

# Uncertain Supply Chain Management

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## Driving growth performance shaped by environmental uncertainty and integrative strategy: The supply chain analysis of business transformation in ICT companies

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### CHRONICLE

#### Article history:

Received April 7, 2021  
 Received in revised format May 18, 2021  
 Accepted June 29 2021  
 Available online June 29 2021

#### Keywords:

*Environmental uncertainty*  
*Integrative capability*  
*Business model transformation*  
*Firm performance*

### ABSTRACT

This study examines the impact of environmental uncertainty and integrative strategy on growth of firm performance through the mediating role of the Business Model Transformation (BMT) strategy of information communication technology (ICT) in Indonesia. The research data was collected from the executive management of ICT through survey research with 30 questionnaire surveys and exploratory study with seven company leaders through in-depth interviews. This study analyzes the suitability of the overall model through causal relationships using Partial Least Square-Path Modeling (PLS-PM). The results show that the BMT predominantly influences the growth of ICT companies. The BMT is predominantly built by the environmental uncertainty (ET) strategy rather than by integrative capability. Thus, companies need to improve their ability and creativity to anticipate and adapt to any uncertainty that unexpectedly results in dynamic competition.

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## 1. Introduction

The modern global economy is on the border of the new industrial revolution. The evolutionary process of developing civilization continues to change, mainly due to the transformation of innovative technologies in telecommunications, such as the internet and digitalization (Hootsuite, 2019). Revolution 4.0 is a change in the way of human life and working as fundamentally, where the advancement of technology can integrate into the digital life (Iskandar, 2020). Thus, digital transformation in the context of Industry 4.0 is very important in community preparation to transfer society 5.0 (super-smart society), which reaches a high level of convergence between virtual space and physical space (Keidanren, 2016). In the Industrial 4.0 Revolution, technology had a massive influence, especially with the creation of the Internet of Things (IoT) and penetration of OTT services, where all work and equipment could be linked and run through the internet, this provides an opportunity for ICT companies. ICTs are companies or entities that provide internet connection services and other related services. ICT's market segment portfolio is quite clear, namely individuals and companies (retail and corporate). According to him, on a micro-level, the key to an ICT's business success lies in how high the quality of the company's ability to converge to three main aspects, namely: computing, communication, and content (Mason, 2020; Plate & Ismail, 2020). In Indonesia, the information and communication sector recorded growth of 9.41% or the third-highest below the growth of other service businesses (BPS, 2019). Thus, the telecommunication industry is a significant contributor to the distribution of economic development throughout Indonesia (Statistics, 2018). The growth of ICTs has been driven by increased use of the internet. APPJI, in collaboration with Polling Indonesia, conducted a Survey of Indonesian Internet User Behavior Penetration & Profile 2018. The survey results revealed that internet penetration in Indonesia in 2018 reached 64.8%. In 2017, out of a total population of 262 million people, 54.68% or 143.26 million people were internet users. The number increased so that in 2018, 64.8% of the 264.16 million inhabitants of Indonesia, or around 171.17 million people, were internet users (Indonesia Central

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Bureau of Statistics, 2020; Focus Utama Buletin APJII, 2017). Besides, Indonesia's 4th rank among the countries in the world (after China, India, USA) with the highest number of internet users, with 64.8% internet user penetration (171 Mio), thus, Indonesia has the opportunity to have a competitive advantage to be able to compete globally (InternetWorldStat, 2019; Statista, 2020), however Kearney (2016) and Pigliapoco and Bogliolo (2011), divided the Internet value chain into five segments, namely: content rights, online services, enabling technology services, connectivity (ICT) the critical stage, and user interfaces. However, despite the significant increase in data traffic, there is a Covid-19 impact on declines in business service (Wyman, 2020). Although operators got growth, the Telco industry requires a large investment, yet the revenue is low. Digital services, although it has grown, has not been able to replace the decreasing operator's revenue (Plate & Ismail, 2020). However, growth data traffic must be considered not able to cover the pressure of the telecommunications industry in the past few years due to the presence of over the top (OTT) services. It was already miserable long before Covid-19 because it was eroded by OTT (Bisnis.com, 2020; Statista, 2020). OTT players are considering a latent hazard for operators because OTT does not require large investments but generates profits through operator networks or "dumb pipes," providing bandwidth (ATSI, 2015; Figueiredo, 2016). These conditions indicate a problem in the Firm Performance of ICT companies in Indonesia, the current model of the telecommunications organization will not survive because the disruption pressures telecommunications companies to become platform companies that offer various services from content to software (Alliedmarketresearch, 2019) (KPMG, 2020). In the opinion of (Hunger & Hhelen, 2013), performance is the result of the activity.

