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Development of a competency-framework for MBA students: a case of tier-II and tier-III institutions of North Karnataka

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Abstract: This research develops a competency framework for MBA Students of Tier-II and Tier-III institutions of India, specific to the North Karnataka region. In an outcome-based education (OBE) system, performance indicators assess student competencies and lead to the attainment of program outcomes. The reviewed literature listed about 137 competencies for MBA students. Based on the frequency, 48 competencies were extracted and categorised into 4 dimensions using the Hogan competency model. Further, 25 essential competencies were obtained out of 48 based on the ranks given by the industry and academia for the students of the territory under consideration. The Di-graph of interpretive structural modelling (ISM) depicts the relationship between dimensions and competencies within the dimensions. The authors recommend the proposed competency framework to identify the essential competencies for curriculum development, delivery, and assessment of the selected MBA programs for the study.

Keywords: competency framework; MBA program; interpretive structural modelling; North Karnataka; competencies; tier II and III; outcome-based education.

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1 Introduction

Today, businesses have become more complex, more diverse, more interdisciplinary, and multicultural. The major essences of any business are transformation and the orientation towards service. GE and Coca-Cola are discussed less in comparison to Uber and Amazon. Businesses and the processes involved are more technology-driven. Hence, business dynamics have a direct bearing on Human Resource requirements.

As the economy is evolving, there is a demand for a potential workforce. Economists are projecting a substantial increase in skill requirements. Even the education sector considered as a service offered by many is not an exception. The business expects education to follow carefully or be ahead of the market. Consequently, many researchers showed concern about merely acquiring the degrees, which has consequences on the quality of education. Hence, employers are complaining about the lack of competencies in graduates, more specifically to management education. Therefore, management education needs to respond and cope with change that the businesses demand in a controlled manner to survive and sustain keeping value system in place.

The Association to Advance Collegiate Schools of Business (AACSB, 2007) reported in the global economic scenario – 'Management' – as a stream of education and training needs to acquire new dimensions, eligibility procedures**,** and accreditation standards and prepare the students to contribute to the organisations. Organization for Economic Cooperation and Development (OECD, 2018) said that due to the rapid globalisation, there is an increase in the demand of global mindset professionals. The field of Management is dynamic, so new businesses, new services, approaches, tools, and techniques are continually evolving. The challenge before the organisation is to find the best human resource for a job with the requisite competencies. In this view, competency has become the catchphrase in the higher education sector for preparing students to perform and sustain in the rapidly changing and interdependent world. Hence, Roberto and Márcio (2018) said that the competency development approach has become essential to assess educational institutions.

Further, Westera (2001) mentioned that the attainment of competencies had become a central issue in post-secondary education. Kuhlich (1991), Camuffo and Gerli (2004), and Boyatzis (2009) criticised the effectiveness of traditional MBA programs and emphasised that required innovative strategies in graduate management education. They have stated that a trend in education is moving towards a competency-based approach that is a global initiative.

In India, some existing regulatory institutions like The University Grants Commission, All India Council for Technical Education, National Council of Training in Vocational Technical and School Boards, etc. All have suggested the need for improvements in management education. Thus, it is high time for management institutions, particularly Tier II and Tier III institutions, to examine the quality of education and design program to match the industry expectations through the development of their students. In this context, the main objective of the research is to identify the competencies required for MBA students of Tier-II and Tier-III institutions of North Karnataka, India. This paper presents a review of the literature that sets the background for this research, followed by the methodology, results, discussion, conclusion, and possibilities for further study.

2 Theoretical framework

The AACSB (2018) reported that due to global economic forces, emerging technologies and demographic shifts are leading the business environment to undergo profound changes, and society expects for social responsibility. OECD (2018) envisaged that these trends are providing many opportunities for human advancement. Gonda (2014) has claimed that educational institutions are the centers for human resource development; businesses, society, and human resources are mutually dependent. Thus, AACSB (2018) expressed that the factors having an impact on the business are also impacting higher education. All India Council for Technical Education (AICTE, 2018) and AACSB (2018) reports said that to keep pace with the Volatile, Uncertain, Complex, and Ambiguous (VUCA) world and business schools should develop relevant competencies to make students more adaptive.

