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BRIDGING COMPETENCE AND CURRICULUM FOR COMPLEX CHANGE

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ABSTRACT

Purpose*: The rapid technological changes prompt a company's supervisors and managers to update their management capabilities in order to stay competitive. Aimed at enhancing low-level supervisors' management capabilities, this study explores the training programs that help improve, and are most compatible with, each specific management competency.*
Design/methodology/approach: *Focused on low-level supervisors in the Taiwanese Mold industry, this study was conducted by means of focus group with the competency indicators, training programs and questionnaire confirmed by 32 experts. Through cluster sampling, supervisors at Taiwanese small- and medium-sized Mold manufacturers were surveyed, and competency indicators were derived from answers stated in the 326 valid questionnaire copies returned (at a 66.53% response rate). Finally, 8 experts were consulted as part of a Gray Relational Analysis (GRA) to identify the priority of training programs that matches each specific competency.*
Findings: *Totally 7 indicators and types of training programs are identified with regard to low-level supervisors' competences, and so were the optimal competency-program combinations. GRA was proved an effective way to solve the ambiguity regarding how a given competency is paired with the training programs.*
Originality/value: *The findings solve the ambiguity regarding how the emerging requirements for management competences, which are resulted from technological advances, are responded with appropriate training programs. The types of training programs identified provide a foundation for on-the-job training. The findings also prove GRA a reliable approach to finding the type of training program most suitable for a particular competency.*

Keywords: Low-level supervisors, Management competence, Training programs, GRA

INTRODUCTION

In the process of corporate operations, the rapidly changing technological aspect keeps generating new requirements for employee competences (Dumas & Hanchane, 2010). It is therefore a challenge for a company's human resources development staff to cultivate new competences, and subsequently ensure productivity and market competitiveness (Holden & Griggs, 2010; Chang, 2012b). Many empirical studies indicate how technological advancements result in extra requirements for an employee's knowledge and skills (Gashi et al., 2010), how training leads to higher corporate competitiveness (Dumas & Hanchane, 2010) and how urgent it is to offer on-the-job training for supervisors. Because training directly improves the trainees' productivity while enhancing their performance in such areas as strategies, organizational decision-making and innovation (Dumas & Hanchane, 2010), it is

extremely important to teach or train supervisors to handle changes by taking appropriate measures, so they may eventually deliver performance at work (Amran *et al*., 2011).

The competences of low-level supervisors determine a company's quality of production, which is closely linked to corporate operating performance (Palvia *et al*., 2010). Such competences can be further divided into core competence, professional competency, management competence, general competence (Lei & Slocum, 1992) and dynamic capability to grasp dynamic environments (Chang, 2012a). Each competence is considered a combination, or a set, of capabilities attached to an individual (Sora *et al.*, 2010). Given the fast-changing technological environment nowadays, it is imperative that managers engage themselves in continuous learning in order to meet the organization's need for sustainable transformation.

It is an important issue to meet the emerging requirements for competences and find training programs that match those needs (Marzo-Navarro *et al.*, 2009). Previous researchers on related topics usually adopted such approaches as expert consultation and survey research. Vincent and Focht (2009), for one, combined expert consultation and the Q-sort method in their exploration of how the training curricula for environmental program managers were designed to match their core competences, while a survey research of Marzo-Navarro *et al*. (2009) examined the gap between competences required by companies and those emphasized in the college curricula. These studies underscored the necessity and benefits of combining experts in a particular field with a quantitative research approach.

Taiwan's highly competitive Mold industry boasts a comprehensive supply chain that comprises 3,416-odd firms and approximately 38,800 employees as of 2006, which also makes mold the largest among the country's metal manufacturing industries (MOEA, 2007). A company will never stay competitive without continuously training its low-level supervisors for improved management capabilities. To expedite the research process, this study's author defined *low-level supervisors*, namely those supervising at the section, shift or division levels (including foremen), as employees whose primarily duties are executing tasks, improving work efficiency, and accomplishing day-to-day assignments. *Management competences* in the present study refers not only to the ability of low-level Mold company supervisors to wisely use organizational resources, but also to the knowledge, skills and attitude that contribute, and add value, to the organization. *Training programs*, on the other hand, are defined as on- or off-the-job educational courses officially offered by a company to its low-level supervisors during the employment contract period, with an aim to bolster those supervisors' management competences in accordance with its production initiatives.