Business model Transformation is very important to overcome the phenomena that are facing organizations engaged in the Information and Communication Technology industry. Because the technology sector is constantly changing, companies must promote technological improvement, find strategic markets, and develop innovative business models, and exploit and evaluate opportunities to compete in different fields that will distinguish them from competitors. BMT becomes a major component in the digital environment. Zott et al. (2011) state that business model innovation appears as an alternative to process and product innovation, where managers and entrepreneurs create additional value in a given time. Such as shifting processes from the old business model into a new business model, due to the old/traditional business models will not function optimally in the face of a high competition market (Arnold, Kiel, & Voigt, 2017). Therefore, companies need to change existing business models and adopt new business model approaches with changing the paradigm (Burmeister, Luettgens, & Piller, 2015; Dijkman, Sprengels, Peeters, & Janssen, 2015; Mikusz, Schafer, Taraba, & Jud, 2017). Implementation of BMT requires the support of organizational capability (Teece, 2018), and according to (Jiang, 2016; Teece, 2007), in the perspective of dynamic capabilities (DC) shows that integrative capability is the key to dynamic capabilities. Without effective integrative capabilities, uncertainty can inhibit the possibility of new recombination and integration of resources between companies (Jiang, 2016; Hutomo & Pudjiarti, 2020). This capability is an important and key factor conducive to the transformation of business models and the promotion of sustainable value creation (Foss & Saebi, 2016; Battistella, De Toni, De Zan, & Pessot, 2017). Integrative abilities play an important factor, such as being able to integrate new business models through existing organizational infrastructure and all business components (Deloitte & Forbes Insight, 2018; Geissbauer, Schrauf, & Vedsø, 2016; Hermann, Pentek, & Otto, 2016). For companies to be able to catch up with new markets or adopt new technologies, IC is needed. In the current era of paradigm shift known as Industry 4.0, companies must improve their IC and facilitate the sharing of knowledge between product engineering and production to achieve competitive advantage (Synnes & Welo, 2016). Wei Jiang, Mavondo, and Matanda (2015) found that integrative capability has a significant direct impact on a firm's performance (marketing effectiveness and financial performance) and also indirect impact via the creation of new operational capabilities. The environment plays a special strategic role in the case of technology companies (Covin & Slevin, 1991; García-Sánchez, García-Morales, & Martín-Rojas, 2018; Rivera-Rodríguez, García-Merino, & Santos-Alvarez, 2017). However, Buliga and Voigt (2016) and Golden et al. (2018) found that ET has a negative impact on performance and compound by internal organizational change. Therefore, (Rivera-Rodríguez et al., 2017) search for the impact of uncertainty on performance have been investigated in a series of empirical studies, most focused on private sector organizations. Most of these studies support the proposition that uncertainty has a negative effect on performance (e.g., Anderson & Tushman (2001), Lin & Germain (2003), and Power & Reid (2005).

## 2. Literature Review and Conceptual Framework

From the perspective of dynamic capabilities (DC), determining integrative abilities is the key to dynamic capabilities. Without effective integrative capabilities, it can overcome the difficulties of combinations and resources between companies (Jiang, 2016; Teece, 2007) stated, integrative as a company's capabilities to strategically acquire, collaborate the sources that are reachable in commercial enterprise partnerships in order to obtain managerial visions. Previous study found that integrative capability has a significant direct impact on company performance (marketing effectiveness and financial performance) and indirect impacts through the creation of new operational capabilities. However, according to (Jiang, 2016; Yu, 2012) the ability of integration from the perspective of a company's growth, four stages can contribute to improving the ability to grow, namely the ability to scanning, the ability to collect, the ability to combine (organization) and the ability to innovating and modifying resources (Helfat & Campo, 2016; Helfat & Raubitschek, 2018) (Pang, Wang, Li, & Duan, 2019). Wei Jiang, Mavondo, and Matanda (2015) argue the company's knowledge system has four dimensions, namely: the company's engineering system (equipment, software, tools) where the employee's knowledge and skills are embedded, the company's

