

***DYNAMIC CAPABILITIES IN MANUFACTURING: THE MAIN  
ROLE OF MANUFACTURING CAPABILITY, KNOWLEDGE RE-  
SOURCES AND ENVIRONMENTAL TURBULENCE TO IMPROVE  
ENTERPRISE PERFORMANCE***

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*Received May 2015; accepted August 2015*

**Abstracts**

The aim of this study is to identify and analyze of influence manufacturing capability and knowledge resources on dynamic capability also implication toward enterprise performance. Environmental turbulences are existed as intervening variable enterprise performance. This finding integrates insights in dynamic capability framework into a generalization of the enterprise performance in manufacturing. This research applied a random sampling method to collect responses and increase the generalizability obtained number of respondents. Hence, this study applies questionnaire methods as the main research tools in order to conduct an in-depth investigation. The research used mix method in triangulation transformation model. Furthermore, this research is expected to provide enterprises with valuable suggestions for management practices to increase enterprise performance in manufactures.

**Research paper**

**Keywords:** *Dynamic Capability, Enterprise Performance, Knowledge Resources, Manufacturing Capability, Environmental Turbulence*

**Reference** to this paper should be made as follows: Sarjana, S. (2015). “Dynamic capabilities in manufacturing: The main role of manufacturing capability, knowledge resources and environmental turbulence to improve enterprise”, *Journal of Entrepreneurship, Business and Economics*, Vol. 3, No. 2, pp. 41–64.<sup>1</sup>

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<sup>1</sup> This paper is a revised and expanded version of a paper presented at the International Conference on Entrepreneurship, Business and Social Sciences, Indonesia in 2015.

## **Introduction**

The evaluating performance of enterprise is playing a more and more vital role in modern enterprises (Zhang, et al, 2014). Enterprise production and management capabilities, process and results can be reflected through a number of financial indicators and innovation ability index (Fu, 2013). In dynamic industries where life cycles can be extraordinarily short, firms that are slow to market lose any launch advantages such as building an installed base or encouraging complementary goods. They may also be unable to fully amortize fixed costs before their product is obsolete (Shilling, 2010). The ability to connect two of the most popular concepts of today in the field of performance measurement is reflected in the use of economic value added as a measure of financial performance under the balanced scorecard model and the strategic management of the whole enterprise (Bogavac et. al, 2014). The capabilities of a manufacturing system are a key determinant of performance and drive competitiveness over time (Hayes et al., 1988).

The city is an economic entity, the sum of its economic strength and resources, and the jobs and business opportunities it offers. The city is a social or demographic entity, made up of the people who live in the city, their connections and relationships; and perhaps, albeit to a lesser extent, those who occupy it more briefly, such as commuters and visitors. The city is a physical entity, its geography, the vitality of its neighborhoods, the quality of its environment, and the soundness of its infrastructure. The city is a political entity, an entity within legally defined boundaries, containing a local government, with the public resources, capacity, and leadership it provides (Mallach, 2013). The city is emerging as the leader of transformation in

terms of service sector development and attracting foreign direct investment (Drobniak & Skowronski, 2012). City development is related to industrial development, and industrial development is related to city development (Bailey & Cowling, 2011). The city has received an important contribution to its identity and improved its quality of life (Ertas & Ozdemir, 2013). The industrial policy implications for cities are subsequently explored in terms of building new industrial districts, developing high skill ecosystems, and fostering multinational webs of cities, all with the aim of ensuring the conditions exist in cities for creativity and development to flourish, notably a diverse and democratic economic system (Bailey & Cowling, 2011).

## **Literature Review**

### **Enterprise Performance**

Enterprise performance (EP) is defined as a composite result of all the performance indicators categorized in different perspectives, views and models (Andreescu, 2008). EP is measured by return on sales and return on investment (Gao and Tian, 2014). EP management system focused on the monitoring, planning, and managing the performance of an enterprise (Woolman, 2014). EP evaluation can make objective and fair judgment of an enterprise's operational effectiveness in a certain operating time. This will help to guide this enterprise to promote its reform and innovation, thereby enhance the competitiveness of this enterprise (Zhang, et. al, 2014). Measure of performance in today's enterprises provides more a balanced perspective instead of only one (financial). The complexity of business processes has influenced the management to develop performance measurements, while the new information technology was the factor that enabled the revolution of

measurement and measurement of performance in real time. (Bogavac et. al, 2014). The recognition of environmental turbulence is a main element in the strategic success through developing performance (Al-Nuiami, et. al, 2014).