LITERATURE REVIEW

The Mold industry is both technology- and capital-intensive in nature, with a distinctively high value-added ratio. It is safe to say the requirement that low-level Mold company supervisors keep improving their management capabilities is derived from the *endogenous growth model* (Romer, 1986), which suggests a corporate organization's overall capabilities grow in proportion to its individual departments' capabilities (Romer, 1986). In each company department, it is imperative that low-level supervisors as an integral part of production initiatives update their management competences to ensure corporate competitiveness. In an exploration of the *fit* between competences required for a job position

and job assignments on the personal level, Bretz and Judge (1994) put forth the theory of vocational fit. Likewise, Seethamraju (2012) used the fit theory trying to achieve a high degree of correlation between corporate operations and business education curricula. Apparently, it is imperative that the planning of training programs fit the requirements for employee competences.

Indicators of management competences

The effects of technological changes on management practices are exemplified by team-oriented tasks, the "just-in-time" production strategy, and the quality control circle (Gashi *et al*., 2010). Generally speaking, indicators of management competences are summarized from either the structural or the behavioural perspective. Noe (2005), for one, took the structural perspective to identify 6 indicators from the viewpoint of "managing cultural diversity," namely cost, resource-acquisition, marketing, creativity, problem-solving and system flexibility.

For instance, the relationship-management capability from the behavioural perspective has an implicit impact on the *quality* (Palvia et al., 2010). Lyons (2012) mentioned 10 innovative leadership capabilities: problem-framing, opportunity recognition, experimentation, revenue model innovation, valuation of ideas, risk selection, influence without authority, manage ambiguity/conflict, team creativity, and adaptive governance. Meanwhile, thinking/analysing skills, knowledge of management details, applying theory, professional and personal development, team skills are the five indicators to determine whether the learners' competences vary among learning styles (Rodwell, 2005). According to Liu *et al*. (2010), businesses in the manufacturing sector must focus on the management of uncertainties concerning supply and demand in order to develop the mass customization ability.

From the behavioural perspective, this study's author proposed some indicators to measure management competences that help supervisors adapt to an ever-changing environment, as listed in Table 1.

Table 1 Operational Definition of Indicators of the Management Competences of Low-Level Mold Company Supervisors

Primary indicators	Secondary indicators	Definition
(1).Communication/negotiation capability	Listening skills; self-expression skills; negotiation skills	The capability of negotiating with higher-level supervisors, listening to the subordinates, conveying work-related information, and coordinating inter-departmental operations.
(2). Capability as a team leader	The skill of influencing subordinates; the skills of creating the workplace atmosphere; and the conflict management skill	The capability of delegating/monitoring works, setting up work-oriented teams or task forces to ensure the goals are timely achieved, and creating a teamwork-oriented atmosphere in the workplace.

(3). Social-networking capability	The social-networking skills; the skills of motivating subordinates; the skills of incentivising subordinates.	The capability of wisely using social networks, encouraging subordinates to improve production efficiency/quality, and generating benefits for the production initiatives.
(4). Decision-making capability	Planning skills; monitoring skills; problem-solving skills; authorization	The capability to conduct production scheduling, timely solve production-related problems and customer complaints, while in the mean time promoting the efficiency of production line.
(5). Mold-relevant derivative intelligence	Continuous learning; creativity	The ability to win the subordinates' recognition for Mold-related expertise and subsequently achieve management effectiveness; to continuously acquire Mold-related knowledge/skills while applying creativity and innovative thinking to work.
(6). The customer-service capability	The skill of grasping customers' needs; the skills of building relationships; the skills of handling complaints.	The capability of timely responding to, and meeting, customers' needs; making the company more reliable among customers; improving customer loyalty.
(7). The ability to maintain system flexibility	The adaptability to technological evolution; the capability to use high-tech equipment/ tools	The ability to use high-tech equipment, new tools and incorporate production-related needs into plans or designs of new processes in accordance with emerging and ever-evolving technologies.

