

Digital/web-based Technologies and Purchasing and Supply Management: a UK Study

David Gallear (1), Abby Ghobadian (1) and Nicholas O'Regan (2)

1. Brunel University, UK; 2. Middlesex University, UK

ABSTRACT

The digital revolution on the web/internet is believed to be having a major impact on the performance of firms' purchasing and supply functions. Beyond anecdotal evidence however, little is known about the actual level of utilisation of web-based interaction technologies in purchasing and supply management (P&SM). This paper addresses this gap through an empirical survey of 156 UK-based organisations. Findings indicate that only six in every ten organisations use digital/web-based technology (DWBT) in P&SM, and that the usage level is particularly low in SMEs. Current uses, and the importance of DWBT in P&SM in the future are reported. The paper also investigates the perceived benefits of DWBT in this area, and the link between uses, benefits and P&SM relationship orientation. The evidence suggests that at present DWBT is not a key driver of closer (collaborative) buyer-supplier relationship development. Implications are put forward.

INTRODUCTION

Recently there has been a growing interest in the use of information and communication technologies in purchasing and supply across many industry sectors. Such deployments come hot on the heels of the emergence in the late 1980s of inter-organisational collaboration in the form of cooperative buyer-supplier relationships.

As late as the early 1990s, transactions between industrial or commercial buyers and suppliers that relied on what are now referred to as 'arms length' agreements based on market price (Hoyt and Huq, 2000) were the norm. Subscribing to the idea that a long-term relationship with customers or suppliers is a potentially valuable way of securing commercial advantage (Boddy et al., 1998), inter-organisation collaboration between firms has since emerged as a common feature of high performing firms (Harland et al., 1999). The use of digital technologies and the internet as a communication platform has been advocated as a significant route for developments in the operation and strategic management of supply (Croom, 2005) and consequently for providing important new avenues for wealth creation (Amit and Zott, 2001). It has, for example, been proposed that stronger buyer-supplier relationships develop when supply chain integration increases as a result of the deployment of such systems (Frohlich and Westbrook, 2001).

Despite the perceived importance attached to the enabling capacity of the internet and web-based applications, empirical research relating to the actual use and to the benefits of digital/web-based technology (DWBT) in purchasing and supply management is still much in its infancy. Consequently, much of the published work in this area is in the form of case studies and descriptive frameworks (Johnson and Whang, 2002).

Against this background, the research reported in this paper adopts an empirical survey approach to examine a number of salient issues:

- the usage and uses of digital/web-based technology (DWBT) for purchasing and supply management;
- firms' perception of the importance of DWBT implementation and hence its projected use in the future; and
- the perceived benefits derived from DWBT utilisation.

It also investigates if differences in DWBT usage occur based on firm size and sector, and investigates the relationship between uses, perceived benefits, and buyer-supplier relationship orientation.

METHODOLOGY

The instrument used to gather the data was a postal survey. A questionnaire, primarily based on five-point Likert measurement scales was drafted. The scales were derived by synthesising the prior research and reports of the application of DWBT found in the literature. Six senior purchasing and supply executives evaluated the instrument and suggested revisions. This step provided an important functional perspective and thus confidence that the instrument was fit for purpose and unambiguous. The instrument was administered to a random sample of purchasing and supply managers of UK firms, identified through the UK Institute of Logistics and Transport institutional database. Usable responses were received from 156 firms.

FINDINGS

Use of DWBT in Purchasing and Supply Management

Six in every ten firms in our sample (60 per cent) reported the use of DWBT in purchasing and supply management. Overall, the proportion of users appears to be quite low. The main purposes reported by users were *communicating with suppliers*; *marketing products/services*; and *locating technical data*. The least prevalent uses of DWBT in purchasing and supply management were for the downstream associated activities of *efficient consumer response* and *virtual trade shows*. The uses, as a percentage of the DWBT users only and as a percentage of the sample as a whole respectively, are illustrated in figure 1.

