ICIS 2019 Proceedings
General Topics

Leadership in the Digital Transformation of a Supply Network: A Revelatory Case Study

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Short Paper

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Abstract

Digital Transformation (DT) is an ongoing phenomenon across various industries that has significant impacts at the organizational, industry, and societal levels. DT is particularly crucial for traditional firms that are confronted with threats from innovative companies and increasingly dynamic markets. However, research on supply network-level DT and DT leadership remain absent to date, which are critical in the pursuit of far-reaching and sustainable impacts. Our research objective is to use a case study of Topsun, the largest outdoor equipment manufacturer in China, to address these gaps. We find that the process of enacting supply-network DT leadership consists of three phases: (1) articulating a strategic vision, (2) actualizing internally and advocating externally, (3) assembling for collective action. Our model is a conceptual innovation that sheds light on the underlying mechanism of obtaining and executing supply-network DT leadership, which can be used as a roadmap for traditional firms to undertake DT and leverage its collective impacts.

Keywords: Digital transformation, supply network, leadership, case study, China

Introduction

Digital Transformation (DT) refers to the transformation accelerated by "combinations of information, computing, communication, and connectivity technologies" (i.e. digital technologies - Vial 2019, p. 118) that involves elemental changes in a firm's business processes, management philosophy (Matt et al. 2015), organizational capabilities and structure (Vial 2019). Despite various benefits and opportunities from digital technologies, DT is particularly critical for traditional firms as they are also confronting substantial threats from "born-digital" companies (Sebastian et al. 2017, p. 198). For example, the world's leading toymaker, LEGO Group, was close to bankruptcy in 2004 after a 12-year steady revenue decline. Reaching this climacteric, LEGO decided to initiate a DT programme through mobile games and applications (Matt et al. 2015) based on engagement of IT and enterprise platforms for new revenue sources, and leveraging digital tools (e.g., Digital Designer) to cultivate new design capabilities (El Sawy et al. 2016). As a result, LEGO attained a steady recovery and remarkable financial improvement post-2005 (e.g. LEGO's CAGR was 20% for the 2009-14 period, with a gross margin of 37.1% in 2014 - World Economic Forum 2019).

Despite the achieved DT success by firms like LEGO, many traditional enterprises struggle to attain the desired results (e.g. estimated DT failure rate ranges from 66% to 84% - Libert et al. 2016). The high DT failure rate may be indicative of a lack of understanding of how traditional firms can digitally transform effectively, which in turn, can stem from at least two gaps in the existing literature. First, contemporary business competition tends to be network-based, as opposed to between individual firms, but research on how to digitally transform an entire supply network from a core firm's perspective - a leading firm of the industry in terms of scale and financial performance that can influence the offerings and other entities of a supply network- is lacking. Second, there is a paucity of research on the enactment of DT leadership by a core firm in this context as well. Using a case study of the Topsun Group, a leading manufacturer of outdoor

camping equipment, this study aims to address these gaps by addressing the research question: "How can a core firm in supply network enact DT leadership to realize network-wide DT."

Literature Review

Digital Transformation

Attracted by the benefits of digital technologies, such as efficiency improvements, cost reductions, business innovations (Svahn et al. 2017) and being existentially threatened by innovative firms (Sebastian et al. 2017), traditional firms across industries are exploiting digital advances, particularly the SMACIT technologies (Social, Mobile, Analytics, Cloud, Internet of Things - Sebastian et al. 2017), to enact DT. As a consequence, various improvements have been achieved, such as enhanced customer experiences, reshaped customer value propositions , optimized operational efficiency, and new business opportunities to improve business performance in dynamic markets (e.g., Sebastian et al. 2017; Vial 2019). According to a global survey, 1,559 executives of 450 large companies across 106 countries overwhelmingly believe that failure to conduct effective DT will harm their companies' competitiveness (Fitzgerald et al. 2014). Apart from organizational level effects, DT also has significant impacts at industry and societal levels, which could improve individual quality of lives considerably (Vial 2019). For example, health information technology based on big data and analytics, electronic health records and augmented physical products are now broadly and deeply used, and being substantially recognized as value-adding in the healthcare sector – an industry that has been a "traditional laggard in technology adoption" (Vial 2019, p. 130). Furthermore, DT initiatives have allowed healthcare providers to access geographically disparate patients at a reduced cost, which contributes value at the societal level.