Types of training programs

Training is considered the source of corporate competitiveness (Dumas & Hanchane, 2010). In response to the changing circumstances, an organization must factor diversity management into the training programs (Danowitz et al., 2009). Topics of the training programs include: 1. organizational theories; 2. human resource management; 3. instruments of gender and diversity management; 4. special methods for organization studies; 5. participatory organizational design; 6. teambuilding; 7. legal regulations for gender and diversity management; 8. personality development; 9. gender and diversity theories; 10. labour market theories from gender and diversity perspectives; 11. project-seminar (Danowitz et al., 2009).

According to Gashi et al. (2010), team-working and quality circles both help corporate managers develop the change-adaptable management competences. Training programs

responding to the need for innovative leadership (Lyons, 2012) include: (1) data and decisions; (2) economics for business decision-making (microeconomics); (3) leading People; (4) problem-finding and problem-solving; (5) financial accounting; (6) introduction to finance; (7) marketing management; (8) leadership communication; (9) operations management; (10) macroeconomics in the global economy; (11) strategic leadership; (12) ethics and responsibility in business.

To sum up, the 7 types of training programs contributing to the management competences include: interpersonal communication, team leadership, problem-solving and analysis, recognition of roles and responsibilities, work instructions, motivation, and executability.

METHODOLOGY

Focus group interviews

The method proposed by Krueger and Casey (2000) was used in the present study. Convenience sampling was conducted to select 32 experts, or supervisors/managers at small- and medium-sized Taiwanese Mold manufacturers who have 15 or more years of work experience and are in charge of on-site management (including 12 mid-level and 20 low-level supervisors). The experts were convened for 3 discussion sessions, where they established management competence indicators while confirming the questionnaire and types of training programs.

The survey research method

Questionnaire development: Based on the literature review and operational definitions of competence indicators, a draft questionnaire was developed and then confirmed by the experts. The questionnaire is made up of 50 questions that involve the communication/negotiation capability (A1-A8), the capability as a team leader (B1-B7), social-networking capability (C1-C5), decision-making capability (D1-D9), Mold-relevant derivative intelligence (E1-E8), the customer-service capability (F1-F7) and the ability to maintain system flexibility (G1-G6).

Data collection: cluster sampling was used to collect data, with the details stated below:

a. Type of Mold firms selected: In this study, four sub-groups (i.e., stamping, plastic moulding, die-casting and forging) of metal mold companies were examined;
b. Percentages of sampling distribution: The percentages were determined on the basis of the number of Taiwan's existing Mold firms and the distribution of Mold employees. The researcher surveyed 92.2% of the employees for Mold firms with fewer than 30 workers; 6.9% for those with 30-99 workers; 0.6%, firms with 100-199 workers; 0.2%, firms with 200-299 workers; 0.1%, firms with more than 300 workers.
c. Distribution of questionnaire: Totally 490 copies of questionnaire were first sent out through post services and then through e-mail. Having reminded, by way of e-mail correspondence, the respondents to send back their copies of completed questionnaire, the researcher received 326 valid copies of questionnaire after deducting those not answered by low-level supervisors. The response rate is 66.53%.
d. Data analysis: Based on the Grey Relational Analysis (GRA) method, the data collected was analyzed to examine how much the management competence indicators are related

to their corresponding training programs. Mid-level supervisors (5) and experts in the field of Mold (3) were selected from small- and medium-sized, Taiwan-based multinational Mold companies as the *experts*, who then answered questions concerning the management competence indicators and their corresponding training programs. The research project was concluded using the GRA proposed by Teng (2003).

RESULTS

Descriptive statistics of the sample

Males and females account for 71.4% and 28.6% of the survey responses, respectively. As far as age is concerned, people aged 31-40 represent the largest portion of the sample (53.2%), followed by those aged between 41 and 50 (28.6%), which suggests that low-level Mold company supervisors are mostly young or middle-aged. People with a seniority of 1 to 5 years account for 16.7% of the responses; 6 to 10 years, 15.9%; 11 to 15 years, 34.9%; 16 years or longer, 32.5%, a sign that a relatively large percentage of Mold company employees have a seniority of 10 or more years.