McClelland (1973) studied that to assess candidates' capabilities with work positions; application of competency criteria is useful. Based on this, Singh et al. (2016) mentioned that the industry has already adopted the competency-Based approach in selection, training and development, performance management, compensation management, and career planning. Porter and McKibbin's (1988) research showed that MBA students did not meet the requirements of employers. Westera (2001) indeed said that the achievement of competencies had become a central issue in post-secondary education. Camuffo and Gerli (2004) argued that the effectiveness of a traditional an MBA program is getting criticised by researchers and regulatory bodies in the US and Europe. Singh and Pathak claimed (2016) that the B-schools to implement the competency-based approach in their curriculum to meet the industry expectations and bridge the gap is no more a choice. In the Indian context, Maheshwari (2013) found that no clarity on program outcomes and imitating curricula, pedagogy, industry-interface, and academic research models of graduate programs of USA Management Schools 30 years ago. Chaturvedi and Agnihotri (2014) report on *Indian Management Education Vision – 2025* mentioned that Management education in India is almost 60 years old.

While Gonda (2014) mentioned that higher education considered one of the supporting systems for the business; thus, developing a competent human resource is the responsibility of higher education. Relevance and the quality of higher education in India are being discussed and successfully tackled by regulatory bodies like the Ministry of Human Resource Development (MHRD, 2013) and University Grants Commission (UGC, 2011), making plans to develop the higher education more significant and quality

orientated. Despite such policies, Reddy (2016) mentioned that India has at least 5,500 B-schools, but only 7% of MBA graduates were employed. Besides, Reddy said that the MBA programs were not focusing on developing required skills, knowledge, and abilities. Further, evidenced by the 'Employability Test' conducted by the 'Aspiring Minds' (2012), a global job skill credentialing leader found out that out of 32,000 MBA graduates from 220 business schools across India only 10% had required skills that recruiters look for while hiring management graduates. Maheshwari (2013) attributed to no clarity on knowledge, skills, abilities, attitudes, and values essential for management students to become competent.

A study by Chyung et al. (2006) found that to become competent, a person needs the capability to use knowledge, skills, or abilities and should effectively perform the activities to the expected standards. Abraham and Karns (2009) said that business schools did not emphasise the competencies required by the businesses in their curriculum. During the same time, Boyatzis (2009) revealed that research on competency originated from universities such as Harvard and followed by Boston University (with David McClelland, American psychologist), Columbia (with Warner Burke, Professor of Psychology and Education), the University of Minnesota (with Marvin Dunnette, American psychology professor), Henley Management College (with Victor Dulewicz, UK psychologist), and Case Western Reserve (with Richard Boyatzis, American psychologist), David Kolb (American educational theorist), Don Wolfe (Professor), Diana Bilimoria(Professor), and Melvin Smith (Professor). They also mentioned that these many researchers (Barksdale, 1998; Bennis and O'Toole, 2005; Campbell et al., 2006; Ghoshal, 2005; Mintzberg, 2004; Moberg, 2006; Pfeffer and Fong, 2002) had discussed equally on the relevance of competencies highlighted by business schools in context to industry. However, Kuhlich (1991) and Bell and Mitchell (2000) said that the competency trend seems to be a global initiative in the different regions of the world, such as UK, US, Australia, and Italy and debated extensively. Now, India must prepare a robust competency-based management education system.

Furthermore, Boyatzis (2008) ascertained that the MBA programs should question whether the program develops student competencies. Thus, the AACSB (2018) recommended introducing competency-based education, which allows students to exhibit proficiency with specific competency at their speed. McClelland (1973) advocated replacing the traditional approach of intelligence testing in the education sector by competency testing. Later the concept of competence became extensively known through the work of Boyatzis (1982) and Institutionalised in education at the beginning of the new millennium (European Commission –2005, 2006).