Although being frequently mentioned together with IT-enabled organizational transformation, which is an internal transformation of a single organization that is triggered by the application of new digital technologies, and is supported by "single IT artifact" that is "primarily focused on operations" (Vial 2019, p. 132), DT possesses several fundamentally distinct traits. First, DT often involves "combinations of digital technologies" (Vial 2019, p. 132). Second, DT highlights IT impacts on organizational changes as well as emphasizes the strategic alignment between technology and business (Li et al. 2018; Venkatraman 1994). Finally, as illustrated previously, DT does not only have influences on the focal enterprise, but also impacts on the individual (e.g. customers), industry, and societal levels (Vial 2019).

Previous studies have identified various Critical Success Factors (CSFs) for organizational DT, which can be classified into three broad categories. The first is strategic factors that establish the overall aim of DT, guide organizational resource commitments to DT initiatives, and confirm managerial commitment to DT. This provides a high-level guide to stakeholders on the value and direction of DT initiatives (Chatterjee et al. 2002; Hess et al. 2016). The CSFs that fall under this category include top management championship (Chatterjee et al. 2002; Westerman et al. 2014), strategic investment rationale, extent of coordination (see Chatterjee et al. 2002), digital transformation strategy (Hess et al. 2016), and a competent Chief Digital Officer (CDO; Tumbas and Berente 2018). The second category consists of transformational capabilities that firms need in pursuit of successful DT, including dynamic managerial capabilities (Li et al. 2018), innovation capabilities, and business innovation focus (Svahn et al. 2017), which enable organizations to strengthen support and ensure subsequent effects from management, as well as empower organizational-wide continuous cultivation of new capacities and learning, so as to seamlessly accommodate and effectively adapt changes from DT (Li et al. 2018). The third category of CSFs is related to the significance of infrastructural assets - including an operational backbone and a digital service platform - for firms' achievement of operational reliability, efficiency, speed and responsiveness to the dynamic markets, and subsequently retain their strategic competence (see Sebastian et al. 2017).

A closer examination of the DT literature reveals two gaps regarding our proposed research question. First, very few studies have looked at DT at the supply-network level. Further, these studies explored supply-network DT in terms of system functionalities (Korpela et al. 2016) and possible connection with emerging technologies (Korpela et al. 2017), but little research has been conducted from the perspective of a core firm within the supply network. An understanding of this perspective is crucial, particularly for traditional manufacturers, because rising complexity or variety in products and constant market changes have brought challenges of meeting higher customer expectations at the network level, while simultaneously having to reduce production costs to maintain flexibility and competitiveness (Madenas et al. 2015). In addition,

supply network partnership has long been regarded as pivotal for supply-network members to collaborate for mutual or collective benefits, such as efficiency improvements, mitigation of traditional competitive barriers, and reducing uncertainty (Madenas et al. 2015). Second, to date, studies on core firm exercising DT leadership to induce industrywide impacts remain absent. As illustrated earlier, DT requires several key capabilities and infrastructural assets across a supply network, but it is not likely for a single entity within a supply network to acquire all of them. Further, DT enacted only by a few players within a supply network are likely to be limited in scope and impact. Therefore, research on supply-network DT leadership is vital as it is crucial for shaping and implementing collective initiatives, as well as for broader and more sustainable outcomes (Huxham and Vangen 2000). To address these gaps, the purpose of this study is to investigate in how supply-network DT initiatives could be effectively implemented through the attainment and execution of DT leadership. Since this relates to collective actions among supply network business partners, we turn to a review of literature on organizational collective action to establish a theoretical lens that will guide our inquiry.

