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Exploring dynamic capabilities of executives for core strategy

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Whether a solar product maker is able to achieve sustainable and competitive effectiveness depends on the dynamic capabilities of its executives. This study used various methods to establish the dynamic capabilities and components of executives in resource-based view. The survey research was adopted to find out essential dynamic capabilities with 481 valid questionnaires retrieved at a 73.10% response rate. Thirty Taiwanese solar manufacturing CEOs were selected to take the in-depth interviews in order to explore special dynamic capabilities in the industry, and finally a triangulation strategy was applied to obtain the results. To obtain continuous benefits of competition, practical implications are applied in self-diagnosing the rigidness of the corporate entities' core competencies, planning on-the-job training program, screening executive trainees as well as the training of successors and tutoring newly promoted executives.

Key words: Dynamic capabilities, executives, manufacturers, solar energy.

INTRODUCTION

Dynamic capability is one of an organization's core competences (Zahra et al., 2006), an important source of sustainable competitive advantages (Lawton and Rajwani, 2011; Sirmon et al., 2010). The performance of dynamic capability for senior executives is closely related to the financial performance of the organization (Fang et al., 2010; Lee, 2008; Lee et al., 2011). The achievement of dynamic capability by senior executives can effectively enhance resource productivity, boost competitive efficiency (Chiou, 2011; Adeniran and Johnston, 2012) and create market differentiation (Helfat and Peteraf, 2003).

Prior studies on dynamic capability tend to focus on firm-level or individual-level issues. The research on the firm-level issues emphasizes the importance of organizational resources and capabilities in a highly competitive and dynamic environment to ensure the effectiveness of the organization (Teece et al., 1997; Helfat and Peteraf, 2003). The research on the individual-level issues stresses the identification of personality traits for entrepreneurs via the psychology approach (Dollingers, 2003) or the interpretation of the influence of social backgrounds on business decisions via the sociological approach (Ucbasaran et al., 2001; Chang, 2012).

In the super competitive environment of the solar industry, the studies on the dynamic capability of senior executives are faced with some problems: (1) Resource-based view posits that an organization's core competences are the fundamental of competitive advantages. If the core competences should become rigid, senior executives must resort to dynamic capability

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to appropriately respond to market competition (Chang, 2012); (2) Dynamic capability can be acquired (Mulders et al., 2010). However, solar energy companies are lacking in specific contents of dynamic capability as a basis for the screening of potential senior executives and the development of management succession. Therefore, this study sets out to answer the following questions: What is the dynamic capability and the contents of such capability that should be for senior executives in the solar industry? What can be done to develop such dynamic capability to ensure sustainability of the organization?

This study aims to examine the dynamic capability and the content of such capability for senior executives in solar manufacturers in Taiwan from the resource-based view. Senior executives include chairpersons, CEOs, general managers and vice presidents. The research focuses on the individual-level issues via the sociological approach. The main research method is a survey to identify the common dynamic capability required of senior executives in solar manufacturers in order to rapidly respond to external needs. Meanwhile, interviews with CEOs are conducted to categorize the special dynamic capability required for timely adjustment of internal resources. The contribution of this study lies in its findings that can serve as a reference to the solar industry in the self-diagnose of the degree of core competence rigidity, the response strategies according to the competitive environments (Chang and Chang, 2011), the development of a screening mechanism to identify potential senior executives, the planning of on-the-job training programs for senior executives and the establishment of an effective succession plan. All these initiatives will enable potential senior executives to acquire the dynamic capability they need.

DYNAMIC CAPABILITY

In a view of organizational level, the definition of dynamic capabilities was made by Teece et al. (1997, p516), “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments “. In a view of individual level, they were defined as “the ability to renew, augment, and adapt competencies over time” by Marcus and Anderson (2006, p.19). Considering the application needs of individual-level dynamic capabilities in solar manufacturing industry, this study defines dynamic capabilities as “a set of flexible abilities possessed by executives (Vice President and above) to achieve competitive advantages by integrating, establishing and reconfiguring internal/external competencies for the quick launch of technological products and for grasping even the slightest change in business opportunities”.