Many researchers tried to define competency in context to higher education. A few of them are presented in Table 1.

Roberto and Márcio (2018) said that to determine the responsibility of educational institutions adopting a competency development approach is necessary. This approach seeks out to assess the role of educational institutions in the development of competencies. So, Mulder et al. (2009) said that competency development as a productive way to prepare students for their working lives and ethical contribution towards society. Further, they have discussed the role of competencies in the education sector, such as the use of competency instruments in accreditation processes, in aligning learning objectives, course content, and assessment of student achievement. Roberto and Márcio (2018) included competencies in the conception and design of the programs. Further, he said that educational programs' tendency to add competency development leads to transformation

in students' roles. Also, Barth et al. (2007) and Dall'Alba and Sandberg (1996) examined students' study through practice and took greater accountability for the development of their competency. Camuffo and Gerli (2004) studied the MBA program's ability to develop a set of competencies that enhance students' working performance. They recommended the identified competencies to evaluate training needs and to identify educational objectives and proposed to improve the design of an MBA program.

Table 1 Competency definition

Author	*Year*	*Competency definition*
Boyatzis	1982	Competency as the ability to demonstrate a system or sequence of behaviour that is functionally related to attaining a performance goal
Sternberg and Kolligian	1990	Competency describes the person's underlying attributes, such as their knowledge, skills, or abilities
Le Deist and Winterton	2005	Competency is a useful term that bridges the gap between education and job requirements
Ewell (2001) and Collins (2012)	2012	Competencies not only include particular levels of knowledge, skills, and abilities that a student had attained at the end (or as a result) of his or her engagement in a particular set of collegiate experiences but also students expected to master the specific levels of performance
Organization for Economic Cooperation and Development (OECD)	2018	The concept of competency implies not only the attainments of knowledge and skills but also the achievement of knowledge, skills, attitudes, and values to meet complex demands. It further argued that educational institutions play a vital role in developing the competencies of students

Likewise, Camuffo et al. (2009) studied the extent of competencies like networking, organisational awareness, use of technology planning, result orientation, and system thinking developed during the MBA program and impact on career outcomes. Nevertheless, Boyatzis et al. (2002), Boyatzis et al. (1995), and Boyatzis and Saatcioglu (2008) examined the impact of the MBA program on the development of cognitive, social, and emotional intelligence competencies. They envisaged that effectiveness in management and leadership roles in adults developed through a management program. Sharma (2017) addressed the need for transformation in management education and investigated in management education the need for competencies development. He argued that focus should not be given only to knowledge and skills but also to values and ethics. He mandated the responsibility of management education to embed these competencies in the management curriculum for sustainability.

Rychen and Salganik (2005) worked with experts, academics, and industry on the *Definition and Selection of Competencies* in the OECD project. They said that competencies identified should lead to beneficial outcomes for individuals to meet significant demands in various contexts and society. This study has identified 137 competencies in the context of students of the MBA program through the literature review and listed the few competencies, as shown in Table 2.

Table 2 Frequency of occurrence of competencies

Competency	*Authors*	*Frequency*
Achievement-orientation	Ames (1992), Boyatzis (2008, 2009), Hogan (2009), Boyatzis et al. (2010, 2012, 2014), Amdurer et al. (2014), Ferry (2016)	9
Self-confidence	McClelland (1973), Boyatzis et al. (2002, 2010, 2014), Boyatzis (2008), Camuffo et al. (2009), Hogan (2009), Amdurer et al. (2014)	8
Trustworthiness	McClelland (1973), Boyatzis (2008), Hogan (2009), Boyatzis et al. (2010, 2014)	5

Draycott and Rae (2010) and Jones and Warnock (2014) argued that the competency framework approach could analyse the content based on skills and knowledge students gained from their formal learning experience. This kind of assessment helps students discover themselves. Marsh and Bishop (2014) have discussed the competency framework applied in developing competencies and assessing students in an academic field. According to the Competency Classification Index (CCI, 2016), project classification of competency would allow the industry to express the required knowledge, skills, and attitudes for a particular work. Also, for the alignments between positions available in the workforce and curricula. Therefore, this study has classified the identified 137 competencies using Hogan Competency Model (Hogan, 2009).