Organizational Collective Action

Organizational collective action (OCA) refers to the goal-oriented cooperative endeavour undertaken by a collection of organizations with shared interests (Matinheikki et al. 2017). The research on OCA has spanned decades (e.g., Gray 1985), and is closely linked to the research on collective strategies (Barnett et al. 2000), interorganizational relations (Gulati et al. 2017), and strategic alliances (Luo 2008). OCA can be conducted in various network forms, such as a joint venture, a consortium, a trade association, or a trade-union federation (Barnett et al. 2000). Prior studies have identified various key drivers of effective OCA, which are classified into four dominant theoretical perspectives (see Palmatier et al. 2007). The first is **commitment-trust**, suggesting that participants' commitment to and trust in OCA are fundamental for strong relationship building between partners. The drivers identified in line with this perspective include commitment (Carmeli et al. 2017), trust (Jap and Anderson 2007), external confidence (Monge et al. 1998), involvement (Corbett and Montgomery 2017), and accountability (Dyer et al. 2001). The second perspective is **dependence**, which emphasizes the importance of mutual and interdependencies among the participants in achieving effective OCA, as dependent stakeholders tend to aspire for strong relations. The key drivers derived from this perspective are inter-/joint/relationship dependence , dependence asymmetry (Kim and Choi 2015), functional requirements overlap (Arya and Lin 2007), goal congruence (Jap and Anderson 2007), and tie strength (Carmeli et al. 2017; Kim and Choi 2015). The third perspective, **transaction cost economics**, indicates that appropriate governance structures accounting for relationship-specific investments and restraining opportunistic behaviours are essential for effective OCA. The comprising drivers include effectiveness and mode of governance, enabling forms of regulation (Fortwengel and Jackson 2016), member satisfaction with process (Monge et al. 1998), value creation/ payoff (Matinheikki et al. 2017; Zeng and Chen 2003), opportunistic behavior (Zeng and Chen 2003), relation-specific and complementary investments/ resources (Lee et al. 2018), and quality and quantity of information (Monge et al. 1998). The fourth perspective is related to **relational norms**, which suggests that strong norms enable firms to develop lasting, healthy, and hard-to-replicate relationships. This perspective contains the following key drivers, relational norms (Zeng and Chen 2003), collective identity (Zeng and Chen 2003), embeddedness (Gulati et al. 2017), information/knowledge sharing norms (Rehm and Goel 2015), procedural justice, reciprocity (Zeng and Chen 2003), relationship harmony (Jap and Anderson 2007), shared cognitive understanding (Fortwengel and Jackson 2016), status/status difference (Arya and Lin 2007), and third-party leadership (Mizruchi and Yoo 2017). Moreover, all these drivers tend to be developed, promoted, and reinforced by a core firm (Hargrave and van de Ven 2006).

Several other studies have taken a process-oriented - as opposed to factor-oriented - view in their exploration of OCA. For example, one study suggests a sequential model for the attainment of effective OCA with three successive phases - problem setting, direction setting, and structuring – and identified the optimum conditions for the enactment of OCA in each phase (see Gray 1985). Another views OCA as a product of a political process that stems from conflicting partisan perceptions in an institutional context, and introduces four distinctive subprocesses that facilitate effective OCA attainment - framing contests, construction of networks, enactment of institutional arrangements, and collective action processes (see Hargrave and van de Ven 2006). A third study differs from the two by paying less attention to the antecedent conditions and contextual factors, such as conflicts and turbulences (Gray 1985; Hargrave and van de Ven 2006), and instead emphasizes the significance of the formative process. It proposes a cyclical

developmental process of effective OCA, which consists of three phases – negotiation, commitment, and execution – and an ongoing mechanism of assessment across them (see Ring and van de Ven 1994).

Applying the DT and OCA literature as our theoretical foundation to interpret and examine Topsun's DT initiative, a process model of how DT leadership of a supply network can be attained and leveraged is developed to address our proposed research question.

Research Method

The case research approach is especially appropriate for our study because its strengths lie in exploring "how" questions (Walsham 1995), multi-faceted and understudied phenomena (Siggelkow 2007), as well as examining processes (Orlikowski and Baroudi 1991) that are inextricable from its natural context (Yin 2017) – all conditions are relevant to our study. To address our research question, we identified two case selection criteria. First, the case organization must be a core firm of the supply network. Second, it should have attained supply-network DT leadership. The Topsun case suits this study well by fulfilling both criteria: (1) Topsun's leading industry position affords the firm a strong influence over its supply network, and (2) Topsun has led its network of suppliers and business partners in DT, who are actively implementing DT initiatives of their own and seeking help from Topsun on those initiatives.

Established in 1991 and based in Hangzhou, China, Topsun Group has grown into a diversified MNC with nearly 7,000 employees distributed across China, the United States and Europe. Topsun's business scope covers three main industries – manufacturing, cultural creativity, and financial investments – with manufacturing as its core business. Topsun is the largest exporter of outdoor products in the world, with products distributed across more than 60 countries worldwide. Its market leadership allows Topsun to wield significant influence over its business partners along its supply network. Topsun's DT journey began in 2000, when a self-developed ERP system was implemented to support its growing business. Since 2015, Topsun has been focusing on organization-wide, extensive DT by implementing in-house developed systems to meet operational demands with an IT department of more than 40 employees.