Reliability and validity of the questionnaire

As far as reliability is concerned, the questionnaire has an overall 0.939 Cronbach's Alpha, with Cronbach's Alpha values for individual questions ranging from 0.936 to 0.939, hence the satisfactory consistency and stability among those items. Meanwhile, the questionnaire was proved to have content validity as the focus-group experts used management competence indicators to make sure it correctly appraised the content intended for measurement in terms of correctness and effectiveness.

Grey Relational Analysis (GRA)

(1). Determining the importance weights

Table 2 shows how the experts (E) prioritized the management competence indicators (on a scale of 1 to 7, 1 being the most important and 7 the least important) according to how important they are. Those indicators include communication/negotiation capability (CA), the capability as a team leader (TA), social-networking capability (RA), decision-making capability (DA), Mold management intelligence (DK), the customer-service capability (CS) and the ability to maintain system flexibility (SA). Table 3 shows how the types of training programs are prioritized, including programs in interpersonal communication (RC), team leadership (TC), problem-solving and analysis (PS), perceptions of roles and duties (RD), work instructions (WC), motivation (EC) and executibility (PC).

Table 2 Prioritizing the Management Competences by Importance

	Indicators	E1	E2	E3	E4	E5	E6	E8
Management competences	CA	2	3	1	1	1	4	1	2
	TA	3	2	6	2	3	1	2	4
	RA	5	4	7	4	5	5	5	3
	DA	4	1	2	3	2	3	3	1
	DK	1	7	3	7	4	2	6	7
	CS	7	6	5	6	6	6	7	6
	SA	6	5	4	5	7	7	4	5

Table 3 Prioritizing Different Types of Training Programs

	Programs	E1	E2	E3	E4	E5	E6	E7	E8
Types of training programs	RC	4	4	7	1	4	6	1	6
	TC	3	3	6	4	5	3	5	3
	PS	1	2	1	2	1	2	3	1
	RD	7	1	2	5	2	1	2	2
	WC	6	5	3	7	6	5	4	4
	EC	5	7	5	6	7	7	7	7
	PC	2	6	4	3	3	4	6	5

(2). Establishing the sequence correlation

Table 4 shows the data was examined using the grey relational analysis software, with *management competences* being the main factor $\chi_i(k)$ and the *type of training program for management competences* being the sub-factor $\chi_j(k)$.

Table 4 Referential and Comparative Sequences Derived from the Grey Relational Analysis

Main factor $\chi_i(k)$ (referential sequence)	Sub-factor $\chi_j(k)$ (comparative sequence)
CA $\chi_{i1}(k)$	RC $\chi_{j1}(k)$
TA $\chi_{i2}(k)$	TC $\chi_{j2}(k)$
RA $\chi_{i3}(k)$	PS $\chi_{j3}(k)$
DA $\chi_{i4}(k)$	RD $\chi_{j4}(k)$
DK $\chi_{i5}(k)$	WC $\chi_{j5}(k)$
CS $\chi_{i6}(k)$	EC $\chi_{j6}(k)$
SA $\chi_{i7}(k)$	PC $\chi_{j7}(k)$

(3). GRA: Take the example of how training programs are connected with 'the communication/negotiation capability'

A. Since the primary data proved to have comparability, a GRA was conducted by using the *communication/negotiation capability* $\chi_{i1}(k)$ to represent the referential sequence and the *type of training program* to represent the comparative sequence.

B. The value of difference sequence was calculated using the formula of $\Delta_{ij}(k) = \left\| \chi_i(k) - \chi_j(k) \right\|$.

C. The formula in (2) was used to calculate the maximum and minimum values, which are 6.0 and 0.0, respectively.

D. Assumed the distinguishing coefficient $\zeta = 0.5$.

E. The grey relational coefficient was calculated using the formula:

$$\gamma(\chi_i(k), \chi_j(k)) = (\Delta\min + \zeta\Delta\max) / (\Delta_{ij}(k) + \zeta\Delta\max)$$

F. Calculating the grey relational grade: since we assumed ($\beta = 1/8$), we learned that $\gamma(\chi_{M1}\ \chi_{j1}) = 0.6515$, $\gamma(\chi_{M1}\ \chi_{j2}) = 0.6228$, $\gamma(\chi_{M1}\ \chi_{j3}) = 0.7750$, $\gamma(\chi_{M1}\ \chi_{j4}) = 0.6442$, $\gamma(\chi_{M1}\ \chi_{j5}) = 0.5234$, $\gamma(\chi_{M1}\ \chi_{j6}) = 0.4092$ and $\gamma(\chi_{M1}\ \chi_{j7}) = 0.6344$.