organizational system (routines, procedures, and incentives) that direct the creation and control of employees' knowledge, knowledge and skills (both specific or scientific), and values and norms related to knowledge and by directing the creation and control of knowledge. In this study, the integrative strategy was measured by the dimensions shown in Table 1.

**Table 1****Variable operational of integrative strategy**

Variable	Dimension	Indicators	Source Literature
Integrative strategy	Resource Match	Match our advantage with partners' resources	Pang et al., 2019; Helfat & Campo, 2016
		Utilize partner advantage	
		Optimize resources with cooperation	
		Optimize resources in environment changes	
	Partner Selection	Evaluate the potential of partners	Pang et al., 2019; Jiang, 2016
		Establish the cooperation network	
		Build a good partnership	
	Risk control	Assess the risk of external innovation	Pang et al., 2019
		Separate the risk of external innovation	
		Balance the risk of external innovation	
	Opportunity Identification	Change of technology	Pang et al., 2019
		Change of competition	

Definition of Integrative strategy: The dynamic ability of companies to strategically acquire, combine, deploy, configure, activate resources effectively and align activities by developing external and internal resources between sharing strategic partnerships

Some people suggest that the environment is a pattern of all conditions and external influences that affect the life and development of the business organization. The contemporary business environment has been marked by increasing intensity of competition and a fast pace of change in markets and customer expectations. An uncertainty environment is in a situation that changes continuously, substantially, uncertainly, and unpredictable (Maxwell, 2017). Therefore, Pratono and Mahmood (2014) measured ET by the dimensions of competitive uncertainty, market uncertainty, and technological uncertainty. Turula and Bajgoric (2018) state that ET as the extent to which events are diverse and unpredictable in the environment in a particular industry (Tsai & Yang, 2014; Wong, Lee, & Chang, 2017). García-Sánchez et al. (2018) found that the uncertainty and complexity of the environment in which an organization operates and its relationships with stakeholders require companies to engage in continuous updating, collaboration with various parties, and process innovations, products, and systems to maintain a competitive advantage. ET changed the direction of the relationship between entrepreneurial management and company performance. ET changes the positive impact of entrepreneurial management on company performance. ET they assessed by dimensions: market uncertainty, technological uncertainty, and competitive intensity. In this study, the ET strategy is measured by dimensions: market uncertainty, regulatory uncertainty, and competitive uncertainty (Pratono & Mahmood, 2014) (Table 2).

**Table 2****Variable operational of Environmental Uncertainty**

Variable	Dimension	Indicators	Source Literature
Environmental turbulence	Market turbulence	Unpredictable customer demand	Duncan, 1972; Clark, 1985; Jauch & Kraft, 1986 Anderson, 1985; Jaworsky & Kohli, 1993
		Rapidly changes the marketing practices	
		Rapidly changes the customer preferences	
	Regularity turbulence	Difficulty to predict regularity changes	Volberda & Van Bruggen, 1997; Wijen & van Tulder, 2011
		Uncertainty of the law and regulation	
	OTT Intensities	The intensity of price wars	Jaworsky & Kohli, 1993
		The intensity of new product on the market	
		Easiness of the competitors to compete with the products offered	

Definition of Environmental turbulence: The innovative ability of organizations to respond to the complexity, and predictability of change business to follow the change of customer preferences, and market demands

Business model transformation emerged as an alternative to process and product innovations, with which managers and entrepreneurs created added value in specific times (Zott, Amit, & Massa, 2011). BMT is known as a very important booster for achieving a competitive advantage. BMT is a redefinition reconceptualize of: (a) content (with the addition of new activities), (b) structure (relating to different activities), and (c) compliance (governance) (changes to units responsible for conducting activities) ((Srivastava, 2013) (Johansson & Abrahamsson, 2014; Kim & Min, 2015) found that companies that add new business models can improve their performance. Business model transformation in this study has been assessed with dimensions: New Technology/equipment, New Partnership, New revenue models, and New cost structures (Table 3).