3 Methodological procedures

The research used primary data and literature to meet the objectives. The research methodology included the following four phases: listing of competencies from literature, development of competency Framework, establishing relationships among the identified dimensions, and competencies using the interpretive structural modelling (ISM) approach.

3.1 Listing of competencies from literature

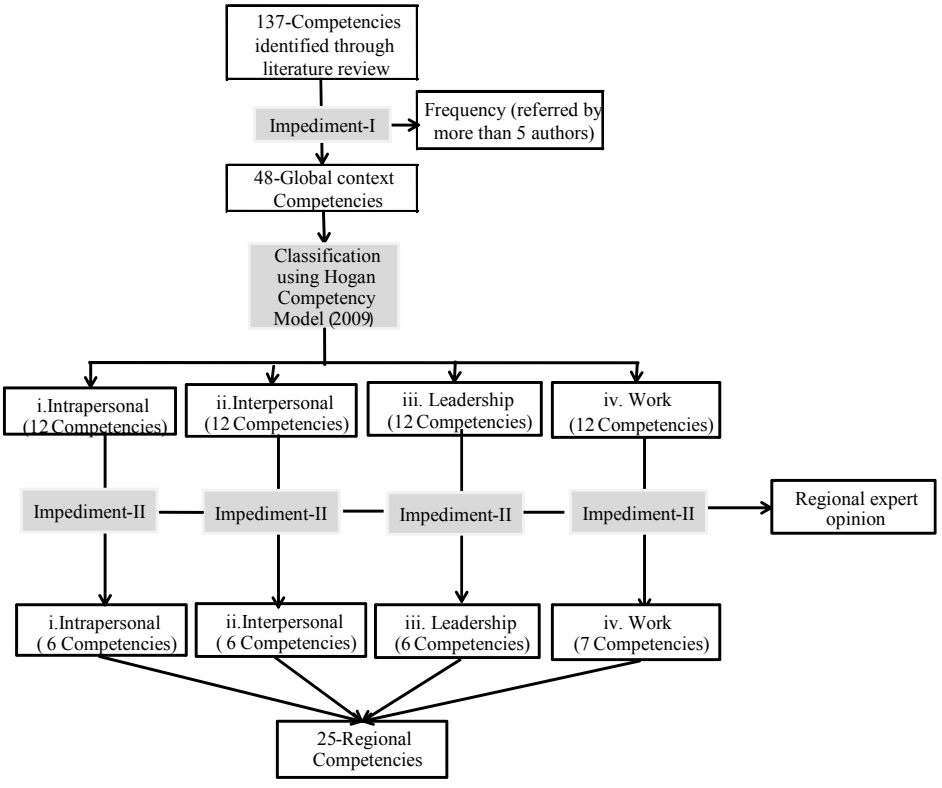
The systematic literature review listed 137 competencies required for an MBA student. Some of these competencies relevant globally, and others may be specific to the territory of study. However, few competencies might be redundant in the context of research.

3.2 Development of competency framework

137 listed competencies from the reviewed literature were an extensive set of competencies to consider in any academic program, not equally important, and some may be redundant as well. Figure 1 depicts the framework used to extract the relevant competencies required by the MBA students of the study region. Universities/institutions can select relevant competencies based on their needs. Authors have extracted competencies at two levels using criteria of the frequency of occurrence and experts' opinions. In the first iteration, the listed competencies mapped on to the frequency of presence in the literature. The frequency indicates congruence with the view of the researchers in different scenarios. The competencies taken from the literature review had

the frequencies spread of 1–10. This study considered, the competencies which had frequency more than 5, 48 of the competencies taken to the next level.