EP management has primarily consisted of the finance and accounting tasks of budgeting, planning, forecasting, analysis, and reporting. EP management should be employed more broadly across an organization as a management operating system, enhancing the execution of the organization's strategy (Anderson, 2015). EP management systems are often deployed in a wide range of scales, in terms of number of users and services, quantities of data stored and manipulated, rates of processing, numbers of nodes, geographical coverage, and sizes of networks and storage devices. Scalability means not just the ability to operate, but to operate efficiently and with adequate quality of service, over the given range of configurations (Jogalekar, et. al, 2000).

Performance measurement systems are an extremely important part of the control and management actions, because in this way a company can determine its business potential, its market power, potential and current level of business efficiency. The significance of measurement consists in influencing the relationship between the results of reproduction (total volume of production, value of production, total revenue and profit) and investments to achieve these results (factors of production spending and hiring capital) in order to achieve the highest possible quality of the economy. Measuring performance allows the identification of the economic resources the company has, so looking at the key factors that affect its performance can help to determine the appropriate course of action (Bogavac et. al, 2014).

### **Dynamic Capability**

Dynamic capability (DC) is crucial for an enterprise to be able to cope with changes in the environment by delivering the right knowledge at the right time to the right person, as well as encourage knowledge sharing in order to achieve organizational goals, thereby enhancing organizational performance (Quinn, 1999). DC is indirectly defined as an ability to create and reconfigure the resources to adapt rapidly changing markets (Wang & Ahmad, 2007). DC represent the ability of a firm to create new manufacturing processes and new products / services in order to rapidly respond to changing environments (Helfat et al., 2007; Teece, 1998). DC also refer to a firm's ability to integrate, establish, and redeploy internal and external resources into the best configuration in order to be able to create and develop new capabilities and create new market opportunities (Eisenhardt and Martin, 2000; Wu, 2007). According to Pavlou and El Sawy (2011), dynamic capabilities are usually embedded in organizational processes and routines that allow an enterprise to adapt to the changing market conditions in order to reconfigure its source base, enable morphing and adaptation, and eventually achieve an edge over competitors. Wu (2006) further found that dynamic capability is a crucial intervening variable that transforms resources into performance, which means that if enterprises can utilize dynamic capabilities, it is possible to manage internal and external resources to enhance organizational performance and gain high competitive advantage.

Wang and Ahmad (2007) defined DC as the firm orientation stable behavior to renew, integrate, recreate and reconfigure their capabilities and resources. Reconstructing and upgrading their core capabilities in response to the dynamic market are considered essential to sustain competitive ad-

vantage. If a firm with highly dynamic capabilities is able to quickly cope with the dramatic changes in the external environment, it can establish competitive advantage and increase their market value. However, it is difficult to build a new capability as it demands effective organizational processes for new learning (Liu and Hsu, 2011). DC is defined as the orientation stable behavior of firms to renew and integrate their capabilities and resources upgrade their core capabilities in response to the dynamic market to sustain competitive advantage is used as moderating variable (Dadashinasab and Sofian, 2014). Pavlou and El Sawy (2011) explain four DC such as sensing, learning, integrating, and coordinating capabilities, as a sequential logic to reconfigure existing operational capabilities. Sensing capability is the ability to identify, interpret, and pursue opportunities in the environment, while learning capability is the ability to enhance existing operational capabilities with new knowledge. Integrating capability is the ability to assimilate individual knowledge with the unit's new operational capabilities, and coordinating capability is the ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities. There are three critical components of DC, which are: capability possession (i.e. having distinctive resources), capability deployment (i.e. allocating distinctive resources), and capability upgrading (i.e. dynamic learning and building new capability) (Luo, 2000).

The primary premise of the DC framework is that a firm has operational capabilities and resources that are directly involved in enterprise performance by converting inputs into outputs and dynamic capabilities that influence enterprise performance indirectly by updating, integrating and reconfiguring a firm's existing operational capabilities and resources (Teece,

Pisano & Shuen, 1997). DC emphasize the transforming of environmental characteristics and how the firms manage to adapt, integrate, and reconfigure the internal and external organizational resources to compete with the dynamic environmental conditions (Teece, 2007). Some capabilities act as both dynamic and operational capabilities and they are used to renew operational capabilities to simultaneously maintain a firm's current operations and to positively influence overall firm performance (Helfat and Winter, 2011). DC creation processes are directly related with R&D (Hsu and Wang 2012).