Wheelen et al. (2015) conclude the definition of performance is the result of an activity. Selection of measures is needed to assess performance based on the type of organizational aspect. Among these performances is measured by profitability, market share, cost reduction. Business firm performance is the output or result of the application of all activities related to business activities (Best, 2009). Firm Performance indicators are sales growth and profitability (Hubbard and Beamish, 2011). Hunger and Hhelen (2013) revealed several measures of company performance, namely: a). Basic measurements, consisting of

traditional financial measurements: through ROI, earnings per share (EPS), operating cash flow, and Shareholder value: economic value added (EVA) and market value added (MVA). b) Balanced scorecard approach: which combines financial measures with operational measures on customer satisfaction, internal processes, company innovation, and development activities. The BSC covers four areas: financial, customers, internal business processes, and learning and innovation. In this study, Firm Performance has been assessed from the dimensions: tangible process and intangible process.

**Table 3I**  
Variable, dimension, and construct of BMT and firm performance

Variable	Dimension	Indicators	Source Literature
Business model Transformation	New Technology/equipment	People/Technical Competencies	Hamelink & Opdenakker & 2019 Foss & Saebi, 2018; Teece, 2017; Osterwalder & Pigneur, 2010
		Equipment	
		Technology Update	
	New Partnership	Customer Information	Osterwalder & Pigneur, 2010
		Key partner	
		Value Chain to Create value	
	New revenue models	Revenue model	Osterwalder & Pigneur, 2010
		Revenue streams	
		Volume and structure of revenue	
		Estimation of cost	
Structure (and profit potential)			
New cost structure	Financial Barrier		

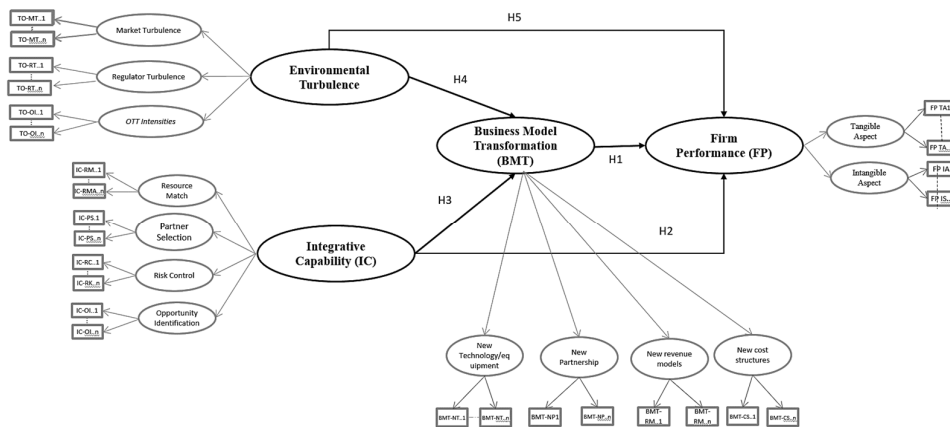
Definition: Organizational ability to develop and seek new methods of various business activities that focus on internal capabilities and partnership strategies, which fundamentally change the old business roots.

Variable	Dimension	Indicators	Source Literature
Firm Performance (FP)	Tangible Aspects	Market share	Hensley & Dobie, 2015; Ng & Kee, 2011
		Pricing	
		Sales turnover growth	
		Cost Reduction	
		Increase Profitability	
	Intangible Aspects	Financial Investment	Hensley & Dobie, 2015; Ng & Kee, 2011
		Customer Loyalty	
		Management Innovation	
		Organizational Learning	
		Service Uptime	
Network Coverage			
Productivity			

Definition: The level of company achievement is shown through positive growth from overall financial and non-financial indicators through tangible and intangible aspect to achieve organizational performance goals.

