

PRODUCTION VALUE CHAIN MODEL FOR SUSTAINABLE COMPETITIVE ADVANTAGE

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Abstract:

In the Fourth Industrial Revolution, 4IR, manufacturing firms face more competitive environments, rapidly changing information and communication technologies (ICTs), and customers' preferences than ever before. This paper analyzes relevant literature and proposes a systemic customer-centric knowledge-based production value chain (KPVC) to leverage distinctive core competencies (DCCs) and create sustainable competitive advantage (SCA) in manufacturing contexts. The paper introduces an integrative customer-centric KPVC model that enables companies to respond to environmental drivers, leverage DCCs, and create SCA. It adopts an exploratory approach to developing a unified and inherently interdisciplinary model based on a review of relevant scholarly literature. The KPVC integrated model comprises production value chain (PVC), knowledge management (KM) processes, and business process re-engineering (BPR) enabling activities. A successful move to KPVC requires a fully integrated and automated system allowing firms to define, track, and manage their work processes. Effective KPVC is a principal approach for leveraging DCCs in the quest for achieving SCA in today's competitive business world and generating better values for customers and companies.

Key words: *knowledge management, value chain, strategic imperative, competitive advantage*

INTRODUCTION

In the 21st century Fourth Industrial Revolution, 4IR, or Industry 4.0, manufacturing firms face more competitive environments, rapidly changing information and communication technologies (ICTs), and customers' preferences than ever before. These new technologies enable ever-higher production efficiencies [1]. Firms are now exploring new ways to integrate business processes under ICTs into a customer-oriented response strategy to develop high customer value. A knowledge-based production value chain (KPVC) has been introduced within this context to leverage the firm's DCCs to deliver the highest value for both customers and companies. A value stream is a new approach to generating business models that maximize business potential, minimize costs, and provide the respective enterprise with high-level competitiveness in the long term [2].

Models of business competitiveness have shifted their focus from external factors related to the market to internal factors based on tangible and intangible assets of organizations. Tiwana [3] argued that knowledge is the only source for innovation and SCA. Therefore, effective development, maintenance, and expansion of corporate

knowledge are becoming a strategic imperative for SCA in virtually every industry [4].

The increasing dominance of knowledge as a basis for improving the efficiency and effectiveness of organizations triggered many companies to find new ways of utilizing the knowledge they have gained in devising or enhancing their business practices [5]. For instance, in facing shrinking business cycles, organizations seek to create and exploit people, processes, and technology-based knowledge faster and better and maximize their profitability by having product leadership through a shorter time to market and, if possible, a longer product life cycle [6]. Therefore, the product development cycle must shrink through delivering changeable knowledge-based capabilities and features.

As the World's economy is shifting from a traditional to a knowledge-based economy, the importance of customers to business firms has created brutal 'rivalries' over acquiring new customers or retaining/expanding relationships with current ones. Knowledge is becoming the new competitive weapon in e-business. It enables companies to serve each customer in their preferred way and nurture profitable and durable customer relationships [7, 8].

The SCA of organizations usually comes from what it knows, how quickly it acquires new knowledge, how efficiently it uses it, and how quickly it applies new knowledge. Effective development, maintenance, and expansion of knowledge and relationships are becoming the strategic imperative for customer-centric SCA [4, 9]. Therefore, organizations that want to create and sustain success in the 21st century must act in a way that continues to provide value for clients and profit for themselves through resources, i.e., knowledge, that is inimitable, non-transferable, and immobile [10].

The basic notion of the paper holds that organizations respond to environmental changes through organizational response activities that seek to diffuse existing pressures, exploit existing opportunities, or create new opportunities. The paper introduces an integrative customer-centric KPVC model that enables companies to respond to environmental drivers, leverage DCCs, and create SCA. The specific objectives of this paper are as follows:

- Introduce the KPVC as a strategic manufacturing model in today's fast-changing and highly competitive marketplace.
- Adopt various perspectives to help organize thoughts related to KPVC building blocks of several interdisciplinary subjects.
- Explain the theoretical contribution of the study to existing literature,
- Discuss the paper's implications, limitations, and future directions.