Dynamic capability can be regarded as a potential and emerging method of integration to understand the sources of enterprise competitive advantages (Hou, 2008). From a penetrating perspective of research theory, recent studies on dynamic capability have discussed organizational learning theory, resource - based theory, social networks and complex adaptive systems theory, and so on. From a perspective of research path for dynamic capability, there are four major paths: nature, antecedents, process and outcomes, based on the collection of recent literature.

1. The nature-based perspective argues that dynamic capabilities are required to tackle a rapidly changing external environment of business competitions (Gärtner, 2011; Winter, 2003).
2. The antecedents-based perspective stresses that dynamic capabilities are generated or introduced to maximize the benefits of corporate operations (Liu and Hsu, 2011; Barrales-Molina et al., 2010).
3. The process-based perspective explains, from a resource-oriented point of view, that competitiveness in its nature indicates heterogeneity among competitors in terms of operating resources and the methods to achieve sustainable operations (Shane et al., 2009).
4. The outcomes-based perspective believes that dynamic capabilities have a direct influence on the performance of new product development (Pavlou and El Sawy, 2011; Zahra et al., 2006; Zheng, et al., 2011).

Dynamic capabilities can help enterprises agilely implement various types of reformations internally and resource allocations (Koch, 2012). Accordingly, this study is founded on the resource-based view, from a perspective of outcomes.

EXECUTIVES’ DYNAMIC CAPABILITY

Dynamic capability is a key for the executives to make good use of resources driving business growth in the changing environment (Landroguez et al., 2011). The components of dynamic capabilities are composed of one set of capabilities, including Sensing Capability (Kindström et al., 2012), Learning Capability, Integrating Capability, Coordinating Capability. These four factors of dynamic capabilities have been regarded to orderly form a procedural framework (Pavlou and El Sawy, 2011). According to Landroguez et al. (2011), three organizational capabilities (Market orientation, knowledge management and customer relationship management) would lead to the creation of superior customer value. Agarwal and Selen (2009) classify higher-order capabilities as five combined capabilities (entrepreneurial alertness, collaborative agility, customer engagement, collaborative innovative capability, and collaborative organizational learning). Chang (2012) has also proposed that market-oriented sensitivity, the ability to absorb knowledge, social-networking capability, and the integrative ability to communicate and negotiate are four required dynamic capabilities for IT entrepreneurs. Koch (2010) pointed out, electronic market places should have

these dynamic capabilities: digitized process reach, customer agility and entrepreneurial alertness. It appears various fields of industries need somewhat different dynamic capabilities.

Market-oriented sensitivity

It can be defined as "the ability to spot, interpret, and pursue opportunities in the environment" (Pavlou and Sawy, 2011). While some believe that market opportunities are an objective existence and some consider them subjective creations; this type of sensitivity is valuable as it helps grasp opportunities in the three manners stated below (Sarasvathy et al., 2003):

1. Identifying the opportunities: When there is a clear relation between supply and demand in the market, executives may identify opportunities by connecting demand and supply;
2. Discovering the opportunities: executives are expected to discover business opportunities when uncertain demand/supply or any unexpected emergency occurs in the market;
3. Creating the opportunities: when neither demand nor supply is certain in the market, executives have to create valuable market opportunities by envisioning market fluctuations with an insight into them.

The ability to absorb knowledge

It has been regarded as one of individual dynamic capabilities (Chang, 2012). This ability is founded on the Organizational learning theory (Santos-Vijande et al., 2012), defined as "the ability to revamp existing operational capabilities with new knowledge" (Pavlou and Sawy, 2011). The executives proceed to transfer knowledge and absorb what they are learning by the knowledge creation models proposed by Nonaka and Takeuchi (1995), S (Socialization), E (Externalization), C (Combination) and I (Internalization) to fully interpret the process of learning and absorption. Thus, the followings are stressed:

1.A comprehensive corporate development plan and systematically conducted organizational learning, combined with knowledge management (Shane, et al., 2009);
2.The ability to make innovative responses to a highly uncertain market (Chang, 2012);
3.The ability to respond more efficiently to market changes than competitors by learning, renewing, creating products or processes (Gärtner, 2011).