A firm that understands how a given DC is linked to its existing operational capabilities will be more successful at renewing its operational capabilities and gaining a competitive advantage than firms that lack such understanding (Gao and Tian, 2014). Two premises of the valuable DC are necessity and feasibility. DC as a kind of organizational routines, are source of transformation and stability which are consistent with organizational routine duality viewpoint. Based on the necessity of implement of DC, the adjustment time of the changes is needed (Tiantian et al., 2014).

### **Manufacturing Capability**

Manufacturing Capability (MC) refers to capability simultaneously maintains a high level of balanced performance in productivity, quality, lead times, and flexibility. As mentioned above, this capability involves a system of consistent organizational routines that collectively control the efficient flow of good design information (i.e., value-added) to customers (Fujimoto, 1999, Sooreh et al., 2011). MC is embodied by all available manufacturing resources and corresponding processes which can be performed by those

resources, as well as the knowledge about how these resources and processes could be effectively, economically used (Zhao and Cheung, 1999). MC is the most basic part of the original capability and the core operational capability in manufacturing enterprise (Gao and Tian, 2014). MC has achieved the strategic capability in the process of manufacturing (Roth and Velde, 1991). Skinner (1969) consider that MC is the most important element to construct the enterprise competitive advantage. Manufacturing can provide organizations with certain competitive power. These capabilities can be used as a competitive weapon, achieving manufacturing performance in cost, quality and time dimensions.

MC is the core operational capability in manufacturing enterprises and MC as the operational capability in dynamic capability framework (Gao and Tian, 2014). MC information modelling involves mainly how to represent manufacturing processes, resources, the constraints imposed on them, and their relationships (Molina et al, 1995). Literature in the operations management field has currently classified MC into five types: quality, cost, delivery, flexibility, innovation (Ward et al, 1995). MC of the organization can be enhanced by investing in new equipment and technologies and gives little emphasis to improving infrastructure such as planning and measurement system and work force policies (Hayes & Wheelwright, 1984).

### **Knowledge Resources**

Knowledge is a much richer construct than data or information (Davenport & Prusak, 2000). As a resource, knowledge can be accumulated, manipulated, disseminated, aggregated, and leveraged to achieve a variety of distinct purposes including either replication or creating increases in the general



knowledge stock of an organization (Lengnick-Hall & Griffith, 2005). As indicated previously, knowledge is defined in this research as an intangible resource that consists of interpreted information useful for creating strategic capability (Davenport & Prusak, 2000; Lengnick-Hall & Griffith, 2005). Intangible resources are non-physical resources that are typically embedded in routines and practices and have intrinsic productive value that has evolved over time to create distinctive organizational capabilities (Barney, 1995).

Increasingly the business world's attention is migrating to resources and more specifically to knowledge resources (Grant & Baden-Fuller, 2004; Coff et al, 2006; Turner & Makhija, 2006). While these perspectives have generated many useful insights, a strategic, resource-based view (RBV) view suggests the need for a definitional anchor that reflects a clear resource-based orientation and conceptualizes knowledge as a resource designed to accomplish a particular strategic purpose. In other words, a resource-based view of knowledge begins with an understanding of knowledge as a particular kind of asset and with a clear expectation of what we intend to do with that knowledge. Categorizing knowledge with respect to resource-related characteristics may resolve some of the equivocal findings in the knowledge management literature and provides a useful lens for theory and practice (Lengnick-Hall & Griffith, 2011). Knowledge Resources (KR) vary in the extent to which they are valuable, rare, difficult to imitate, hard to substitute, and require deliberate and specific actions to exploit effectively. KR enable an organization to understand what to do, how to do it, and/or why things work the way they do (Grant, 1996; Davenport &

Prusak, 2000). The management of KR was partly governed by an explicit but informally managed organizational strategy (Coyte et al, 2012).