The paper proceeds as follows: it starts with a review of the adopted theories, methodology, results and discussion, a theoretical contribution to existing literature, implications, limitations, future trends, and concluding remarks.

THEORIES ADOPTED IN THE STUDY

This paper conceives KPVC as a holistic model that integrates interrelated concepts, techniques, and methodologies to leverage DCCs and create SCA in response to dynamic business environments. The conceptual foundations of the proposed KPVC model include knowledge management (KM), production value chain (PVC), and business process re-engineering (BPR) that amalgamates through a literature review as a new perspective.

Advancements in ICTs have transformed production systems and created challenges and opportunities for business models. Digital transformation is a holistic socio-technical challenge that affects employees, structures, tasks, and organizational procedures. The competitiveness of companies does not exclusively depend on integrating the latest technologies but also depends on how good companies address the interactions with customers and partners, the adjustment of organizational routines, and the creation of an appropriate corporate culture [11]. The far-reaching disruptive power of ICTs has created the mantra that spotting disruptive new technologies and finding beneficial ways to employ them is imperative for corporate survival. Organizations can generate perfor-

mance differences in the face of disruptive digital transformation change by learning and adjusting their existing business models to a changing world. The dynamic capabilities theory argues that the key to success in a disruptive digital world is rooted in organizations' abilities to sense changes in the environment, seize upcoming opportunities, and adapt, integrate, and reconfigure the current resource base [12].

Knowledge is a complex entity [13] that involves knowing more tacit and explicit knowledge [14]. It is an understanding of information and its associated patterns [15]. It is also believed that 90 percent of the knowledge in any organization is embedded in and synthesized in people's heads only [16, 17]. Therefore, knowledge can be broadly categorized into explicit and tacit knowledge, and both work interdependently and, in turn, lead the organization to the path of success [18].

If all knowledge were codified and made formal or explicit, the KM function would be little more than compliance and management [19]. Davenport et al. [20] define KM as a process of collection, distribution, and efficient use of knowledge resource throughout an organization. KM is a process that facilitates knowledge sharing and establishes learning as a continuous process within an organization [21]. It is a type of organizational change; wherein the level of support by top management determines its success or failure [22].

Porter [23] and Normann [24] used the idea of a value chain to show how companies add value to their raw materials to create products or services to meet customer needs and preferences. The concept of the value chain comes from a business management perspective. Value chain managers look for opportunities to add value to the business. They may look for ways to cut back on shortages, prepare product plans, and work with others in the chain to add value to the customer. The PVC includes primary inbound logistics, operations, outbound logistics, marketing and sales, and service activities. The support activities are infrastructure, human resource management, technology development, and procurement.

In a knowledge-based economy, the primary strategic resource of a company is its knowledge capital. In facing competitive, dynamic, and complex business environments, organizations seek to create an SCA over their rivals. In the quest for SCA, organizations utilize their DCCs. Effective strategies allow organizations to optimize their resources and develop the ability to extract opportunities and limit threats to achieve SCA [25]. The need here is to deliver knowledge:

- a) at the *right* time,
- b) at the *right* place,
- c) in the *right* format.

The result is to use knowledge to create value for customers and companies [5]. Knowledge is developed as a non-depleting resource that, unlike other business resources, the more knowledge is shared, the more new knowledge is generated. Knowledge sharing is a successful way to improve knowledge-intensive processes and create value for customers and profitability for the business.

Several streams of research converged to produce a new theory of the firm, viz., the firm's knowledge-based view (KBV). These streams include the RBV of the firm, epistemology, and organizational learning [26]. Today's world economy has shifted its focus from tangible to intellectual resources. Although some academic resources are more visible than others, most consist of employees' expertise, know-how, know-why, and experience [27, 28]. In the KBV of a firm, competitive advantage or positioning is created through knowledge-intensive competencies that maximize value-adding offerings to customers.