Figure 1 Development of competency framework



Those 48 competencies using Hogan competency Model were classified into 4 dimensions viz. Intrapersonal, Interpersonal, Leadership, Work and each dimension includes 12 competencies, as shown in Table 3.

In the second iteration, experts (Camuffo et al., 2004; Patil and Bagodi, 2021) from academia and industry of the region invited to rank among 1 to 12 (12 being the highest and 1 being the least important) through electronic media based on their preference for the competencies of each dimension. Each competency coded as C_{ij} where *i*- is the dimension (1..4), and *j* is the competency (1..12). The email sent to 115 experts, 40 (12:28 respectively) experts, replied genuinely. The 40 responses were analysed; then for each competency Respondent-competency-Weight (RCW) was computed using the formula:

$$RCW_{ij} = (\text{Actual Ranking} - \text{Minimum Ranking})/(\text{Maximum Ranking} - \text{Minimum Ranking}))_{ij} \quad (3.2.1)$$

Thus, obtained RCW_{ij}s of all respondents were averaged and termed as Mean-RCW_{ij} ($MRCW_{ij}$) of given *i*, and *j* shown in Table 4.

Table 3 Classification of competency

Dimension	*Intrapersonal* (*D1*)	*Code*	*Interpersonal* (*D2*)	*Code*	*Leadership* (*D3*)	*Code*	*Work* (*D4*)	*Code*
Competency	Achievement orientation	C11	Active listening	C21	Building teams	C31	Efficiency orientation	C41
	Empathy	C12	Adaptability	C22	Business acumen	C32	Hard working	C42
	Initiative	C13	Emotional self-awareness	C23	Coach and mentor	C33	Information analysis	C43
	Planning	C14	Emotional self-control	C24	Conflict management	C34	Organisational awareness	C44
	Positive outlook	C15	Ethics	C25	Critical thinking	C35	Pattern recognition	C45
	Risk taking	C16	Influence	C26	Decision making	C36	Presentation	C46
	Self-confidence	C17	Negotiation	C27	Entrepreneurial	C37	Problem identification	C47
	Self-management	C18	Oral communication	C28	Goal setting	C38	Problem solving	C48
	Social awareness	C19	Relationship	C29	Inspirational leadership	C39	Quantitative data analysis	C49
	Time management	C110	Teamwork	C210	Managing performance	C310	System thinking	C410
	Values	C111	Trustworthiness	C211	Motivating others	C311	Technical	C411
	Written communication	C112	Integrity	C212	Resource management	C312	Theory building	C412

Table 4 Respondent-competency-weight

D1		*D2*		*D3*		*D4*	
Competency code	RCW_{ij}	*Competency code*	RCW_{ij}	*Competency code*	RCW_{ij}	*Competency code*	RCW_{ij}
C11	0.605	C21	0.536	C31	0.545	C41	0.657
C12	0.484	C22	0.540	C32	0.586	C42	0.670
C13	0.570	C23	0.366	C33	0.358	C43	0.602
C14	0.557	C24	0.477	C34	0.353	C44	0.502
C15	0.588	C25	0.530	C35	0.617	C45	0.316
C16	0.425	C26	0.425	C36	0.674	C46	0.541
C17	0.669	C27	0.358	C37	0.473	C47	0.640
C18	0.525	C28	0.532	C38	0.554	C48	0.550
C19	0.293	C29	0.423	C39	0.532	C49	0.493
C110	0.372	C210	0.530	C310	0.383	C410	0.520
C111	0.470	C211	0.570	C311	0.547	C411	0.327
C112	0.280	C212	0.623	C312	0.441	C412	0.183
$MRCW_{ij}$	0.486	$MRCW_{ij}$	0.492	$MRCW_{ij}$	0.505	$MRCW_{ij}$	0.500