An evidence-based KR is one of the two types of knowledge resources. Type of KR consists of knowledge about something (know-what) or how to do something (know-how) or an understanding of relationships (know-why) that is based on sound logic, repeated observation, and consistent results from careful implementation (Pfeffer & Sutton, 2006). To understand how knowledge can be a strategic resource it is important first to distinguish knowledge from data and information. Data comprise the discrete, objective facts about events that reveal very little about their importance or relevance (Davenport & Prusak, 2000). The firm's KR were developed in the active interactions between human capital in external and internal relationships and harvested to achieve additional sales, new product development and improvements in the efficiency of operational processes (Coyte et al, 2012).

Policy directed to SMEs needs to avoid the assumption that current activities are efficiently organized, adequately resourced and effectively executed, as this may not be the case and there may be substantial opportunities for improvement in these areas, before financial and knowledge resources are dissipated in intentionally capturing knowledge about, and investigating and commencing, new product/service ventures (Coyte et al., 2012). From a resource based view, KR can be simple or complex, tacit or explicit, codified or un-codified in varying combinations of the traditional ways that knowledge has been characterized conventionally (Lengnick-Hall & Griffith, 2005).

Six characteristics help distinguish the potential competitive value of KR in terms of their connection to strategic intent: completeness, proven success, immediate utility, malleability, leverage potential, and catalytic capacity. A knowledge resource is characterized by completeness if it contains all the necessary information elements, interpretations, connections, procedures, and sequences for effective application without further manipulation or analysis. Proven success means that the KR has specific (focused), objective, measured, and tested demonstration of consistent desired outcomes resulting from its application. A KR has immediate utility if it can achieve measurable and predictable performance gains as soon as it is fully implemented in a new setting. A KR is considered malleable if it is readily customized, interpreted, blended, analyzed, and manipulated to be useful for a variety of different applications. A KR has high leverage potential if it complements other resources and serves as a linking pin across a firm's tangible, intangible, and capability assets. A KR has catalytic capacity if it triggers creativity, innovation, resourcefulness, and new insights. These characteristics are used to differentiate between two types of KR. The first three characteristics are highly associated with evidence-based KR and the latter three with tinkerable knowledge resources (Griffith, 2012).

### **Environmental Turbulence**

Environmental Turbulence (ET) is one in which frequent and unpredictable market and or technical changes within the industry increase risk and uncertainty in the new product development strategic planning process (Calantone et al, 2003). ET is defined as a combined measure of the changeability and predictability of the firm's environment. The complexity of the firm's envi-

ronment, a dual measure of the pervasiveness of the impact of a challenge on various parts of the firm as well as the frequency of occurrence of challenges. Relative novelty of the successive challenges which an organization encounters in the environment, a measure of the extent to which knowledge gained from experience can be extrapolated to respond to new challenges. Rapidity of change, the ratio of the speed with which challenges evolve in the environment and the speed of the firm's response. Visibility of the future which assesses the adequacy and timeliness of information about the future (Ansoff, 1990). ET is a dynamic, unpredictable, expanding, fluctuating environment. It is an environment in which the components are marked by change (Volberda & Van-Bruggen, 1997). A new approach to the division of the environment and divided the environment into five levels of turbulence: stable, reactive, anticipatory, exploring, and creative based on four attributes: the novelty, speed of change, complexity, and predictability of change in the business environment (Ansoff, 1979).

ET by itself does not lead to scanning activities unless the external events are perceived to be salient to decision makers (Radovic Markovic, et. al, 2012). In specifically on ET: dynamism (intensity of changes and frequency of changes), complexity (number and relatedness of elements) and predictability (availability of information and predictability of changes) as well as entrepreneurial orientation and innovation performance (Volberda & Van-Bruggen, 1997). ET in the context of innovation has the potential to extend the threat-rigidity thesis into the entrepreneurship domain (Ko & Tan, 2012). In general under turbulent environments the importance of social capital as a factor affecting firm innovative capability is lowered. At the same time, however, if two firms are able to go beyond the expected norms

of their competitive relationship and work out collaborative partnerships by developing their mutual social capital, then such a relationship yields rich benefits (Dutta & Paul, 2013). The higher the level of ET the more firms turned to platform product design (Thomas, 2014).