Data Collection and Analysis

Case access was granted in December 2018. The research process consists of a preparatory and a fieldwork phase. In the preparatory phase, the focus was to gather and review secondary data to develop an overview of the case study from various sources, including webpages, corporate presentation slides and other published materials. This phase formed the basis for the formulation of our initial interview questions (Strauss and Corbin 1998). The subsequent fieldwork phase was for primary data collection and was conducted at Topsun's headquarters and the premises of its business partners. 18 semi-structured face-to-face interviews were conducted in total, averaging 60 minutes in length. Each interview was guided by a standard list of open-ended questions on multiple aspects of Topsun's DT initiative, which allowed us to elicit relevant data from our informants and capture additional information through response elaborations (Galletta and Cross 2013). Role-and-department-specific questions were also tailored to the different informants (Myers and Newman 2007). Chain referral sampling (Biernacki and Waldorf 1981) was used for informant selection, through which the right informants were identified by a "gatekeeper" of the organization, as researchers often lack sufficient inside information to do so (Pan and Tan 2011). The informants included key members of the DT planning and management team, IT specialists, managers of its various business units (BUs), and representatives of Topsun's business partners to constitute "a variety of voices" (Myers and Newman 2007, p. 22). All interviews were digitally recorded, transcribed, and collated to ensure data accuracy and completeness (Walsham 1995).

Data analysis was performed simultaneously with data collection to fully leverage the flexibility of the case research method (Eisenhardt 1989). From the literature review on OCA, a set of theoretical themes (i.e., key drivers and phases of effective DT leadership and OCA - Walsham 1995) were identified and used as the theoretical lens to guide subsequent data collection (Weick 2007). The interview data were organized and coded using a mix of open, axial, and selective coding (Strauss and Corbin 1998), and the set of themes was adjusted whenever new evidence challenging the existing scheme emerged (Walsham 2006). More specifically, selective coding was used to identify new, and validate existing aggregate dimensions related to the theoretical lens (e.g. 'Articulating'), axial coding enabled the identification of new, or the verification of the existing, second-order themes under each dimension (e.g. 'Internal Strategic Cohesion'), while open

coding was a process where the data were abstracted to form first-order conceptual categories and mapped to the corresponding dimensions and themes (e.g. data related to 'Define strategic change' and 'Set DT objectives'). A systematic verification process was also adopted to ensure each finding was justified by evidence from at least two data sources (Klein and Myers 1999). Data analysis was conducted via a highly iterative approach to move back and forth between empirical data, the relevant literature, the theoretical lens, and the developing process model (Eisenhardt 1989). The empirical data was organized using a combination of the temporal bracketing, visual mapping, and narrative strategies (Langley 1999). In particular, from our data, we identified three phases with distinct activities and objectives in relation to the attainment and execution of DT leadership. The relevant activities, events, and decisions at Topsun were subsequently distributed into the three phases to investigate how effective OCA was attained in Topsun's exercise of DT initiatives. Furthermore, a detailed narrative and several visual maps that outlined our interpretation of Topsun's initiatives were generated to summarize the massive data into a more manageable and organized form. The narrative and visual maps were then compared with the theoretical lens and relevant literature to shape the emerging theory (Walsham 1995). The nascent theory was then depicted in sketches, and together with the narrative and visual maps, were verified with the informants for the validation of our interpretation. This process continued until a state of theoretical saturation was reached (Pan and Tan 2011) where our findings can be comprehensively explained and no additional data can be collected to improve our developed model (Eisenhardt 1989).

Preliminary Findings

The preliminary findings from our study suggest that the attainment and enactment of supply network DT leadership is a sequential process of at least three phases consisting of four initiatives: the core firm needs to be **articulating** a strategic vision, before **actualizing** the DT initiatives internally and **advocating** for DT externally. This is followed by **assembling** the external entities for collective action (refer to Figure 1). Of the four, articulating and advocating set cohesive strategic goals at the enterprise and inter-organizational levels respectively, which represent the motivational dimension of DT (Lunenburg 2011). Actualizing and assembling, on the other hand, represent the behavioral dimension of DT after the strategic cohesiveness is in placed on the two levels to enable attainment of the DT leadership.