Based on the literature review of the above concept, the following hypotheses have arranged with the model being in Fig. 1:

- H1. BMT affects firm performance.
- H2. Integrative capability affects Firm performance.
- H3. Integrative capability affects business model transformation.
- H4. Environmental uncertainty strategy affects business model transformation.
- H5. Environmental uncertainty strategy affects firm performance.



**Fig. 1.** Research framework

**3. Research Method**

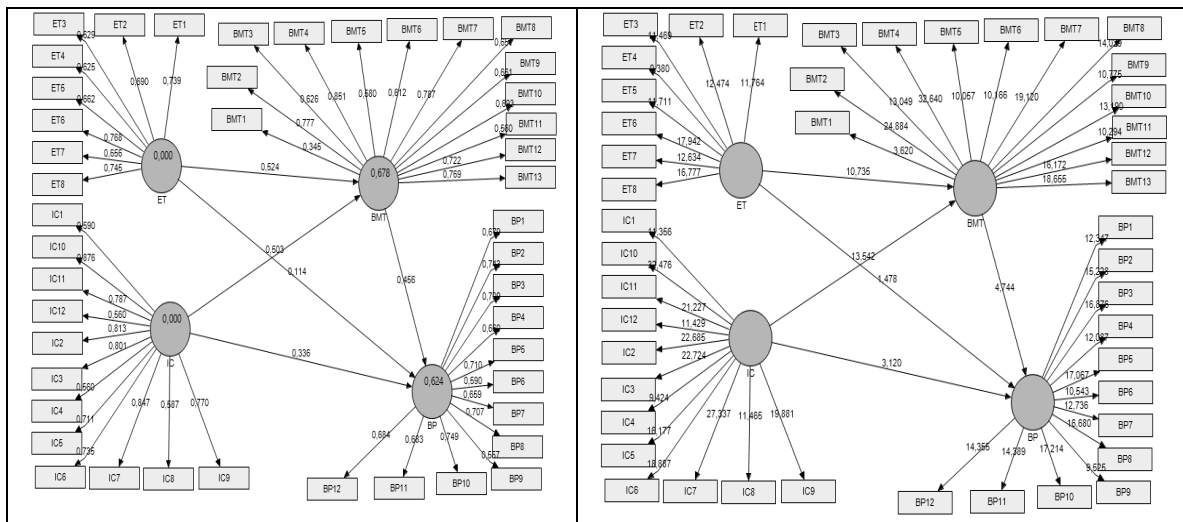
The objectives of this study are to examine and reveal the relationship between variables through causality. Causal research, according to Aaker (2013, P. 66), "when it is necessary to show that one variable causes or determines the values of other

variables, a causal research approach must be used." Unit of analysis is an ICT's company in Indonesia with the unit of observation being the company's management. Observations using time horizons are cross-section/one-shot, meaning that the information or data obtained is the result of research conducted at a certain time in 2020. The data used in this study are primary data obtained from questionnaires to management. ICT companies with a sample of 30 companies and 7 explanatory study with in-depth interview of top management ICT. Research data were collected via a questionnaire, phone call and distributed through several methods, including electronic form using Google form and printed format directly delivered to the respondents. The respondents were the executive management level of the firm, including the Board of Director, chief executive officer, chief technology officer, chief operating officer or Senior Manager of the selected companies who are believed to have sufficient knowledge on both company strategy, as well as the business process of the company. The unit analysis is the organization. Therefore, one valid questionnaire per organization represents one sample. The analytical approach and solution techniques that are used as analysis tools are Partial Least Square (PLS). This study used multivariable scales to measure the dimensions of constructs. These scales were derived from prior studies and reconceptualized in this study. All items have been assessed on five-point Likert scales ranging from 1 ("strongly disagree") to 5 ("strongly agree").

