
One-Dimensional Innovation	44	16942	0.468	[0.388,0.548]	11.49***	1045.32***	95.9%	0.0667	3524
Multi-Dimensional Innovation	33	8515	0.454	[0.364,0.544]	9.91***	503.94***	93.7%	0.0627	3302
Single Performance	32	13922	0.356	[0.300,0.413]	12.36***	225.22***	86.2%	0.0201	8233
Comprehensive Performance	45	11535	0.538	[0.439,0.636]	10.72***	1289.03***	96.6%	0.1078	1669

The high power distance  $r=0.502$  ( $z=12.14$ ,  $p<0.001$ ) is greater than the low power distance  $r=0.350$  ( $z=6.63$ ,  $p<0.001$ ), and the two subgroup relationship values show a significant decreasing trend (low entitlement distance code is 0). It shows that the relationship between service innovation and corporate performance is more significant at high power distances. The regression analysis results of the power distance subgroups shown in Table 3 are:  $B = 0.1467$ ,  $p > 0.05$ , That is, the influence of power distance on the relationship between service innovation and firm performance has not passed the statistical test.

In the high individualism  $r=0.316$  ( $z=6.81$ ,  $p<0.001$ ) is lower than the low individualism  $r=0.531$  ( $z=12.47$ ,  $p<0.001$ ), the two subgroup relationship values show a significant increasing trend (low individualism code is 0). It shows that the relationship between service innovation and corporate performance is more significant in low individualism. The regression analysis results of the individualist subgroup shown in Table3 are:  $B=-0.2124$ ,  $p<0.05$ . It shows that individualism has a significant negative impact on the relationship between service innovation and corporate performance, which is the same as the sub-group meta-analysis.

In the case of high uncertainty avoidance,  $r=0.386$  ( $z=9.23$ ,  $p<0.001$ ) is lower than the low uncertainty avoidance  $r=0.555$  ( $z=9.53$ ,  $p<0.01$ ), and the two subgroup relationship values show a significant increasing trend (lower Determine the evasion code to 0). It shows that the relationship between service innovation and corporate performance is more significant in low uncertainty avoidance. The regression

analysis results of the individualist subgroup shown in Table3 are:  $B=-0.1706$ ,  $p<0.05$ . It shows that uncertain avoidance has a significant negative impact on the relationship between service innovation and firm performance, which is the same as the sub-group meta-analysis.

In the high long-term orientation,  $r=0.475$  ( $z=10.79$ ,  $p<0.001$ ) is greater than the low power distance  $r=0.458$  ( $z=7.76$ ,  $p<0.001$ ), and the two subgroup relationship values show a decreasing trend, but the trend is not obvious (Low long-term orientation code is 0). It shows that the relationship between service innovation and corporate performance is not significant in different long-term orientations. The regression analysis results of the power distance subgroups shown in Table3 are:  $B=0.0131$ ,  $p>0.05$ , which is consistent with the subgrouping results, but the influence of long-term orientation on the relationship between service innovation and firm performance has not passed the statistical test.

### **Industry Type Effects**

The sub-group of industry types mainly includes service industry, manufacturing industry and hybrid industry. When conducting sub-group meta-analysis data analysis, it mainly considers service industry and manufacturing industry. It can be seen from Table2 that the failure safety factor (Fail-safe N) is greater than 400, and the analysis results are stable. The service industry is  $r=0.477$  ( $z=11.01$ ,  $p<0.001$ ), and the manufacturing industry is  $r=0.463$  ( $z=7.94$ ,  $p<0.001$ ), the correlation coefficient between the two is not much different, showing a weak downward trend (service industry code is 0). It shows that the relationship between service innovation and corporate performance is not significant in different industry types. It can be seen from Table3 that the industry regression coefficient is  $B=-0.0144$  ( $P>0.05$ ), and the regression results are consistent with the sub-group meta-analysis. However, the impact of industry type on the relationship between service innovation and firm performance has not passed the statistical test.

### **Enterprise Scale Effects**

Enterprise scale is based on the number of employees. The number of employees is  $\leq 500$  for small and medium enterprises, and  $>500$  is for large enterprises. As can be seen from Table2, the Fail-safe N value is greater than 1000, and the analysis result is stable. Large-scale  $r=0.418$  ( $z=8.46$ ,  $p<0.001$ ), medium and small-scale  $r=0.449$  ( $z=9.52$ ,  $p<0.001$ ), the correlation coefficients of the two are similar, showing a slight decreasing trend (the medium- and small-scale coding is 0). It shows that the relationship between service innovation and corporate performance is not significant in different enterprise scales. It can be seen from Table3 that the regression coefficient of scale is  $B=-0.0301$  ( $P>0.05$ ), and the regression results are consistent with the results of sub-group meta-analysis, but the impact of scale on the relationship between service innovation and firm performance has not passed the statistical test.

### **Service Innovation Dimension Effects**

The sub-grouping of the service innovation dimension is two-dimensional innovation (coded as 0) and multi-dimensional innovation (coded as 1). It can be seen from Table2 that the failure safety factor (Fail-safe N) numerical result is greater than 1000, and the analysis result is very stable. The single-dimensional innovation  $r=0.468$  ( $z=11.49$ ,  $p<0.001$ ), multi-dimensional innovation  $r=0.454$  ( $z=9.91$ ),  $p<0.001$ , the correlation coefficient of the two is not much different, showing a weak decreasing trend, indicating that the relationship between service innovation and corporate performance is not significant in different service innovation dimensions. It can be seen from Table3 that the regression coefficient of service innovation dimension is  $B=-0.0175$  ( $P>0.05$ ), and the regression results are consistent with the results of sub-group meta-analysis. However, the impact of service innovation dimension on the relationship between service innovation and firm performance has not passed the statistical test.