Iteration 3 was to select the competencies above the mean of $MRCW_{ij}$. This iteration was able to filter 29 competencies. There were 4 overlapping competencies out of 29, and those excluded from further consideration. For example, in the interpersonal dimension, the integrity competency was eliminated as it addressed by trustworthiness and ethics competencies. Similarly, motivating-others in leadership dimension and quantitative-data-analysis and problem-identification competencies in the work dimension excluded. The essential 25 competencies as listed in Table 5.

Table 5 Essential competencies

D1		*D2*		*D3*		*D4*	
Competency code	RCW_{ij}	*Competency code*	RCW_{ij}	*Competency code*	RCW_{ij}	*Competency code*	RCW_{ij}
C11	0.605	C21	0.536	C31	0.545	C41	0.657
C13	0.570	C22	0.540	C32	0.586	C42	0.670
C14	0.557	C25	0.530	C35	0.617	C43	0.602
C15	0.588	C28	0.532	C36	0.674	C44	0.502
C17	0.669	C210	0.530	C38	0.554	C46	0.541
C18	0.525	C211	0.570	C39	0.532	C47	0.640
						C48	0.550
						C410	0.520

3.3 Relationship among the identified dimensions and competencies using the ISM approach

To establish the relationship in the form of levels and driving and dependence power among the dimensions and competencies within each dimensions ISM technique was used. The steps followed to develop the Di-graph in this study are discussed below. The research has shown developing Di-graph between the dimensions as an example, and similarly, Di-graph developed between the competencies is demonstrated.

Step 1: Structural self-interaction matrix (SSIM)

To develop SSIM expert's inputs considered and using these inputs, the one to one relationships among the dimensions initiated. Mahajan et al. (2014) said that there is no consensus amongst researchers on the number of experts to be consulted. For this study, authors have identified the nature of contextual relationships among dimensions and the same reviewed by an academic expert in the field of management education. The following four symbols denote the relationship between two factors (dimensions in this case) i and j. They denoted by letters *V*, *A*, *X*, *O*, and shown in Table 6, where *i* and *j* are dimension number along the row and column. The *V*, *A*, *X*, *O* indicates:

V against *ij* – *i* influences *j*

A against *ij* – *j* influences *i*

X against *ij* – both *i* and *j* influence each other

O against *ij* – both *i* and *j* do not influence each other

Table 6 Structural self-interaction matrix (SSIM) for dimensions

Dimension number	*i* \ *j*	*1*	*2*	*3*	*4*
1	Intrapersonal		V	X	A
2	Interpersonal			V	O
3	Leadership				A
4	Technical				

Step 2: *Reachability matrix*

In this step, SSIM converted into the Reachability matrix by replacing *V*, *A*, *X*, or *O* of SSIM by 1 or 0 in the Reachability matrix. The criteria for this replacement are as stated below, and the Reachability matrix shown in Table 7.

If the (i, j) entry in the SSIM is *V* then the (i, j) entry in the Reachability matrix becomes 1 and the (j, i) entry becomes 0

If the (i, j) entry in the SSIM is *A* then the (i, j) entry in the Reachability matrix becomes 0, and the (j, i) entry becomes 1

If the (i, j) entry in the SSIM is *X* then the (i, j) entry in the Reachability matrix becomes 1 and the (j, i) entry also becomes 1

If the (i, j) entry in the SSIM is *O* then the (i, j) entry in the Reachability matrix becomes 0, and the (j, i) entry also becomes 0

Also, the cells where $i = j$ then insert 1 in the respective cells of the Reachability Matrix.