Surprisingly, the use of DWBT for finding suppliers was reported by only just over half of the DWBT users. Furthermore, and despite being the most popular use, only just over half of all respondents reported the use of DWBT for communicating with suppliers. Given this observation of low adoption, we were immediately interested to discern if organisational contingency factors may have had an impact. A chi-square test of independence was performed to explore the relationship between use/non-use of DWBT and firm type (i.e. manufacturing or service based) and firm size respectively. The test revealed no significant difference in DWBT use on the basis of firm type. However, the test revealed a significant difference in terms of firm size (Pearson Chi-square=0.337, p=0.01). Examination of the descriptive statistics indicated that the use of DWBT was significantly more prevalent in large firms (69% of large firms) than in SMEs (only 46% of SMEs). This is consistent with Min and Galle (2001) who suggested that organisation size is believed to influence the electronic commerce adoption practices of firms. Although their work did not deal

specifically with e-commerce based purchasing, they noted that the “common rationale is that small firms are lacking organisational readiness in adopting e-commerce due to their less sophisticated information technology infrastructure, limited financial resources and weak market positions” (Min and Galle, 2001).

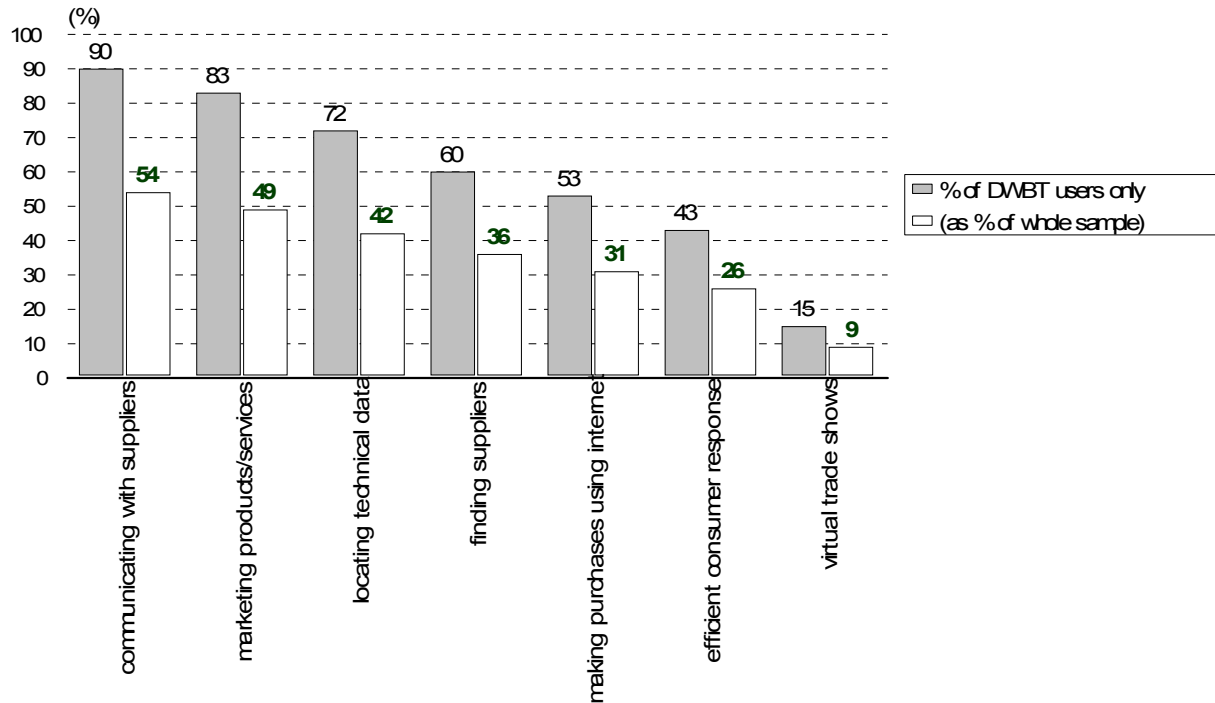


Figure 1. Main purposes of using digital/web-based technology (DWBT) for supply chain management

All participants (DWBT users and non-users) were asked how important they thought the use of DWBT would be for the purposes listed approximately eighteen months into the future. The most important perceived future uses were found to largely mirror the main existing uses. This is illustrated in figure 2. The most significant change concerned *efficient consumer response* (ECR). Whereas only one quarter of organisations were already using DWBT for ECR, over two thirds believed its use for this purpose would be important in the future.

A comparison of the non-users future perspective to the users future perspective revealed no major divergences in terms of the rank order of uses (i.e. from the overall trend presented in figure 2) although on average, the proportion of non-users perceiving DWBT to be important in the future was one quarter less than the proportion of users. In addition, it was for uses associated with the demand-side as opposed to the supply-side of the supply chain that the no-users were relatively less convinced of the future importance of DWBT implementation. For example, 36% less non-users than users attached future importance to the use of DWBT for *marketing products/services*, and 50% less non-users than users attached future importance to the use of DWBT for *virtual trade shows*.