Social-networking capability

It is founded on the social networks (Fang et al., 2010; Chou, 2011). The ability to deal with social network relationship can be considered as a basic ability to make good use of social capital. Blyler and Coff (2003) pointed out, social capital is the ability of resource management, which will help the company acquire, integrate, reorganize and transfer resources. It can be defined as "the ability to combine individual knowledge into the unit's new operational capabilities" (Pavlou and Sawy, 2011). The followings are stressed:

1. The ability to obtain diverse resources (Gärtner, 2011);
2.The ability to effectively arrange resources to maximize the benefits of rapid corporate growth (Chang, 2012);
3.The ability to meet emerging market opportunities by creatively integrating, reconfiguring, obtaining and releasing resources and developing new competencies (Teece, 2011);
4. The ability to obtain technologies, organizations among other tangible or intangible resources to meet the demand for changes in the start-up stage (Chang, 2012).

The integrative ability to communicate and negotiate

This ability is based on the Complex Adaptive Theory defined as "the ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities" (Pavlou and Sawy, 2011). The followings are stressed:

1. The adaptability to a complicated set of interacting factors in the environment (e.g., economic, political, social, and cultural factors) (Shane et al., 2009; Chen et al., 2009);
2. The ability to make a comprehensive corporate development plan to avoid potential emergencies while controlling start-up risks (Sarasvathy et al.,2003);
3. The ability to handle various unpredictable risks facing a start-up with flexibility (Chang, 2012);
4. The ability to tackle the uncertainties in a fluctuating market by modifying, integrating and reconfiguring the organization's internal/external skills and resources (to meet needs) (Hou, 2008).

Operational definitions

Consequently, the dynamic capability draft about four aspects for executives in solar manufacturing has been written out. The operational definition of each aspect is defined and listed in Table 1, and all questionnaire items have been further developed according to the components.

METHODOLOGY

Survey research

Developing the questionnaire

A questionnaire was designed to collect opinions from

Table 1. The operational definitions of dynamic capabilities.

Aspects	Components
Market-oriented sensitivity	A1.The ability of either confirming opportunities and threats in the external environment or perceiving changes in customers' needs, and also the ability to tackle the changing environment and technological advances with proper managerial behaviour (Ambrosini and Bowman, 2009).
	A2.The ability to connect supply and demand and identify opportunities when there are clearly defined supply and demand in the market (Sarasvathy et al., 2003).
	A3.The ability to identify market needs and discover business opportunities when unexpected emergency occurs in the market (Chang, 2012).
	A4. The ability to gain an insight into, and envision, market fluctuations and create valuable opportunities.
Ability to absorb knowledge	B1. The ability to make a comprehensive corporate development plan in accordance with the needs of operating strategies, with systematically conducted organizational learning.
	B2. The ability to make innovative responses to a highly uncertain market through organizational learning (Teece et al., 1997).
	B3. The ability to respond more efficiently to market changes than competitors by learning, renewing, creating products or processes.
Social-networking capability	C1. The ability to obtain diverse resources.
	C2. The ability to effectively arrange resources, so as to generate rapid growth and maximum benefits for the company.
	C3. The ability to meet emerging market opportunities by creatively integrating, reconfiguring, obtaining and releasing resources and developing new competencies.
	C4. The ability to obtain technologies, organizations among other tangible or intangible resources to meet the demand for changes in the start-up stage.
The integrative ability to communicate/ negotiate	D1. The adaptability to a complicated set of interacting factors in the environment (e.g., economic, political, social, and cultural factors).
	D2. The ability to make a comprehensive corporate development plan to avoid potential emergencies while controlling start-up risks (Chang, 2012).
	D3. The ability to handle various unpredictable risks facing a start-up with flexibility.
	D4. The ability to tackle the uncertainties in a fluctuating market by modifying, integrating and reconfiguring the organization's internal/external skills and resources (to meet needs) (Hou, 2008).