Organizations need to analyze and leverage their knowledge-based DCCs and build upon ICT infrastructures such as networks, intranets, extranets, and systems required to generate knowledge, such as data mining and project management. Intranets, extranets, and GroupWare systems must integrate well into an organization-wide system. E-biz solutions must also be combined with backbone legacy and enterprise systems and organizational databases. Such integration requires substantial re-engineering [29]. Therefore, BPR has been introduced in building KPVC as a strategic, unique, and challenging to imitate DCC in competitive business environments. It is based on reorganizing people, retooling ICTs, and redesigning processes to coordinate work activities, information, and knowledge to produce a product or service through business processes. Value-adding business processes enhance the creation of DCCs and contribute to organizational success and SCA achievement [30, 31].

BPR is identified as one of the most important solutions for organizational improvements in all performance measures of business processes [32]. It is a significant enabler of the KPVC model for knowledge-based cross-functional cooperation, coordination, and integration, which often trouble firms with their customers. It should be conducted to understand the vision, strategy, and competitive directions in customer processes and services. Organizations can only improve in operational performance, service quality, and customer satisfaction through streamlining business processes. BPR is not about process automation of existing work methods to speed them up without addressing their fundamental deficiencies. ICT power needs to be used not to automate outdated processes but to 'obliterate' them [33].

METHODOLOGY

The paper provides a comprehensive approach that ultimately helps leverage DCCs and achieve SCA. It proposes KPVC as multiple paradigms in a holistic business model by adopting an exploratory approach to developing the model based on a review of relevant scholarly literature. Exploratory research is undertaken to explore something new or clarify ambiguous problems in a specific situation and when a particular issue of interest has not been clearly defined. Further inquiries could be gained from secondary data previously collected in literature [34]. Usually, exploratory research sets the groundwork for further investigation as it is conducted with the expectation

that additional research will be needed to provide more conclusive evidence [35].

RESULTS AND DISCUSSION

The reviewed literature lacks a simple customer-centric knowledge-based strategic production model for profitably anticipating and meeting customers' needs. Constructing a KPVC strategy requires a set of activities, i.e., plan, design, build, and implement, which seek to create or leverage the firm's DCCs to attain an SCA.

Preliminary Assumptions of the KPVC Model

The model assumes that the SCA is generated through customer-centric knowledge-based production value chain activities that maximize the utilization of DCCs. The preliminary assumptions of knowledge that are suitable for creating a customer-centric SCA are as follows [36, 37]:

- Subjectivity: context and individual background shape the interpretation of knowledge.
- Transferability: knowledge can be extracted and transferred to other contexts.
- Self-reinforcement: knowledge is the only unlimited resource, the one asset whose marginal utility increases and does not decrease once used or shared.
- Perishability: knowledge can become outdated.
- Serendipity (spontaneity): knowledge can develop unexpectedly in a spontaneous or incidental process (e.g., water cooler knowledge exchanges).
- Velocity: the *speed* with which knowledge moves through an organization (e.g., computers and networks enhance knowledge velocity).
- Viscosity: *richness* or *stickiness* of detailed or subtle knowledge transferred (e.g., apprenticeship or mentoring relationship).

Building blocks of the KPVC model

A business model is conceived as a high-level approach to conducting business. The model outlines how a company adds value by creating new or revising existing products, services, and processes. A model is a short set of ideas and assumptions for organizing our thoughts about a particular situation or event and enables us to make sense of the World's complexity [38]. It may also be seen as a simplified and systemic approach for representing and understanding components and interrelationships among elements of a particular situation or event.

The KPVC model is proposed as a holistic production model that integrates concepts, techniques, and methodologies rooted in people, processes, and technology to create profitable and loyal customers. The proposed KPVC provides a multi-paradigm model that integrates the perspectives of PVC, KM, and BPR. The KPVC explains how a business acquires data from suppliers or customers as input, subjects the data to various KM processes, produces products and services, creates value for customers and organizations, and masters the learning. Throughout the strategic change development, the goal is to leverage DCCs and create an SCA over competitors in a particular

industry. The KPVC value chain perspective (Figure 1) is divided into three parts: PVC, KM processes, and BPR activities.