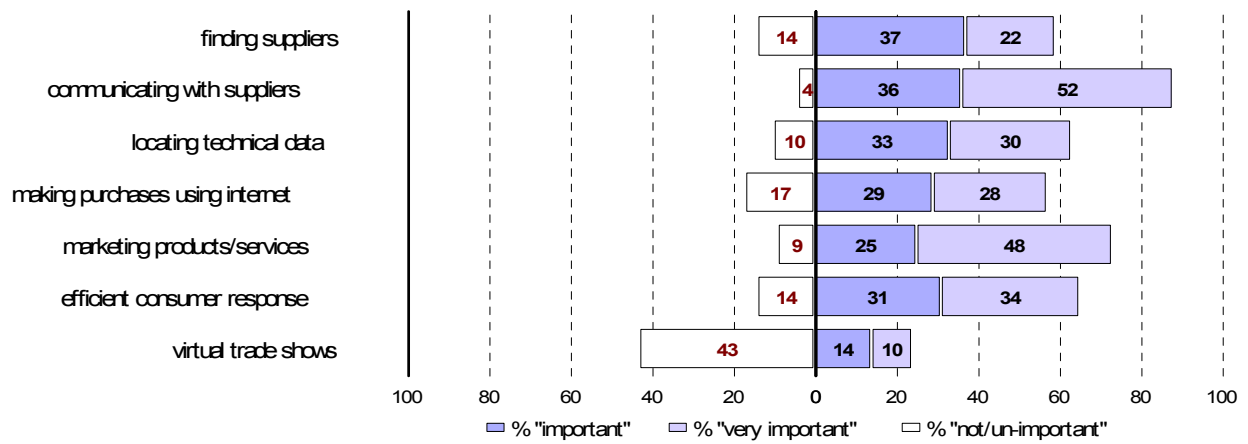


Figure 2. Future perception of the importance of using digital/web-based technology for supply chain management

Benefits of DWBT

All participants were asked to indicate to what extent they believed nine proposed key benefits of using digital/web-based technology for SCM were (if currently a user) or would be (if currently a non-user). The findings are illustrated in figure 3.