across the solar manufacturing industry, authorities, academia and research institutes regarding the essential dynamic capabilities required for solar product manufacturers' executives' quick response to external demand. Outcome of literature review and the operational definitions of such capabilities were included in the draft questionnaire. All questionnaire items were compiled on a 7-point scale with 7 being "The most important" and 1 being "Highly unimportant". The questionnaire comprises four aspects: "market-oriented sensitivity" (A1-A5), "the ability to absorb knowledge" (B6-B10), "social-networking capability" (C11-C16) and "the integrative ability to communicate and negotiate" (D17-D22).

To test its reliability and validity, the preliminary-edition questionnaire was scrutinized by experts for content validity to ensure the questionnaire's content fully reflects the essence of argument proposed by this study's author. A discussion held by 12 experts from the solar manufacturing industry, authorities, academia and research institutes had completed the consolidated literature, and then created the questionnaire. After testing the internal consistency of questionnaire items using Cronbach's α, a reliability-measuring tool, a Bartlett's test of Sphericity was conducted to ensure the multivariate normal distribution is approached in all aspects. The factors' validity was tested using the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy in order to determine the suitability of factor analysis. Finally, the results of a Principal Component Analysis (PCA) were obtained with a varimax rotation in order to analyse whether all items complied with original aspect of questionnaire for the establishment of dynamic capabilities.

Collecting Information

Each of the purposively sampled 60 scholars, 50 government officials and 60 researchers received one copy of questionnaire, with the rest of questionnaires mailed to deputy CEOs or executives at 122 Taiwanese solar product manufacturers (Note: 4 copies per company were give out). 481 out of the 658 copies of questionnaire given out were answered and proved valid, hence the 73.10% response rate. The reason that experts from academia, government authorities, and research institutes are included in the sampling is that the researchers, planners, and implementers of the solar industry policies have direct impact on the cultivation, employment, and development direction of future executive talent. Thus, it is important to include these experts.

The in-depth expert interviews

Currently, there are total 122 solar manufacturers in Taiwan (MIC, 2013). Among those solar manufactures, 30 manufacturers were selected, and each of them had 45 ~ 80 employees. They were the manufacturers of raw materials, products, modules or integrated solutions, and their CEO received onsite interviews, sampling as shown in Table 2. The interviews were conducted in order to acquire information concerning the dynamic capabilities required of the executives, the components of such capabilities, and opinions about hidden issues in this regard. Eventually, these interviews are expected to help identify the special dynamic capabilities required of executives for timely adjusting a company's internal resource allocation. The unstructured interviews were based on the four dynamic capabilities proposed in this present study. During the interviews, not only was a "triangulation" strategy applied to analytical discussions over the survey results (Chang and Chang, 2011), participants in such discussions were also invited to modify the collected opinions through brainstorming in knowledge-sharing sessions, so as to yield some fresh insights, thus, eventually establishing the dynamic capabilities required to quickly respond to external demand and for timely adjustment of a company's internal resource allocation.

RESULTS

Questionnaire

Descriptive statistics

The samples are statistically described in Table 3 according to the answered copies of questionnaire. Among respondents of various backgrounds, those from the solar product manufacturers registered the highest response rate (69.6%), indicating a highly representative sample size of solar company executives.

Experts' opinions vary over learning, social networks and communications

The ANOVA analysis results show that, in "whether there are differences in opinions from varying expert groups", six questionnaire items reach significant differences (Table 4), which means that executives are expected to improve the following capabilities:

1.The ability to absorb knowledge: the emphasis shall be put on the ability to systematically absorb new knowledge, to identify valuable knowledge, and to apply new knowledge.

2.Social-networking capability: the emphasis shall be put on the ability to develop new capabilities in the resource-utilizing process and to obtain intangible resources. By incessant social-networking, a company amasses social capital and wins support of crucial members in the social network (Fang et al., 2010). That explains why an

Table 2. Taiwanese solar product manufacturers sampled and interviewed in this study.