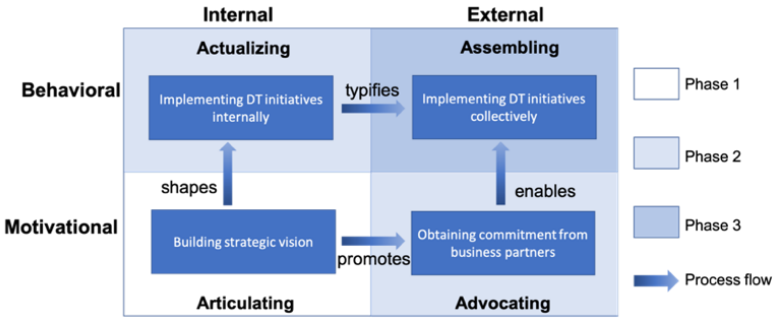

Figure 1. Process Model of Attaining and Enacting Supply Network DT Leadership

Phase 1: Articulating a Strategic Vision

Articulating refers to the phase in which the core firm attempts to achieve internal strategic cohesion towards DT and establish an overall strategy that guides the internal DT process. As with most traditional manufacturers, Topsun's strategy was volume and profit-oriented prior to DT, which emphasized the generation of sales and revenue. The DT and supply network-oriented initiatives of Topsun were triggered in response to the drastically changed macro-economic environment and the firm's internal organizational restructuring in 2008. The Deputy General Manager (DGM) explained their change of strategic direction: *"We modified our operational strategies correspondingly, or it could be seen as a transformation of our supply network. We shifted our attention to outsourcing and subcontracting to transform incrementally, and internally we aimed for lean production… The demand for digitalization and new types of talents became essential"*. He also stressed that the primary driver for implementing DT initiative was *"a top-level design"*. This referred to an overarching strategy that was needed at the initial stage as it would serve to

coordinate the subsequent DT initiatives, and serve as a unifying concept to integrate the firm's DT efforts, including coordination, prioritization, and implementation (Hess et al. 2016). To this end, a new Chief Digital Officer (CDO) was hired to collaborate with the strategic planning team and be in charge of the planning, development, implementation, and modification of DT initiatives. Topsun's DT planning and action team consists of core members from the IT department (i.e., the CDO and Deputy Department Head), the strategic planning team (e.g., the DGM), and the lean management team (e.g., Senior Engineers). The CDO, together with members of the strategic planning team, first set the primary goal of standardizing production processes so to minimize production wastage. To realize the goal, an extensive set of discussions were held with internal stakeholders identified by the team (e.g., managers and supervisors across Topsun's various BUs). Projects were then established to develop new systems, interlink various systems across different BUs and modules, establish the implementation agenda, and measure improvements. As a result, a detailed organizational DT strategy was established with clear objectives, an action agenda, and planned iterations in response to the changing market conditions and organizational priorities.

Phase 2: Actualizing Internally and Advocating Externally

With an established DT strategy in place, Topsun started enacting two initiatives in phase 2 with the DT team working as its executive arm. Topsun first needed to realize its established DT strategy internally to become a successful exemplar in the industry (i.e., actualizing internally). As indicated in phase 1, Topsun's prior profit-oriented strategy had been in place since the founding of the firm, which made the primary concern the traditional mindset of its employees. Consequently, Topsun firstly implemented employee training programs in collaboration with external agencies to induce changes in employee awareness, values, and equipment-use norms. The training results were then used in its internal operations while being modified and improved in relation to its established procedures. Meanwhile, Topsun aimed to standardize its manufacturing processes. As explained by the DGM of Topsun: *"We realized that it would keep getting harder for the industry post 2008… the best industry talents back then were mostly in the Pearl River Delta region, where manufacturers are thoroughly systematized and standardized… We had to learn quickly, to transform and improve"*. To this end, the firm attempted to integrate various business processes and facilities via systems developed in-house (e.g., a Warehouse Management System and an Advanced Planning and Scheduling System), which enabled systems customization to better meet Topsun's ongoing production and operating requirements. Overall, these actions enabled an organization-wide reorientation towards standardized digitally-enabled manufacturing. The integration of various BUs streamlined the management procedure (e.g., cost control) and established product line-, as opposed to BU-, based processes. The actualization of its DT strategy made Topsun an exemplar within its industry. Topsun's management also realized that the interdependence between the supply-network entities underscores the far-reaching and profound DT impact on the supply network as a whole.