**4. Result and Discussion**

*4.1 Evaluation Model*

Before describing the verification analysis, the results of evaluation of the research model have been presented. Based on data processing, the degree of freedom obtained so that it has concluded that the model identified with the over-identified category. The path diagram of the estimated Model Research results is shown in Fig. 2 below:



**Fig. 2. Path Diagram**

The structural analysis model (inner model) shows the relationship between latent variables. The inner model has been evaluated using R Square in the endogenous construct. The value of R Square is the coefficient of determination in the endogenous construct. According to Chin (1998), the R square values are 0.67 (strong), 0.33 (moderate) and 0.19 (weak). Prediction relevance (Q square) or known as Stone-Geisser. This test was conducted to determine the predictive capability with the blindfolding procedure. If the value obtained is 0.02 (small), 0.15 (medium) and 0.35 (large), and for endogenous constructs with reflective indicators. Here are the values of R-square and Q-Square in the moderate construct), and the value of Q square is in the big criteria, so it has concluded that the research model has been supported by empirical conditions or the fit model.

**Table 4**  
**Goodness-Of-Fit Model**

Variable	R Square	Cronbach's Alpha	Q square
<b>Business model transformation</b>	0.678	0.896	0.348
<b>Firm performance</b>	0.624	0.895	0.362
<b>Environment uncertainty</b>		0.845	0.309
<b>Integrative capability</b>		0.918	0.437

Table 4 provides the  $R^2$  value on Firm Performance and Business Model Transformation as an endogenous variable within the criteria of more than 0.6 (strong) with a Q square value  $> 0.15$  and 0.35 (large), so the proposed model is considered good and accepted as a model.

#### 4.2 Evaluation of Measurement Model

Evaluation of latent variables is used to test the validity and reliability of each indicator from each dimension that forms the latent variables. Based on the weight of the factors (standardized loading) in the picture above, obtained the t value of each indicator on the latent variables as presented in Table 5.

**Table 5**  
Measurement Model

Variable	Indicator	Validity		Reliability	
		Standardize loading	t-value	Composite reliability	AVE
Firm Performance	BP1 ← BP	0.679	12.347	0.911	0.562
	BP2 ← BP	0.743	15.228		
	BP3 ← BP	0.709	16.876		
	BP4 ← BP	0.66	12.087		
	BP5 ← BP	0.71	17.067		
	BP6 ← BP	0.59	10.543		
	BP7 ← BP	0.659	12.736		
	BP8 ← BP	0.707	16.68		
	BP9 ← BP	0.557	9.525		
	BP10 ← BP	0.749	17.214		
	BP11 ← BP	0.683	14.389		
	BP12 ← BP	0.684	14.355		
Business Model Transformation	BMT1 ← BMT	0.345	3.62	0.913	0.557
	BMT2 ← BMT	0.777	24.884		
	BMT3 ← BMT	0.626	13.049		
	BMT4 ← BMT	0.851	32.64		
	BMT5 ← BMT	0.58	10.057		
	BMT6 ← BMT	0.612	10.166		
	BMT7 ← BMT	0.787	19.12		
	BMT8 ← BMT	0.651	14.029		
	BMT9 ← BMT	0.661	10.775		
	BMT10 ← BMT	0.693	13.19		
	BMT11 ← BMT	0.560	10.294		
	BMT12 ← BMT	0.722	16.172		
	BMT13 ← BMT	0.769	18.655		
Environment Turbulence	ET1 ← ET	0.739	11.764	0.879	0.578
	ET2 ← ET	0.69	12.474		
	ET3 ← ET	0.629	11.469		
	ET4 ← ET	0.625	9.38		
	ET5 ← ET	0.662	11.711		
	ET6 ← ET	0.768	17.942		
	ET7 ← ET	0.745	12.634		
	ET8 ← ET	0.59	16.777		
Integrative Capabilities	IC1 ← IC	0.59	11.356	0.913	0.557
	IC2 ← IC	0.813	22.685		
	IC3 ← IC	0.801	22.724		
	IC4 ← IC	0.56	9.424		
	IC5 ← IC	0.711	16.177		
	IC6 ← IC	0.735	18.887		
	IC7 ← IC	0.847	27.337		
	IC8 ← IC	0.587	11.465		
	IC9 ← IC	0.77	19.881		
	IC10 ← IC	0.876	32.476		
	IC11 ← IC	0.787	21.227		
	IC12 ← IC	0.56	11.429		

Table 5 shows variables with valid indicators with values Standardize loading  $> 0.50$  or t value  $> 2.01$  (t table at  $\alpha=0.05$ ). Reliability shows that the indicators have a high degree of conformity to form the latent variables with acceptable values (CR  $> 0.5$ ). AVE  $> 0.5$ , which shows, on average more than 50% of the information contained in each indicator is reflected through their respective dimensions that can reflect all variables.