Manufacturers' positions in the supply chain	Chief products	No. of companies sampled	Percentage (%)	No. of companies interviewed (%)
Upper-stream firms	Silica materials, silicon wafer materials	17	13.93	6 (20%)
Mid-stream firms		47	38.51	11 (36.67%)
	Solar cells	15	12.30	
	Solar cell modules	18	14.73	
	Thin-film solar cell modules	9	7.38	
	Dye-sensitized solar cells	3	2.46	
	Concentrator solar cell modules	2	1.64	
Lower-stream firms		58	47.56	13 (43.33%)
	Solar photovoltaic system	39	31.98	
	Solar photovoltaic converters	10	8.20	
	Sales channels/suppliers of solar photovoltaic products	9	7.38	
Total		122	100	30 (100%)

Source: IDBMEA (2012).

Table 3. Analysis of the valid questionnaire copies retrieved n=481.

Items	Groups	No. of copies	(%)
Gender	Male	299	62.2
	Female	182	37.8
Background of experts	Industry	335	69.6
	Academia	57	11.9
	Authorities	38	7.9
	Research institutes	51	10.6
Total no. of employees	< 5	0	0
	6-15	3	0.6
	16-30	73	15.2
	31-50	92	19.1
	Over 50	313	65.1

enhanced social-networking capability helps an organization obtain external resources.

3.The integrative ability to communicate/negotiate: the emphasis shall be put on the ability to respond flexibly to risky events.

Reliability and validity of the questionnaire

The 0.97 Cronbach's proves that the questionnaire is satisfyingly reliable (either as a whole or in each aspect) and also consistent in measuring the respondents' attitudes. Given the satisfactory level of Kaiser Meyer Olkin (KMO) index (0.96), the questionnaire is quite stable. In the Bartlett's test of sphericity, the Approx. Chi-Square of 8690.43 (df=231) achieves statistical significance, which means the within-population matrix has common factors, hence the suitability of factor analysis.

Principal Component Analysis

The purpose of factor analysis is to obtain the construct

Table 4. ANOVA results regarding the expert' varying opinions over dynamic capabilities.

Items		Sum of squares	df	Mean square	F
B6	Between groups	11.58	3	3.86	3.34*
	Within groups	547.41	474	1.16	
	Total		558.99	477	
B8	Between groups	11.69	3	3.90	3.56*
	Within groups	519.21	474	1.10	
	Total		530.90	477	
B9	Between groups	10.96	3	3.65	3.31*
	Within groups	522.96	474	1.10	
	Total		533.93	477	
C14	Between groups	11.79	3	3.93	3.67*
	Within groups	506.96	474	1.07	
	Total		518.75	477	
C16	Between groups	9.67	3	3.22	2.85*
	Within groups	535.81	474	1.13	
	Total		545.48	477	
D20	Between groups	8.63	3	2.88	2.63*
	Within groups	519.34	474	1.10	
	Total		527.97	477	

*P<0.05.

validity of questionnaire. Common factors among variables can be extracted in a factor analysis, enabling the rather complex structure of unprocessed data to be represented by a smaller number of constructs. Moreover, the common factors identified in the analysis help confirm a concept's structural components. Based on the analysis results, factors with eigenvalues exceeding 1 were selected. In other words, 4 variables with a combined explanatory power of 72.91% were extracted. The results showed that each aspect of factor and its subordinate items of questions were both consistent with the original study design; therefore, these four dynamic capabilities had been confirmed.

In Table 5, questionnaire items from A1 to A5 have the highest eigenvalues and belong to the "market-sensing capability" aspect, which means market-sensing capability is considered the most important aspect. The questionnaire item with a factor loading exceeding 0.8 is A4: "When unexpected emergency occurs in the market, the author is able to identify market needs and discover business opportunities." Apparently, company executives must closely monitor market conditions to gain an insight of what drives the market expansion and make every effort to look for start-up opportunities. The finding fits well with the contention of Landroguez et al. (2011) that executives must not only keep discovering business opportunities, but also profit from the combination of start-up resources that creates activities with fresh values.