### **Performance Type Effects**

The subgroups of performance types are the two groups of single performance (coded as 0) and composite performance (coded as 1). It can be seen from Table2 that the single performance  $r=0.356$  ( $z=12.36$ ,  $p<0.001$ ) and the comprehensive performance  $r=0.538$  ( $z=10.72$ ,  $p<0.001$ ), the correlation coefficient of the two show a significant increasing trend. It shows that there is a significant difference in the relationship between service innovation and firm performance among different performance types. It

can be seen from Table 3 that the industry regression coefficient is  $B=0.1838$  ( $P<0.05$ ), and the regression results are consistent with the sub-group analysis results.

Table 3 Regression analysis result

Variable	Coef.	Std.err	t	P_value	[95% conf.interval]	Tau <sup>2</sup>	I <sup>2</sup>	K
Power Distance	0.1467	0.0992	1.48	0.143	[-0.0509,0.3444]	0.1188	94.51%	74
Individualism	-0.2124	0.0894	-2.38	0.020	[-0.3906,-0.3428]	0.1128	94.21%	74
Uncertainty Avoidance	-0.1706	0.0824	-2.07	0.042	[-0.3349,-0.0063]	0.1157	95.22%	74
Long-Term Orientation	0.0131	0.0689	0.15	0.882	[-0.1613,0.1874]	0.1230	95.03%	74
Industry Type	-0.0144	0.1008	-0.14	0.887	[-0.2155,0.1866]	0.1228	94.90%	72
Enterprise Scale	-0.0301	0.0790	-0.38	0.705	[-0.1891,0.1290]	0.0583	91.88%	48
Innovation Dimension	-0.0175	0.0826	-0.21	0.833	[-0.1820,0.1470]	0.1182	95.16%	77
Performance Type	0.1838	0.0802	2.29	0.025	[0.0239,0.3436]	0.1098	95.05%	77

## Conclusion

### Conclusion discussion

This paper uses meta-analysis to quantitatively summarize the empirical research literature on the relationship between service innovation and firm performance. It can be seen from the results of meta-analysis that, in general, service innovation has a significant effect on corporate performance.

First, the cultural dimension has a significant role in regulating the relationship between service innovation and firm performance. Among them, under the culture of low collectivism and low uncertainty avoidance, the relationship between service innovation and performance shows a stronger positive correlation. Power distance and long-term orientation or short-term orientation have no significant adjustment effect on service innovation and corporate performance. Under the culture of high power distance, employees may have controlled panic, negative and distrust, which makes it difficult to form an innovative atmosphere in the organization, so the power distance has no significant adjustment effect on the relationship between service innovation and firm performance. Based on the long-term orientation theory, customers in the process of judging the long-term impact of service innovation projects on their own, do a lot of subjective judgment, and choose to support or not support the service innovation according to their own judgment.

Second, industry type and Enterprise scale have no significant impact on the relationship between service innovation and firm performance. Under the background of the vigorous implementation of the supply-side reform policy, the service industry began to pay attention to the quality of its products. In the same time, the manufacturing industry recognizes the added value of services and begins to increase its service elements. This has led to the integration of the service industry and the manufacturing industry. So the industry type has no significant adjustment effect on the relationship between service innovation and firm performance.

Third, performance types have a significant impact on the relationship between service innovation and firm performance. The correlation coefficient between service innovation and firm performance is higher under comprehensive performance. The impact of service innovation on the enterprise is all-encompassing, and not only the monomer now improves financial performance or non-financial performance. In the service innovation process, the more types of performance are counted, the more comprehensively the impact of service innovation on business performance. In addition, there is a certain transformation relationship between financial performance and non-financial performance. When we use comprehensive performance to calculate, there will be some performance overlap.

In summary, service innovation can have a positive impact on the performance of the company, and is not affected by enterprise scale and its industry.



## Contributions

This paper provides a more scientific and credible research basis for the relationship between service innovation and firm performance. The research results can provide more scientific and credible research basis, and this study can be used as an important supplementary material to help follow-up research. The concludes that service innovation have a positive impact on business performance, but does not require companies to blindly conduct service innovation activities. Before implementing service innovation, companies can invest more attention in the cultural dimension of the company based on the results of this study. It can enhance the collective cohesiveness, enhance the trust between members, and create a united professional team for enterprise service innovation activities. At the same time, companies should encourage new ideas and behaviors of internal employees. When employees have a more open attitude, it is easier for customers to accept new services and products, which is conducive to the performance of the company.

## Limitations and Future Research Directions

Due to research time constraints and other reasons, this paper has the following shortcomings: First, when the data processing is carried out, the dissertation, conference papers and some unpublished work papers are not included in the scope of analysis. Due to the loss of some samples, the accuracy of the research is affected to some extent, so the follow-up Research can expand the scope of research, etc. Second, some documents do not provide more complete information, so that variable information such as enterprise age cannot be extracted, so the adjustment effect analysis is not perfect, and subsequent research can be supplemented. Third, the research in this paper can only conclude that service innovation has a significant positive correlation with corporate performance. The specific impact process is not clear, and empirical research is needed to draw further research conclusions.

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