G. Prioritizing the grey relational sequences: $\gamma(\chi_{M1}\ \chi_{j3}) = 0.7750 > \gamma(\chi_{M1}\ \chi_{j1}) = 0.6515 > \gamma(\chi_{M1}\ \chi_{j4}) = 0.6442 > \gamma(\chi_{M1}\ \chi_{j7}) = 0.6344 > \gamma(\chi_{M1}\ \chi_{j2}) = 0.6228 > \gamma(\chi_{M1}\ \chi_{j5}) = 0.5234 > \gamma(\chi_{M1}\ \chi_{j6}) = 0.4092$.

The types of training program wee then prioritized on the basis of their correlations with the *communication/negotiation capability*, from the highest degree of correlation to the lowest: problem-solving and analysis > interpersonal communication > perceptions of roles and duties > executability > team leadership > work instructions > motivation. The results are shown in Table 5.

Table 5 Prioritizing the Training Program Types According to Their Correlations with the Communication/Negotiation Capability

Type of training program (sub-factor)	CA (main factor)
PS	77.50%
RC	65.15%
RD	64.42%
PC	63.44%
TC	62.28%
WC	52.34%
EC	40.92%

Following that procedure, this study's findings are summarized in Table 6.

Table 6 Priority of Training Program Types by Management Competency

Type of training program \ Indicators	CA	TA	RA	DA	DK	CS	SA
RC	65.15% (2)	66.56% (4)	70.98% (2)	56.88% (5)	53.94% (6)	62.60% (4)	59.73% (5)
TC	62.28% (5)	72.50% (1)	83.75% (1)	65.36% (3)	58.84% (4)	57.86% (5)	60.36% (4)
PS	77.50% (1)	69.69% (2)	51.13% (7)	78.13% (1)	58.54% (5)	40.33% (7)	47.02% (7)
RD	64.42% (3)	68.21% (3)	55.04% (6)	77.50% (2)	52.13% (7)	52.90% (6)	57.34% (6)
WC	52.34% (6)	55.04% (6)	70.98% (3)	56.07% (6)	64.69% (3)	71.25% (2)	80.63% (1)
EC	40.92% (7)	47.38% (7)	61.61% (5)	45.61% (7)	67.54% (2)	82.50% (1)	74.38% (2)
PC	63.44% (4)	65.09% (5)	63.13% (4)	62.54% (4)	70.36% (1)	65.31% (3)	66.34% (3)

In Table 6, the types of training-program types are prioritized in accordance with each specific management competency that low-level supervisors are required of, as stated below:

a. The training programs that enhance the *communication/negotiation capability* are prioritized as: problem-solving and analysis > interpersonal communication > perceptions of roles and duties > executability > team leadership > work instructions > motivation.
b. The training programs that enhance the *capability as a team leader* are prioritized as: team leadership> problem-solving and analysis > perceptions of roles and duties > interpersonal communication > executability > work instructions > motivation.
c. The training programs that enhance the *social-networking capability* are prioritized as: team leadership > interpersonal communication > work instructions > executability > motivation > perceptions of roles and duties, and problem-solving and analysis.
d. The training programs that enhance the *decision-making capability* are prioritized as: problem-solving and analysis > perceptions of roles and duties > team leadership > executability > interpersonal communication > work instructions > motivation.
e. The training programs that enhance the *Mold management intelligence* are prioritized as: executability > motivation > work instructions > team leadership > problem-solving and analysis > interpersonal communication > perceptions of roles and duties.
f. The training programs that enhance the *customer-service capability* are prioritized as:

motivation > work instructions > executability > interpersonal communication >team leadership > perceptions of roles and duties > problem-solving and analysis.

g. The training programs that enhance the *ability to maintain system flexibility* are prioritized as: work instructions > motivation > executability > team leadership > interpersonal communication > perceptions of roles and duties > problem-solving and analysis.

