The Role of Big Data and Predictive Analytics Capabilities in Supply Chain Management: The Perspective of Malaysia Manufacturing Firm

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ABSTRACT: Big Data and Predictive Analytics (BDPA) is considered a significant resource that enables the firm to gain competitiveness in the supply chain. Besides that, another challenge that is still facing by many manufacturing firms is the disproportionate growth between data captured and the firm's capabilities to manage, process, analyze and transfer the big data to actionable knowledge and value. Therefore, this paper investigates and examines the relationship of BDPA capabilities on the firm's financial and market performance. This paper has utilized the Resource-Based View (RBV) theory and quantitative research design to achieve the research objectives. A total of 400 survey questionnaires were distributed to respondents in Malaysian manufacturing companies listed in the FMM Directory and received 138 usable responses representing a 34.50% response rate. The data were empirically tested through structural equation modelling using Smart-PLS. Research findings showed that tangible resources, organizational learning, and data-driven culture positively influence a firm's financial performance, while technical skills and management skills were insignificant. Moreover, management skills, organizational learning, and data-driven culture positively influenced a firm's market performance, whereas tangible resources and technical skills were insignificant.

Keywords: *Big data and predictive analytics capabilities; supply chain management; manufacturing firm performance.*

1. INTRODUCTION

The term "big data" refers to the techniques, practices, methodologies, and applications related to the acquisition, analysis, storage and integration of mass amounts of data to support business decision making [1]. Recently, some academics have stressed the low financial performance of some particular firms is related to poor decision making. Poor decision-making will lead to high operational costs and lower profitability [2]. While Lee, et al. [3] mentioned, the manufacturer could not enhance their financial performance if they do not have better managerial decision-making. On the other side, the rapidly changing market demand and increasing competition lead to low market performance [4]. Besides, Akter, et al. [5] indicated that the firm had not adopted a BDPA as a strategy, it will losing market share and momentum. Many manufacturing firms worldwide, including Malaysian manufacturing firms, face the same problems, which are poor firms' performance, especially in their financial and market performance. Hence, this paper investigates the relationship between BDPA capabilities and the firm's performance in terms of financial and market performance.

2. METHODOLOGY

This paper is quantitative-based which measures by a six-point Likert scale. Based on G-power statistical analysis software, the minimum sample of 138 is determined from the populations of 3163 Malaysian manufacturing companies listed in FMM Directory [6]. There are 400 sets of online survey questionnaires distributed to the targeted respondent via simple random sampling techniques. 138 usable responses received and representing a 34.50% response rate were empirically tested through partial least square structural equation modelling (PLS-SEM) using Smart-PLS 3 software. Three assessments have been conducted, which are normality, measurement model, and structural model assessment.

3. RESULTS AND DISCUSSION

3.1. Assessment of Measurement Model

To ensure all of the measurement items are acceptable, the researcher should perform internal consistency to assess the value factor loading [7]. According to Ramayah, et al. [8], when the value of factor loading (outer loading) is 0.50 and above, it is considered acceptable. Based on Figure 1, all of the factor loadings of the measurement items are in between 0.745 and 0.900 in which exceeded the threshold value of 0.50. It means that convergent validity are successfully fulfilled and no items are required to be deleted [8].

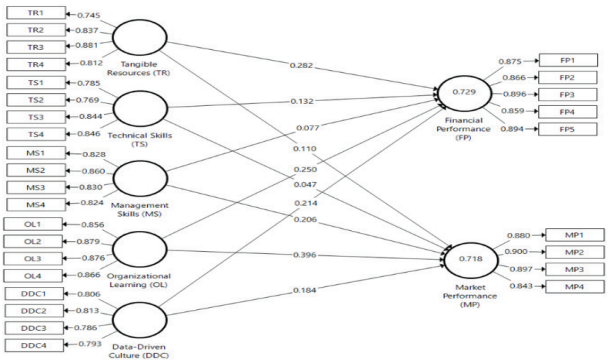

Figure 1 Initial PLS Path Model

Average Variance Extracted (AVE) is used to indicate how much of the variance of the latent variable

is explained by the construct. In this paper all AVEs' value is greater than 0.50 and thus, demonstrates the convergent validity [9]. Besides, all latent constructs reliability are acceptable and satisfactory where all of the composite reliability (CR) value is exceed the threshold value of 0.7 [8] and shows the measurement model's internal consistency. In addition, all of the square roots of AVEs are higher than the correlation estimates between those variables and other latent variables. Hence these indicate adequate discriminant validity the model.

3.2. Assessment of Structural Model

The hypotheses of this study have been assessed by using a one-tailed test (i.e., directional hypotheses) with a 0.05 confidence level. To assess statistical significance, the t-value must exceed 1.645, while the p-value must be no more than 0.05 to achieve the level of acceptance. Based on Table 1, there are total of ten hypotheses in this paper; six hypotheses (i.e., H1, H4, H5, H8, H9, and H10) are supported whereas four hypotheses (i.e., H2, H3, H6, and H7) are not supported.

Table 1 Discriminant Validity: Fornell-Larcker Criterion

Hypotheses	Path	Std. Beta (β)	Std. Error	t -values	P -Values	Confidence interval 5%	Confidence interval 95%	Decisions
H1	TR→FP	0.282	0.082	3.444	0.000 ***	0.157	0.430	Supported
H2	TS→FP	0.132	0.081	1.626	0.052 *	-0.006	0.264	Not supported
H3	MS→FP	0.077	0.098	0.785	0.216	-0.087	0.237	Not supported
H4	OL→FP	0.250	0.098	2.541	0.006 **	0.089	0.410	Supported
H5	DDC→FP	0.214	0.076	2.813	0.002 **	0.103	0.355	Supported
H6	TR→MP	0.110	0.092	1.187	0.118	-0.036	0.264	Not supported
H7	TS→MP	0.047	0.073	0.638	0.262	-0.072	0.165	Not supported
H8	MS→MP	0.206	0.093	2.212	0.014 *	0.055	0.358	Supported
H9	OL→MP	0.396	0.097	4.089	0.000 ***	0.246	0.567	Supported
H10	DDC→MP	0.184	0.072	2.553	0.005 **	0.068	0.301	Supported

Note: DDC (Data-Driven Cultures), FP (Financial performance), MP (Market Performance), MS (Management Skills, OL (Organizational Learning), TR (Tangible Resources), TS (Technical skills); t-value>2.58(***p<0.001), t-value>1.96(**p<0.01), t-value>1.65(*p<0.05)

4. CONCLUSION

This study has found that the firm must be focused on tangible resources, organizational learning, and data-driven cultures to achieve financial performance. This is because these three capabilities have a potential impact on boosting the firms' financial performance. However, this study also found that technical skills and management skills have no significant impact on the firm's financial performance. Besides that, to achieve better market performance, the firms are encouraged to focus on developing their management skills, organizational learning, and data-driven cultures. This is because these capabilities have a significant impact on market performance. However, this study also found that tangible resources and technical skills have no significant impact on the firm's market performance.

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