Results of in-depth interviews with CEOs

An insight into what drives the growth of a fluctuating market

An executive's dynamic capabilities are reflected in his/her insight into what drives the market growth. According to information collected from the in-depth interviews, each solar product manufacturer has a distinctive operating pattern, or the "DNA", embedded in its corporate organization. Executives seeking to enhance corporate performance would flexibly apply resources in various operating patterns. To meet the performance-relevant requirements, departments in a company tackle every quick adjustment in organization and every flexible deployment of personnel with a corresponding task-oriented mechanism for resource allocation, making it difficult to replicate a company's dynamic capabilities. The finding conforms to an argument made by Laamanen and Wallin (2009).

Considering the significance of dynamic capability

Table 5. Result of PCA.

Items	% of variance	Cumulative %	Component				communalities
			1	2	3	4	
D20	20.33%	20.33%	0.73	0.22	0.22	0.32	0.73
D18			0.70	0.24	0.33	0.22	0.79
D22			0.69	0.24	0.36	0.23	0.73
D21			0.69	0.22	0.37	0.27	0.74
D19			0.68	0.29	0.27	0.29	0.71
D17			0.59	.219	.382	.285	0.68
A4	19.68%	40.01%	0.18	0.81	0.16	0.16	0.73
A5			0.18	0.78	0.15	0.19	0.74
A2			0.21	0.78	0.30	0.21	0.75
A1			0.24	0.75	0.26	0.19	0.72
A3			0.24	0.74	0.25	0.24	0.75
C13	17.53%	57.54%	0.37	0.28	0.70	0.23	0.76
C14			0.32	0.27	0.69	0.33	0.77
C11			0.36	0.34	0.68	0.20	0.78
C12			0.43	0.30	0.65	0.23	0.68
C15			0.45	0.28	0.55	0.29	0.67
C16			0.46	0.27	0.55	0.27	0.63
B8	15.37%	72.91%	0.31	0.31	0.16	0.72	0.71
B9			0.27	0.10	0.43	0.69	0.72
B7			0.33	0.35	0.16	0.68	0.74
B10			0.23	0.16	0.42	0.67	0.74
B6			0.29	0.44	0.14	0.61	0.72
Total eigenvalues			4.47	4.33	3.86		3.38

theory, it is apparent that the theory of competencies explains how each competency contains visible and invisible qualities at once although it fails to answer such competency-relevant questions as “How do companies in a rapid-changing market develop a good sense of market-entry timing?” “With how much flexibility can a company apply varied combinations of capabilities to determine the best timing of entry as expected?” As a result, the capability to identify what drives the market growth is a further display of market-oriented sensitivity, and also a dynamic capability of executives.

The ability to determine when to enter or exit a market

The ability to develop a good sense of when to enter or exit a market directly affects a company’s ability to profit from investments, to cash out, and to lower financial losses A particular important part of this ability is to be aware of market demand earlier than competitors, which is reflected in corporate strategies that seek relatively profitable technological solutions in three categories. The first category of solutions help reduce installation costs with a more convenient and safer way to install modules. The second category of solutions improves the conversion efficiency with an optimized combination of parameters for the manufacturing process and materials. The third category of solutions aims at segmenting the market with differentiated products, such as beneficial solar modules that correspond to the amount of sunlight exposure in each region. When reflected in production strategies, such ability helps bolster power-generation efficiency with low-energy consumption, and consequently build the best possible supply chain of raw materials.

The emphasis on when to enter/exit a market echoes the argument proposed by Gwendolyn (2008) that high-performance organizations care much about whether they have the required ability to immediate organize and the flexibility for successful entry into a new market. Consequently, the executive’s ability to determine when to enter a market is as important a dynamic capability as the ability to identify market opportunities.