In manufacturing industry, as market or technology turbulence increases, so too does the level of platform design. The more turbulent the environment, the more manufacturing firms turn to platform-based product designs (Thomas, 2014). Non-linear relationship between social capital and innovative capability is further affected by the nature of the firm's environment, specifically the prevailing level of ET. ET would further accentuate the already non-linear effect of social capital on firm innovative capability (Dutta & Paul, 2013). Declining firms are located in a more turbulent environment, high level of demand instability (Abebe, 2010). Managers of the various subsections of the global business can be advised to align their functional strategies to their organizations global business ET level to achieve maximum success (Johannesson & Palona, 2010). In the complex/turbulent environment, aggressive sales promotions (linked to price promotions) and word of mouth advertising are effective, while in simple/stable environments image advertising and personal selling are more effective. In both environments public relations and sales promotions can be effective, but applied in different ways (Mason, 2014).

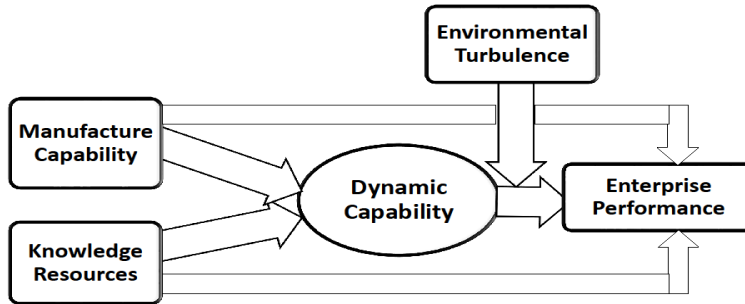
A turbulent environment introduces an inability to forecast accurately, even within contingencies (Calantone et al, 2003, p. 91). High levels of ET arise not only due to the pace of actual change in objective characteristics of the environment but also due to differing levels of competitive action initiated by managers. In that sense, the level of ET and the competitive ac-

tions of firms are inextricably linked and it makes sense to study the two together. Especially, the effort by firms to engage in simultaneous competition and cooperation under ET becomes a highly interesting phenomenon that is worthwhile to explore. A firm's managers perceive changes in environmental characteristics and take action in a way that is consistent with their psychological set, thus also enacting the environment over time (Smart and Vertinsky, 1984).

### **Conceptual Model**

Zheng et al. (2011) explained that a firm can continually renew their knowledge base through its dynamic capabilities so that it is possible to respond to changing environments. Know-how, learning process, business secret, and reputation are examples of capabilities that create advantage to the firms as these capabilities are difficult to acquire from external business environments (Chen & Lee, 2009). Dynamic capability is an important intermediate organizational mechanism through which the benefits of knowledge management capability are converted into performance effects at the corporate level. That is, knowledge management capability enhances the dynamic capability of organizations (Tseng & Lee, 2014). DC concept is extended from the resource base perspective. It is built based on the firm's ability to renew the resource base in form of intangible resources (e.g., processes, skills, routines). These intangible resources when unique and difficult to duplicate will become the source of sustainable competitive advantage. When related to technology management, DC is entrepreneurial in nature where the innovative outcome of the renewed resource base is to create and/or re-

spond to the opportunities and threats of the technological change (Zaidi & Othman, 2014).



**Figure 1.** Dynamic Capability Play Role for Improving Enterprise Performance

H<sub>1</sub> : Manufacturing capability have positive direct effect on dynamic capability

H<sub>2</sub> : Knowledge resources have positive direct effect on dynamic capability

H<sub>3</sub> : Manufacturing capability have positive direct effect on enterprise performance

DC increases organizational performance and provides competitive advantages (Tseng & Lee, 2014). DC can promote EP (Tiantian et al., 2014). DC influence firm performance indirectly by helping the firm renew its existing operations by updating, recombining and reconfiguring its existing operational capabilities (Gao & Tian, 2014). Wang and Ahmed (2007) explained that DC helps enhance corporate performance, particularly when an enterprise has a synchronized development capacity and corporate strategy, which can lead to superior performance. The primary premise of the DC

framework is that a firm has operational capabilities and resources that are directly involved in EP by converting inputs into outputs and dynamic capabilities that influence EP indirectly by updating, integrating and reconfiguring a firm's existing operational capabilities and resources (Teece, Pisano & Shuen, 1997). ET consists of environmental dynamism, environmental complexity and environmental predictability has a significant positive effect on innovation performance (Al-Nuiami, et. al, 2014). The interaction between knowledge transfer and perceived ET significantly but negatively affects innovation (Ko & Tan, 2012). When operating in a turbulent environment, improving new product development can be achieved in several ways. For instance, increasing development time for a one-off product will reduce the risk of forecasting errors and increase the likelihood of new product success. This strategy involves such things as simplifying operations, eliminating delays, eliminating steps, speeding up operations, and introducing parallel processing of steps (Calantone et al, 2003). Their relationship is always changing together with continuous change of the environment that creates gaps between the firms' current capabilities and the market needs (Grobler, 2007). DC is focusing on modifying the firms' resources to match the changing environment (Bowman & Ambrosini, 2003).