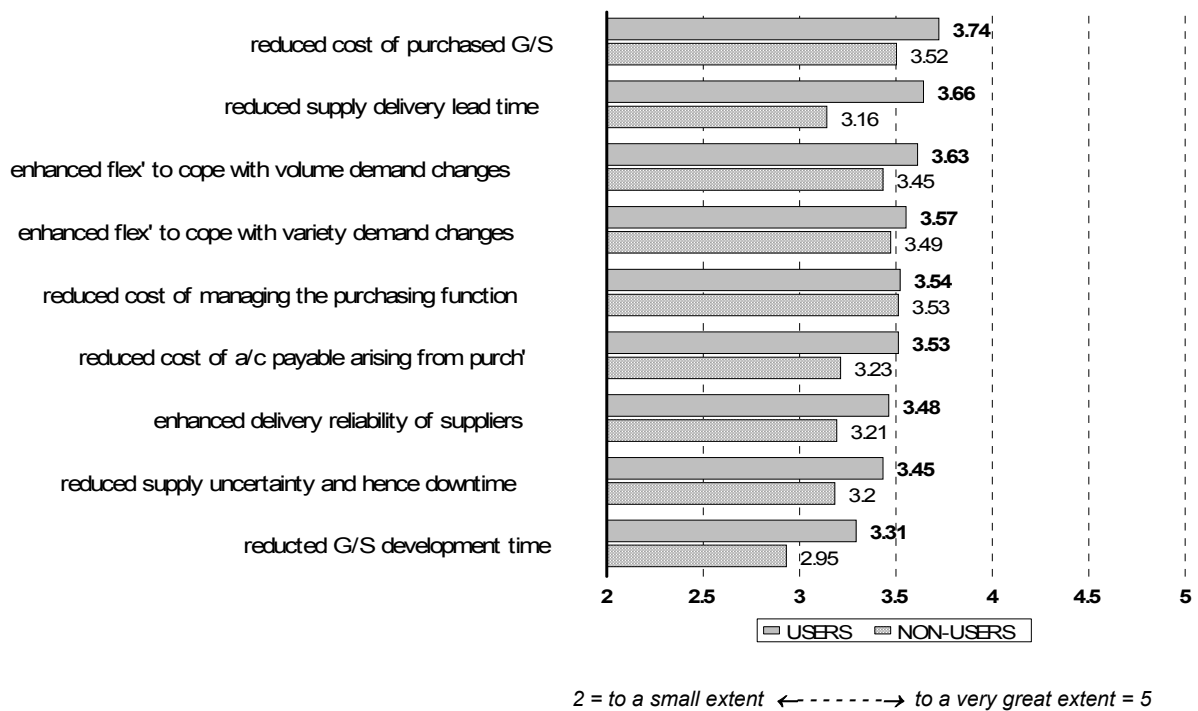


Figure 3. Users and non-users views of the key benefits of using DWBT for SCM

For users of DWBT, the three main benefits identified were: reduced cost of goods/services; reduced supply delivery leadtime, and enhanced flexibility to cope with changes in demand volume.

Non-users perception differed, placing more emphasis on reduced cost of managing the purchasing function; enhanced flexibility to cope with changes in demand variety, and perhaps most notably, much less emphasis on reduced supply delivery lead time. Thus overall, the non-users outlook in terms of the benefits that might be derived from the implementation of DWBT was much more focused on cost and flexibility improvements.

The relationship between the importance attached to the use of DWBT for the seven purposes in our investigation and the perceived key benefits, was investigated using Pearson product-moment correlation coefficient. In this analysis we restricted the sample to the DWBT users only. The results are presented in Table 1 in the Appendix. As can be seen, eighteen strong positive correlations ($p < 0.01$) between combinations of 'use'-'benefit' variables were observed. Examination of the table indicates that in particular, the use of DWBT for *communicating with suppliers* and for *efficient consumer response* is associated with:

- reduced supply delivery leadtime,
- enhanced delivery reliability of suppliers,
- reduced supply uncertainty, and hence downtime for the organisation,
- enhanced flexibility to cope with changes in demand volume for products/services, and
- enhanced flexibility to cope with changes in product/service variety demands.

The use of DWBT for *making purchases over the internet* was also strongly associated with reduced supplier delivery leadtime, as well as reduced costs of accounts payable arising from purchasing activities, reduced cost of managing the purchasing function, and reduced cost of purchased goods/services.

DWBT and buyer-supplier relationships

The final part of our analysis concerned the link between the use of DWBT for purchasing and supply management and firms' buyer-supplier relationship orientation. As mentioned earlier, it has been proposed that stronger buyer-supplier relationships develop when supply chain integration increases as a result of the deployment of such systems (Frohlich and Westbrook, 2001). Against this background, we posited the question, is use of DWBT more prevalent in firms that have a proactive buyer-supplier relationship orientation than in firms that display a reactive buyer-supplier relationship orientation? We thus performed a chi-square test for independence to explore the relationship between buyer-supplier relationship orientation and the use or non-use of DWBT.

A full explanation of the procedure for dichotomising the firms according to the buyer-supplier relationship orientation is beyond the scope of this paper. In short, based on the participants' responses to fourteen questions ascertaining the attributes of their relationship with their main suppliers, and using the buyer-supplier relationship typology proposed by McDonald (1999), the relationship emphasis for each firm in terms of *partnership* orientation, *developmental* orientation, *monitoring* orientation and *traditional (adversarial)* orientation was gauged. Firms were then assigned to one of two categories; those displaying a proactive relationship approach (high relative emphasis on partnership or developmental orientation), or those displaying a reactive relationship approach (high relative emphasis on monitoring or traditional orientation).

The test revealed no significant difference in DWBT use on the basis of firms' buyer-supplier relationship orientation (Pearson Ch-square=1.96, $p=0.162$). Examination of the descriptive

statistics indicated that the use of DWBT was more prevalent in firms with a proactive buyer-supplier relationship orientation than in firms with a reactive orientation, but not to a significant level. Nevertheless, we were still interested to see if there was a relationship between buyer-supplier relationship orientation and the specific uses of DWBT in our subsample of DWBT users only. A chi-square test for independence was therefore conducted for each of the seven uses of DWBT against the proactive/reactive dichotomy. In six cases (that is, uses of DWBT), the test revealed no significant difference in DWBT use on the basis of relationship approach. However, the test did reveal a significant difference in terms of the use of DWBT for *making purchases over the internet* (Pearson Ch-square=8.251, p=0.004). Examination of the descriptive statistics indicated that the use of DWBT for making purchases over the internet was significantly more prevalent in firms with a proactive relationship orientation (67% of them) than in firms with a reactive relationship orientation (only 32% of them). Our findings therefore provide only limited evidence in support of the proposition that the deployment of DWBT leads to stronger buyer-supplier relationships.