Executives with greater dynamic capabilities alter or create customers’ needs

The relative strength of customer satisfaction compared

to executives' dynamic capabilities is affected by three factors, as stated below:

Market positioning: Upper-, mid-, and lower-stream firms in an industry's supply chain have varying degrees of sensitivity to customers' needs.
Company size: Companies of a comparatively large size and/or a high degree of globalization need to be highly sensitive to market changes.
Distinctiveness of core technologies: A company that possesses core/key technologies and occupies a favourable position in the industry's supply chain is able to deliver products that alter/create customers' needs. Take the thin-film technologies for example, they have the potential of altering customers' needs as the high-growth thin-film technology modules are high in efficiency, low-priced and easy to install.

Instead of passively responding to changes, manufacturers of technology-oriented products should actively offer guidance for, or create, customers' needs and create an unchartered "blue ocean" (Shane et al., 2009). The executives' dynamic capabilities are valuable as they help companies achieve sustainable and competitive effectiveness by altering or creating customers' needs. Solar product manufacturers are immensely affected by the governments' subsidy policies. In order to alter/create customers' needs, it is imperative that solar energy be widely used before "grid parity" becomes a reality, even without any industry subsidy.

DISCUSSION

It was evidenced that the research's findings attended to seven dynamic capabilities "Universal Characteristics" and "Distinctive Characteristics". "Universal Characteristics" can be regarded as the emerging commonality after induction. According to literature, from a perspective on antecedents and outcomes, Lin and Hsu (2011) further pointed out dynamic capabilities with such commonality would make direct impact on growth strategies of capability-based enhancement and diversification of company performance. This study attained a conclusion that the four dynamic capabilities, which ought to be acquired by the executives of solar manufacturing industry, can be regarded as common dynamic capabilities. They are "market-oriented sensitivity", "the ability to absorb knowledge", "social-networking capability" and "the integrative ability to communicate and negotiate". This result is the same perspective with Eisenhardt and Martin (2000), and reached an agreement with Landroguez et al. (2011) or Chang (2012) on the dynamic capabilities required for IT entrepreneurs. Apparently, the common dynamic capabilities indeed have the positively competitive effectiveness among the companies.

Each item of common dynamic capability takes a stand on a resource-based view to recognize that the efficiency of enterprise resource control can be enhanced, as well as the business operational performance can be reinforced (Blyler and Coff, 2003; Lin and Hsu, 2011). Consequently, it appears training of these dynamic capabilities to staff in small companies is very important (Mulders et al, 2010); meanwhile, they will have the executives acquire the advantages of sustainable competitiveness with rivals.

As for "Distinctive Characteristics", three required dynamic capabilities derived from in-depth interviews with CEOs are the distinctive characteristics in this particular industry. They include "the capability to identify what drives market growth", "the capability to develop a good sense of market-entry timing" and "the capability to alter/create customers' needs". Not only do these distinctive characteristics indicate that individual companies in the industry use their unique internal resources to create competitiveness, they also echo the argument of Praharad and Hamel (1990) that corporate core capabilities have special values and are difficult to imitate. The three dynamic capabilities, as a result, prove highly implicit in individuals and particularly dependent on the executives. Thus, based on the concept of rapidly changing external environment, CEOs agree it is extremely important that enterprise internal resource allocation must be adjusted simultaneously and timely in order to act swiftly in response to external demand. Therefore, the obtained research results respond to the issues and the purpose of this research. The results are further summarized in Figure 1.

As shown in the outer circle, the dynamic capabilities required for quickly responding to external demand are "market-oriented sensitivity" , "social-networking capability", "the capability to identify what drives market growth", "the capability to develop a good sense of market-entry timing" and " the capability to alter/create customers' needs". These five dynamic capabilities can be regarded as the enablers of outside-in corporate changes proposed by Koch (2010).
As shown in the inner circle, the dynamic capabilities required for timely adjusting a company's internal resource allocation are "the ability to absorb knowledge" and "the integrative ability to communicate and negotiate". Based on Koch (2010) opinions, both dynamic capabilities can be regarded as the enablers of inside-out corporate changes.