DISCUSSION

The rationality of indicators and training programs

Professional knowledge varies among different fields of the Mold industry, and so do the required competences and how training programs should be planned. To meet the requirements stemming from globalization and vertical integration in the Mold supply chain, Taiwanese Mold firms usually design and manufacture products domestically while accomplishing mass-production in China, Indonesia or Vietnam. As for a supervisor's management capabilities, the ability to offer management and guidance to multinational employees (Bird *et al.*, 2010) and cross-cultural management capabilities (Isenhour *et al.*, 2012) are at the core of a *team leader's capabilities*. From the "rationality of indicators" point of view, the survey outcome proved that the indicators fully cover the 7 management competences. Regarding the rationality of training-program types, it has been confirmed with expert consultation that companies are free to incorporate, according to its needs, various topics (e.g., production management, material management, project management, component control and personnel training) into the supervisor training program, hence the expandability.

GRA solves uncertainties in pairing competences and the training programs

The goodness-of-fit test has been adopted as a common statistical approach to examining the *fit*, or testing the consistency of the actually observed and expected/theoretical frequency. GRA is a further application of the Fit theory. When it comes to pairing competences with training programs, the GRA suggests an emphasis on refining process (Chang, 2013b) and thus meets the requirement proposed by Bretz & Judge (1994) that analysis methods should meet the needs of research subjects. The greatest difference between GRA and the conventional statistical methods lies in the fact that the former does not require a sizable sample to calculate how much two sequences of data are correlated (Chen *et al*., 2005). In an attempt to optimize the process of pairing the training programs and competences, GRA contributed to training effectiveness as it solves uncertainties in the connection between competences and training programs.

Making up for the lack of literature

Researchers trying to identify the best competency-program combinations would end up *solving new problems with outdated experiences* if they rely solely on expert consultation and draw inspiration from the experts' experiences. A significant number of quantitative studies were performed in conjunction with the qualitative expert consultation, as exemplified by Marzo-Navarro *et al*. (2009) and Vincent & Focht et al. (2009). In the present study, expert consultation is coupled with the GRA method in order to display the advantages of both qualitative and quantitative research approaches, to quickly obtain the optimal priority of

training programs, and also to effectively reduce the time spent on, and procedure for, pairing the competences and training programs. Results of this study complement research efforts of Marzo-Navarro *et al.* (2009) and Vincent and Focht (2009).

CONCLUSION

Technologies are evolving so quickly that low-level supervisors are forced to constantly update their management intelligence in order to maintain corporate competitiveness. To address the ambiguous relationship between management competences and training programs, this study's author examined low-level Mold company supervisors in Taiwan, using such methods as expert consultation, survey research and GRA to accomplish a research project aimed at identifying the optimal combination of competences and training programs. According to the findings, there are 7 indicators of management competences of low-level supervisors, which in turn have roughly 7 types of corresponding training programs. This study proves GRA an efficient solution to the ambiguous relationships between competences and training programs in a fast-changing corporate environment.

Contributions of this study are that it proved GRA an efficient tool to practice the FIT theory; it makes up for the lack of literature on training effectiveness; it identified the management competence indicators suitable for low-level Mold company supervisors, including their corresponding training programs; it prioritized the training programs for each specific competency expected of the employees, which in turn provides a foundation for planning on-the-job training curricula.

Theoretically speaking, results of this study suggest a "pairing" research approach that is applicable to finding the corresponding training programs for general, core and professional competences. As far as management practices are concerned, this study is focused on the Mold industry, where small- and medium-sized manufacturers are faced with fast-changing technologies. Therefore, any company that needs to change or increase its required competences can draw inspiration from the types of training programs laid out in this study, and then start planning/designing those programs. Regarding the research limitations, the difference in production practices among the subgroups of metal Mold, as well as the difference between small- and medium-sized Mold manufacturers, left this study focused on the *types*, but not *components*, of training programs.

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