#### 4.3 Hypothesis Testing

The results showed that  $R^2$  can be explained as the integrated capability, and environment uncertainty influences BMT of 0.678 or 67.8%, where the Environment Uncertainty Strate has significant and greater influence ( $R^2 = 0.350$ ). Integrated capability and environment uncertainty and BMT influence Firm Performance by 0.624 or 62.4% where only BMT has significant and greater influence ( $R^2 = 0.208$ ) while Environment Uncertainty do not have a significant effect on Firm Performance (t value  $< 2.01$ ). The results of hypothesis testing indicate that hypothesis 1 has been accepted, meaning that

environmental uncertainty influences business model transformation. Hypothesis 1 has been accepted, meaning that BMT influences firm performance. Hypothesis 2 has been accepted, meaning that the IC strategy affects firm performance. Hypothesis 3 accepted, meaning that IC affects business model transformation. Hypothesis 4 accepted, meaning that the environmental uncertainty strategy affects BMT, However, hypothesis 5 rejected, meaning that the environmental uncertainty strategy does not affect firm performance.

**Table 6**

Hypothesis Test

Hypothesis	Estimate Coeff.	Standard Error	t values	R <sup>2</sup>	Conclusion
BMT → FP	0.456*	0.096	4.744	0.208	Accepted
IC → FP	0.336*	0.108	3.120	0.124	Accepted
IC → BMT	0.503*	0.037	13.542	0.328	Accepted
ET → BMT	0.524*	0.049	10.735	0.350	Accepted
ET → FP	0.114	0.077	1.478	0.024	Rejected

\*Significant at  $\alpha=0.05$ 

The results show that the BMT predominantly influences the business performance of internet service provider companies. The BMT is predominantly built by the environmental uncertainty strategy rather than by IC. Thus, companies need to improve their ability and creativity to anticipate and adapt to any uncertainty that can occur unexpectedly and are very dynamic. This study estimates that ET can affect the growth of the company's performance through other mediating factors that need to be examined more deeply in the future study. The implications for the management of ICT service companies, contribute directly to businesses and entrepreneurs can formulate strategies to maintain and develop their business through opportunities of implementing business transformation models that can be considered a basic model in designing new business models and developing company capabilities to get company performance.

## 5. Conclusion

The results have shown that: the IC has influences on business model transformation, environmental uncertainty strategy has influences on business model transformation, environmental uncertainty strategy does not affect firm Firm Performance and business model transformation influences firm performance. The business model transformation predominantly influences the Firm Performance of ICT service companies. The business model transformation is predominantly built by the environmental uncertainty strategy when compared to integrative capability. The output of this study has implications for the management of ICT service companies that improving Firm Performance needs to be supported by the development of business model transformation. The development of business model transformation needs to be supported by an appropriate ET strategy and the development of integrative capability. The findings broaden the knowledge of the transformation model by embracing the internal (integrative capability-IC) and external (environmental uncertainty) perspectives. This study also re-conceptualizes the uncertainty dimension of competitors by adding a new indicator. OTT intensities (over the Top) players are a phenomenon in Telco and tested it empirically. Finally, these results highlight that optimal BMT needs to be framed by strategic ET to create a higher value for the transformation process. ET alone is not enough, and organizations need an integrative strategy to achieve company performance. Moreover, the practical implication side of the findings is to help to open entrepreneurial insights about the importance of dynamic continuous innovation towards the digital era to enhance the environmental uncertainty capability and integrative capability by formulating strategies in developing a transformation model. The social implication is to provide public benefits from the microeconomic side of society and macroeconomics to the Telco's industry. Improve internet service technology education in the community and increase internet user penetration. As limitations/implications, with the research approach chosen, research results may not be generalizable. Hence, future research could further explore the proposed propositions through the framework of the resulting business model with large data surveys and to extend the research to other industries.

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