CONCLUSION

Solar energy-relevant manufacturing has in recent years become a green energy industry that draws so much international attention that countries around the world have started making solar products. The consequently fierce competitions in the solar market are posing

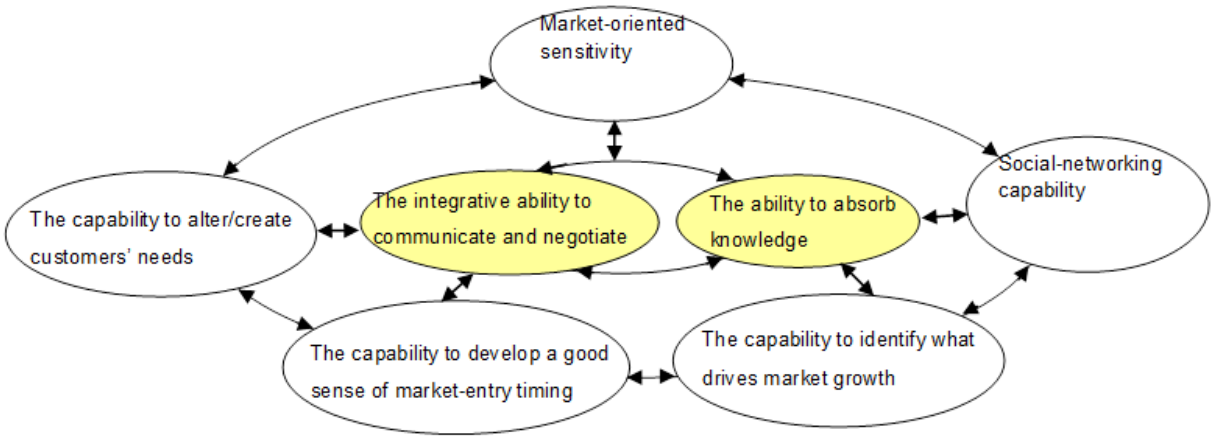

Figure 1. Dynamic capabilities required of executives at solar product manufacturers.

growing challenges to executives in the industry. Findings from this study by surveying executives in solar energy-relevant manufacturing and in-depth interviewing CEOs indicated that those executives making good use of the dynamic capabilities bolstered higher competitive effectiveness for their respective companies. According to the survey, executives should have these four common dynamic capabilities to act swiftly in response to external demand: "market-oriented sensitivity", "the ability to absorb knowledge", "social-networking capability" and "the integrative ability to communicate and negotiate", which had been confirmed by means of triangulation during in-depth interviews with CEOs. Another three special dynamic capabilities in business practices required for timely adjustment of internal resource allocation had been confirmed: "the capability to identify what drives market growth", "the capability to develop a good sense of market-entry timing" and "the capability to alter/create customers' needs".

Many executives used to use old ways and procedures to solve newly emerging problems and unexpected situations. To accomplish sustainable competitive effectiveness for the enterprise in confrontation with rapid changes of the operational environment, this study results manifested what the connotation of dynamic capabilities the executives should have acquired. This study contributed to help the executives accurately sense the market changes, and properly act in response to market demand while making decisions on management. Furthermore, the study results can be applied in self-diagnosing the rigidness of the corporate entities' core competencies, planning on-the-job training program, screening Executive Trainees, training successors and tutoring newly promoted executives. The target is to help the enterprise establish competitive advantages.

As for the research limitations, the operational performance generated by applying dynamic capabilities should not be discussed in this study. Because the research subjects are limited to solar energy product manufacturers, it is not appropriate to infer that the conclusions apply to information communication technology industries. Additionally, it was difficult to delve into the issues using the grounded theory due to the CEOs were not available for many in-depth interviews. Future researchers are therefore advised to include the grounded theory in methodology, with a focus on "logic of generation", and theorize accordingly. They may consider exploring such issues as "the service sector of solar product manufacturers" and "the relations between executives' personal qualities and their dynamic capabilities".

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