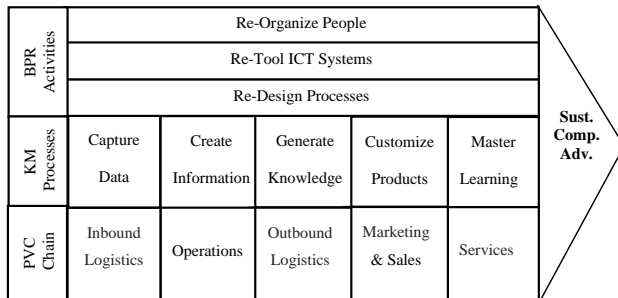


Fig. 1 A Customer-centric KPVC Model

Production Value Chain (PVC)

The PVC includes core and support activities. The primary value chain activities are as follows [23]:

- Inbound Logistics: Receiving, warehousing, and inventory control.
- Operations: Value-creating activities transforming inputs into products, such as assembly and manufacturing.
- Outbound Logistics: Activities required getting a finished product to a customer. These include warehousing, inventory management, order fulfillment, and shipping.
- Marketing and Sales: It refers to activities associated with getting a buyer to purchase a product.
- Service: Activities that maintain and enhance a product's value include customer support and guarantee service.

KM Processes

KM refers to the methodologies and techniques employed in acquiring and distributing valuable customer-derived knowledge concerning customer services or products throughout an organization [39]. KM is needed to capture simple transactional information, i.e., ICT systems, extend strategic partnerships, and develop new products and services. As organizations grow and interact with more and more customers through increasingly diverse media and channels, having a systematic approach to KM becomes critical.

The premise of knowledge-based strategies is based on an organization's ability to create or leverage its DCCs to attain an SCA. The proposed KPVC model aims to help organizations develop long-lasting and profitable relationships based on valuable customer desires and profiles. The KPVC model is presented as an integrated approach for leveraging DCCs in the quest for achieving SCA in today's competitive business world. KPVC is not just about social (people-based) or transactional (technology-based) knowledge; instead, it is a knowledge-based strategy enabled by holistic changes manifested in people, processes, and technology. It represents a shift from product-focused, hierarchical, and function-based data-oriented production to knowledge-based, networked, and process-based learning organizations.

The KM value chain activities include the following:

- Capture Data
- Create information
- Generate Knowledge
- Customize products and services, and
- Master learning

BPR Enabling Activities

BPR tackles the company's reorganization from a functional (departmental) organizational structure to a horizontal (process-orientated) organizational structure. BPR enabling activities include these significant pillars: people, processes, and technology to streamline the primary PVC activities. The 'enabling' actions relate to creating an ICT-based network structure and cross-functional teams, designing a business process orientation, and empowering employees. The three pillars represent the KPVC value chain *enabling* activities that transcend KPVC primary activities. The three KPVC enabling tools are as follows:

- Reorganize People: represents a change in the human resources and organizational structure.
- Retool ICT Systems: represents changes in the ICT infrastructure.
- Redesign Processes: represents changes in business processes.

Because computing in networked production environments is distributed, many people may share their knowledge and experience and make critical decisions. ICTs are fundamental to process redesign as they improve process efficiency, effectiveness, and flexibility. Decision-making is more timely and accurate because data are collected and stored instantaneously. The extensive use of ICTs makes it easier to coordinate functional business units. Simply put, ICTs tie together people, processes, and organizational units [40].