H<sub>4</sub>: Knowledge resources have positive direct effect on enterprise performance

H<sub>5</sub>: Environmental turbulences have positive direct effect on enterprise performance

H<sub>6</sub>: Manufacturing capability and knowledge resources have positive direct effect on dynamic capability and impact on enterprise performance through environmental turbulence.

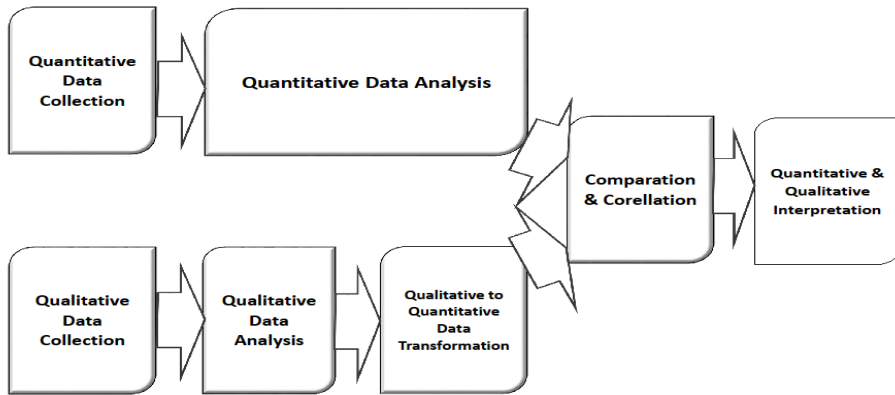


## **Research Methodology**

Researches have taken places in various industries such as manufacturing (Kylaheiko & Sandstrom, 2007). The main objective of this research was to investigate the influence of manufacturing capability and knowledge resources on dynamic capability and implication on enterprise performance with environmental turbulence as intervening variable, this study was aimed at Bekasi industrial estate, Indonesia that have implemented DC as a sampling frame. The sampling method applied in this research was random sampling. As for questionnaire respondents, the main target subjects were the senior managers in the service, technology, and manufacturing industries. The questionnaire was anonymous, mainly distributed on-site and online through e-mails. Simultaneously, in order to facilitate the questionnaire distribution and high responsiveness, the manufacturing and industrial were contacted via telephone and e-mails to be informed of the research objective in order to ease their suspicions of the questionnaire. Finally, the statistical results obtained from the questionnaire were analyzed.

The measurement items of the questionnaire were based on relevant literature and verified by a panel discussion with some experts. The language used in explaining questions was plain Bahasa and easily understood. Therefore, content and construct validities of this research design were fulfilled. The final questionnaire comprised five parts. It included manufacturing capability, knowledge resources, dynamic capability, environmental turbulence, enterprise performance, and the demographics of the sample. A seven point of Likert type scale, ranging from 1 (strongly disagree) to 4 (neutral) to 7 (strongly agree), was used to measure the research variables. The analyzed problems were solved with the use of mainly qualitative and

quantitative research methods. The main research method applied in this study was triangulation transformation model.



**Figure 2.** Triangulation Transformation Model (Bandur, 2014)

## Conclusion

The concept of dynamic capability refers to a process and puts more emphasis in the idea to increase enterprise performance. The strategy aims to achieve best performance in manufacturing is therefore on sustaining the process of improving human well being. The relationship between dynamic capability and enterprise performance is always an important research in the field of strategic management (Tiantian et al., 2014). Dynamic capability enhance performance by promoting timeliness, speed and efficiency of organizational response to the market environment (Chmielewski & Paladino, 2007). Contribution which is a novelty of this research are conceptual model of dynamic capability in enterprise performance at industrial city with efforts adoption prescriptive method of decision theory, strategic management perspective in dynamic capability. This research points out the need for fur-

ther research on dynamic capability in manufacturing and also for further empirical research on dynamic capability framework.

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