SUMMARY AND CONCLUSIONS

To help to establish the strategic and operational importance of digital/web-based technology adoption to purchasing and supply management, this paper reports the findings of an exploratory empirical study of UK firms. The findings of our research indicate that DWBT is currently applied at both the upstream and downstream sides of the supply chain, with a marginally higher emphasis on the supply side. However, given the widespread availability and maturity of DWBT the proportion of users discovered in this study appears to be quite low. The cost of such technology is relatively low and therefore unlikely to be a major inhibitor. It is possible that a lack of understanding of the potential of the technology and/or a lack of skill to exploit them are the main barrier faced. This may be a salient reason for our observation that the use of DWBT was much less prevalent in SMEs. The overall lower than expected usage finding is despite the fact that the sample reported perceived benefits of using DWBT in SCM in terms of all basic supply related performance objectives, that is to say, cost, speed, flexibility and dependability. This in turn suggests that lack of skill to implement and exploit this technology is likely to be the main barrier.

Practical Implications and Limitations

It is important to note that none of the associations observed in this study prove causality. Nevertheless, the findings and associations point to some salient managerial implications. The evidence presented here, although based on management perceptions, provides a clear indication that the use of DWBT in supply chain management activities is seen to have the potential to deliver operational performance improvements. For practising managers, a key question is where to apply DWBT to bring about potential purchasing and supply management related performance improvements. The findings from the examination of the relationship between DWBT uses and key benefits (based solely on the views of the DWBT users in our sample - Table 1), suggests that performance can be enhanced through greater use of DWBT for *making purchases over the internet*, and for *efficient consumer response*. Although the reasons for the lower than expected deployment of DWBT for these two purposes has not been investigated, it is possible that in the case of making purchases over the internet, concerns about the security of transactions or the availability of acceptable suppliers who provide this facility are limiting factors. Our analysis indicates that organisations already recognise and hence have implemented the use of DWBT for *communicating with suppliers* – the third area that had greatest observed association with

enhancing purchasing and supply related operational performance. The strong association between firms observed to emphasise a partnership or development relationship approach and the use of DWBT for *making purchases over the internet* provides further support for the potential utility of DWBT for this purpose.

Like other exploratory studies, this study has its limitations. The partially random sample of respondents was obtained from a single institutional database thus limiting the generalisability of the findings. Furthermore, the reported data are, unavoidably, based on management perceptions which may not fully reflect actual or expected practice. Finally, the main emphasis of this study relates to the use and perceived benefits of DWBT in purchasing and supply management rather than examining the performance impact of DWBT on the various aspects of purchasing and supply management. Any future research should consider a more in-depth approach. For example, it would have been beneficial to augment the quantitative data with qualitative in depth case studies to investigate the performance link.

Acknowledgement

The authors wish to express their thanks to the Institute of Logistics and Transport for its support and cooperation in this study and all the companies that participated.

References

- Amit, R. and Zott, C. (2001), 'Value creation in e-business', *Strategic Management Journal*, Vol. 22, No. 6-7, pp. 493-520.
- Boddy, D., Macbeth, D. K., Charles, M. and Fraser-Kraus, H. (1998), 'Success and failure in implementing partnering', *European Journal of Purchasing and Supply Management*, Vol. 4, pp. 143-151.
- Croom, S. (2005), 'The impact of e-business on supply chain management: an empirical study of key developments', *International Journal of Operations and Production Management*, Vol. 25, No. 1, pp. 55-73.
- Frohlich, M. T. and Westbrook, R. (2001), 'Arcs of integration: an empirical study of supply chain strategies', *Journal of Operations Management*, Vol. 19, No. 2, pp. 185-200.
- Harland, C. M., Lamming, R. C. and Cousins, P. (1999), 'Developing the concept of supply strategy', *International Journal of Operations and Production Management*, Vol. 19, No. 7, pp. 650-673.
- Hoyt, J. and Huq, F. (2000), 'From arms-length to collaborative relationships in the supply chain: An evolutionary process', *International Journal of Physical Distribution and Logistics Management*, Vol. 30, No. 9, pp. 750-764.
- Johnson, M. and Whang, S. (2002), 'E-business and supply chain management: An overview and framework', *Production and Operations Management*, Vol. 11, No. 4, pp. 413-423.
- Min, H. and Galle, W. P. (2001), 'Electronic commerce-based purchasing: A survey on the perceptual differences between large and small organisations', *International Journal of Logistics: Research and Applications*, Vol. 4, No. 1, pp. 79-95.
- McDonald, F. (1999), 'The importance of power in partnership relationships', *Journal of General Management*, Vol. 25, No. 10, pp. 43-59.
- Mudambi, R., Schunder, C. P. and Mongar, A. (2004), 'How co-operative is co-operative purchasing in smaller firms? Evidence from UK engineering SMEs', *Long Range Planning*, Vol. 37, No. 1, pp. 85-102.