Topsun's DGM explained: "*We need to interlink the supply network as a whole to improve efficiency…the elimination of our business partners means we are moving closer to death because we are highly interdependent in nature*". Thus, the second initiative in this phase was to leverage the firm's internal DT to promote Topsun's successful DT model to its supply network partners, and mobilize them for the implementation of their own DT initiatives (i.e., advocating externally). Because most of its business partners are profit-oriented SMEs that lacked the resources and capabilities to have their own internal DT team and infrastructures, the focus of advocating was on inducing a mindset change (Bate 2010) and incentivizing (Milliman and Prince 1989) DT. To do so, Topsun assigned internal stakeholders that have established stable relationships with its business partners to present the economic benefits of Topsun's DT initiatives, and assist them in establishing their own DT objectives to align with Topsun's goals. Next, Topsun set relevant procedure requirements for its business partners to meet in order to strengthen their mutual partnership. For instance, Topsun required the tracking of materials from its suppliers, which demanded digital identification equipment and systems integration with Topsun. Through these actions, many of Topsun's key business partners were influenced, and began incorporating collective DT objectives into their strategies.

Phase 3: Assembling Network Partners for Collective Action

The DT initiatives implemented internally by Topsun provided the firm with invaluable implementation experience, demonstrable results, and the legitimacy to lead its supply network members. Meanwhile, the

external promotion of its DT vision was an indication of Topsun's commitment to extensive DT, generated awareness and prepared its business partners for collaboration. Together, Topsun was now equipped to lead the supply network implementation of DT initiatives (i.e., assembling its network partners for collective actions). Topsun is presently aiming to construct what is termed an "industrial internet" to deepen its engagement and interactions with the entities within its supply network. The CDO described this initiative: *"Unlike the conventional industrial internet, which focuses on driving devices with obtained data, the industrial internet we are building is to realize a smooth and transparent supply network information flow via digital technologies*". To this end, Topsun built a platform named "Outsideasy" to enable its network partners to document and exchange order- and operations-related information on a daily basis (e.g., available orders and material requirements, tracking and product information, production techniques instructional videos). Next, its key business partners acquired essential DT infrastructures with help from Topsun to strengthen the informational linkages along the supply network (e.g., lowering materials and time consumption). Topsun's internal stakeholders were then sent to these enterprises for support the implementation of these initiatives. The Deputy Head of IT explained: "*After these projects, our suppliers saw the huge benefits of DT towards their business and their linkages with us, and have been asking their suppliers to adopt similar processes. This is our intended way of driving and leading DT industry-wide*". The result of these DT initiatives was standardization and systemization across organizational boundaries, resulting in increased efficiency and operational effectiveness across the entire supply network.

Discussion and concluding remarks

Although our study is still in progress, we believe it already hints several theoretical contributions. First, our preliminary model is a conceptual innovation that introduces the notion of DT leadership and describes the underlying mechanism of attaining and enacting DT leadership within a supply network. This mechanism consists of three phases: strategizing, mobilizing, and executing. Second, this study contributes towards addressing the lack of research on supply network-level DT and DT leadership in IS literature. More specifically, this study indicates that to attain DT leadership, a core firm of a supply network has to craft a DT strategic vision and actualize the vision internally to establish its legitimacy as a DT leader by leading by example. It also sheds light on how to achieve effective OCA in the implementation of DT initiatives across a supply network, which is particularly important as effective collaboration beyond a few key entities are crucial to extending the benefits and impact of DT industry-wide (Huxham and Vangen 2000).

This study also has implications for practice. In particular, leading firms within a supply network with the capacity and motivation to exercise DT leadership could use our model as a roadmap to identify the appropriate actions to undertake and the resources to acquire towards DT. In doing so, it is hoped that they can unlock the potential of existing and emerging technologies, and channel them toward revitalizing and reinvigorating the businesses of traditional manufacturers.

Acknowledgement

This research was supported by a research grant from the Zhejiang Merchants Entrepreneurship and Development Center of Zhejiang Gongshang University, and the Special Funds Project for Promoting the Level of Running Local Colleges and Universities in Zhejiang Province (Interdisciplinary Innovation Team Building of Internet and Management Change).

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