THEORETICAL CONTRIBUTION

A literature review lacks a comprehensive conceptual model for KPVC. This paper proposes an integrative model of a KPVC strategy that seeks to add value to the existing literature in terms of the following:

- It provides a concise and holistic customer-centric KPVC model for an inherently interdisciplinary subject matter. Different disciplines have been integrated into a unified model that tells a coherent story.
- It introduces a model that can be used as a high-level blueprint for KPVC implementation in manufacturing settings.
- It integrates critical organizational pillars of people, structure, processes, technology, and data/information in a way that cuts across KPVC processes and advances the cause of system thinking in the search for SCA.
- It addresses process re-engineering to secure a robust and lasting business strategy that is not just a technological solution. These processes cut across many functional areas and are linked by information flow via advanced ICT.

IMPLICATIONS

The current study focuses on identifying various parts and perspectives that create SCA, as knowledge is becoming the new competitive asset in e-business, enabling companies to serve each customer in their preferred way and nurture profitable and durable customer relationships. Effective KPVC is introduced as a principal approach for leveraging DCCs in the quest for achieving SCA in today's competitive business world and generating better values for customers and companies.

LIMITATIONS

Being a theoretical study, the KPVC model presented in this study did not develop or validate any scales for the model variables. Hence, no empirical tests have been conducted to validate constructs of the model and their interrelations and credibly test the theory in practice.

FUTURE DIRECTIONS

It would be interesting for future studies to investigate the findings of this paper as an empirical study by shifting the focus from management theorization to assess the actual implementation in a particular manufacturing case. Case studies are needed to examine the relationship between leveraging DCCs and the overall performance improvement and SCA due to the deployment of KPVC.

To leverage DCCs and create SCA, companies in the future will realize that they require systemic, dynamic, creative, innovative, and strategic thinking rather than conventional, structured, systematic, and prescriptive programming. Adopting knowledge-based non-conventional business solutions is becoming a strategic imperative for SCA in non-conventional business settings.

The vast majority of business organizations in the future would find it inevitable to shift from conventional factors such as product, price, physical location, and physical distribution channel towards customers as a crucial factor for the achievement of SCA. Future competition is likely to continue the shift from internal (product-based) to externally focused strategies (customer-based) and from traditional development of tangible and easy-to-imitate to difficult-to-imitate knowledge-based customization of products and services.

Although business managers and their staff are the knowledge users of ICT systems, active involvement, support, and participation from senior-management levels and ICT managers are essential to implement the KPVC strategy successfully. The holistic organizational transformation focus should continue to be preserved in the future. Therefore, the business should continue to drive KPVC adoption, whereas ICT would be its enabler.

CONCLUDING REMARKS

By growing traditional competitive strategies, contemporary organizations can no longer face turbulent marketplace dynamics. Price or product has traditionally been a competition base for businesses, but today's competition grounds have shifted towards speed, quality, flexibility, and customer intimacy. It is challenging for companies to

take a competitive position for granted as local and global market conditions constantly change.

The traditional market-based view of competitive strategy is based on the firm's external business environment and the threats of competition. Resource-based models of the firm would argue that a firm could only achieve a competitive advantage when its resources are rare and inimitable. In the knowledge-based view of a firm, competitive advantage or positioning is created through knowledge-intensive competencies that maximize value-adding offerings to customers.

The long purpose of designing the KPVC model is the nurturing of SCA. The ability of organizations to successfully compete in dynamic business environments and maximize profitability is becoming highly related to leveraging DCCs that others cannot easily emulate, e.g., the ability to continue to use knowledge to maximize customers' experience through new or revised products or services. Current competitive challenges induced by turbulent and complex business environments have forced companies to identify and create knowledge-based DCCs to secure long-term SCA, i.e., enduring relationships with customers to maximize profitability.

KPVC has been introduced as a holistic production model to leverage the firm's DCCs and create SCA. Adoption of KPVC strategic change demands changes in processes and the social, structural, and technical elements. Therefore, manufacturing organizations that want to create and sustain success in the 21st century must act in a way that continues to provide value for clients and profit to themselves through resources, i.e., the knowledge that is inimitable, non-transferable, and immobile. Organizations may need to shift their orientation from internal focus (products) to external focus (customers), from conventional to creative, strategic planning; from technology to 'tech-knowldgey' emphasis, and from single to dual company-customer relationships.

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