Dr David Gallear, Brunel Business School, Uxbridge, Middlesex UB8 3PH, UK.
David.Gallear@Brunel.ac.uk

APPENDIX.

Table 1. Correlation matrix (DWBT users only) – importance of DWBT usage and key benefits

| DWBT uses | | Key benefits | | | | | | | | |
|-------------------------------------|---------|--|-----------------------------------|--|--|--|--------------------------------------|--|---|--|
| | | Reduced costs of accounts payable arising from purchasing activities | Reduced supply delivery lead time | Enhanced delivery reliability of suppliers | Reduced cost of managing the purchasing function | Reduced product/service development time | Reduced supply uncertainty, downtime | Enhanced flexibility to cope with changes in demand volume | Enhanced flexibility to cope with changes in demand variety | Reduced cost of purchased goods/services |
| Findings suppliers | Pearson | 0.118 | 0.130 | 0.093 | 0.309** | 0.209 | 0.222* | 0.063 | 0.220* | 0.237* |
| | Sig | 0.276 | 0.227 | 0.386 | 0.003 | 0.052 | 0.039 | 0.563 | 0.041 | 0.027 |
| | N= | 87 | 88 | 88 | 88 | 87 | 87 | 87 | 87 | 87 |
| Communicating with suppliers | Pearson | 0.196 | 0.312** | 0.307** | 0.210* | 0.204 | 0.431** | 0.407** | 0.401** | 0.081 |
| | Sig | 0.068 | 0.003 | 0.004 | 0.050 | 0.058 | 0.000 | 0.000 | 0.000 | 0.456 |
| | N= | 87 | 88 | 88 | 88 | 87 | 87 | 87 | 87 | 87 |
| Locating technical data | Pearson | 0.180 | 0.134 | 0.150 | 0.332** | 0.153 | 0.344** | 0.082 | 0.242* | 0.257* |
| | Sig | 0.095 | 0.213 | 0.162 | 0.002 | 0.157 | 0.001 | 0.448 | 0.024 | 0.016 |
| | N= | 87 | 88 | 88 | 88 | 87 | 87 | 87 | 87 | 87 |
| Making purchases using the internet | Pearson | 0.280** | 0.318** | 0.231* | 0.396** | 0.117 | 0.275* | 0.047 | 0.107 | 0.335** |
| | Sig | 0.009 | 0.003 | 0.030 | 0.000 | 0.281 | 0.010 | 0.665 | 0.324 | 0.001 |
| | N= | 87 | 88 | 88 | 88 | 87 | 87 | 87 | 87 | 87 |
| Marketing products/services | Pearson | 0.189 | 0.296** | 0.266* | 0.213* | 0.082 | 0.271* | 0.238* | 0.226* | 0.185 |
| | Sig | 0.082 | 0.006 | 0.013 | 0.049 | 0.453 | 0.012 | 0.028 | 0.038 | 0.090 |
| | N= | 86 | 86 | 86 | 86 | 85 | 85 | 85 | 85 | 85 |
| Efficient consumer response | Pearson | 0.192 | 0.453** | 0.354** | 0.270 | 0.168 | 0.426** | 0.352** | 0.392** | 0.254* |
| | Sig | 0.075 | 0.000 | 0.001 | 0.011 | 0.121 | 0.000 | 0.001 | 0.000 | 0.017 |
| | N= | 87 | 88 | 88 | 88 | 87 | 87 | 87 | 87 | 87 |
| Virtual trade shows | Pearson | 0.144 | 0.169 | 0.097 | 0.163 | 0.024 | 0.122 | 0.221* | 0.165 | 0.182 |
| | Sig | 0.185 | 0.118 | 0.374 | 0.132 | 0.829 | 0.264 | 0.041 | 0.129 | 0.093 |
| | N= | 87 | 87 | 87 | 87 | 86 | 86 | 86 | 86 | 86 |

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).