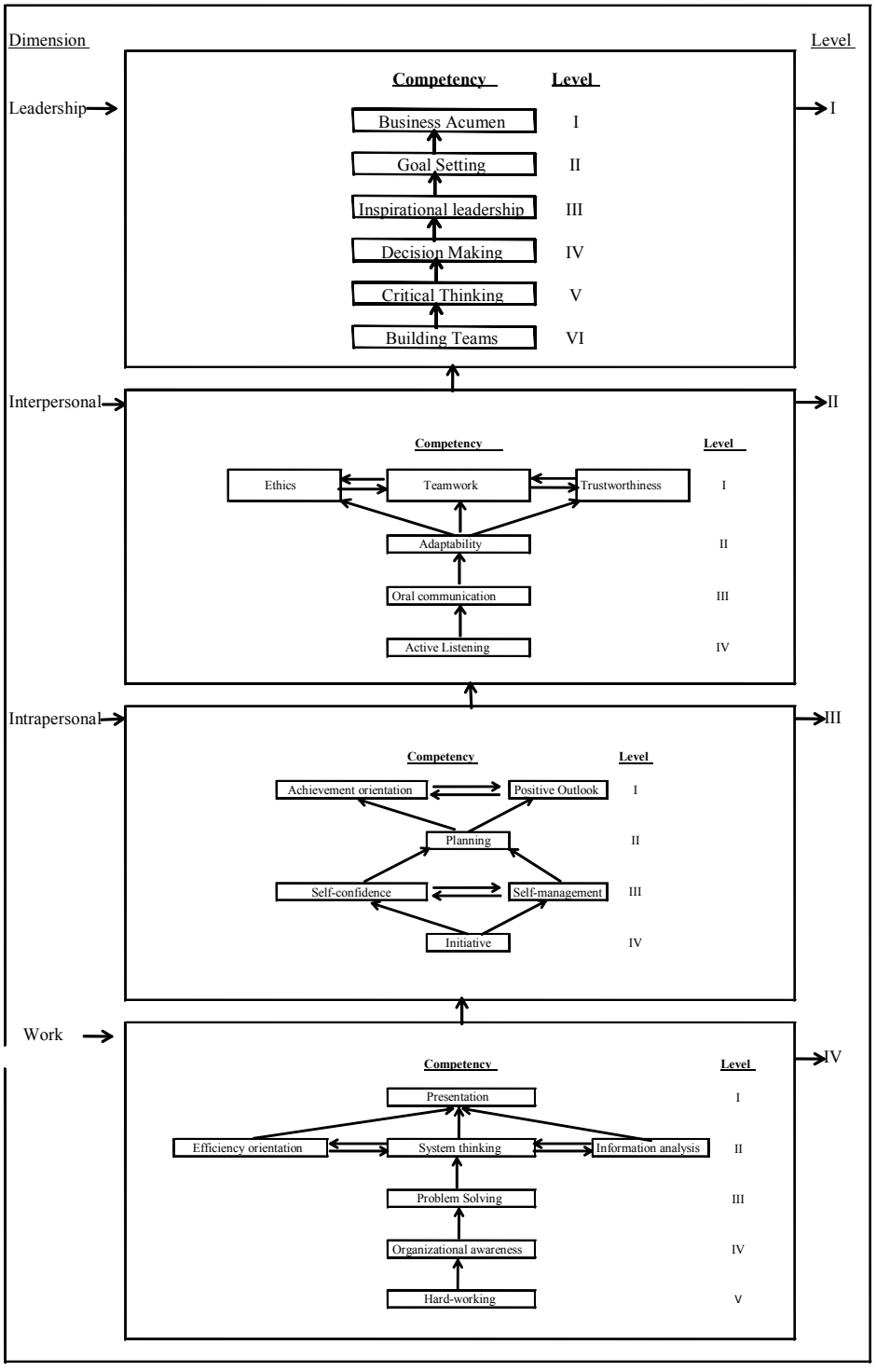
Table 7 Reachability matrix

i \ *j*	*1*	*2*	*3*	*4*	*Driving power*
1	1	1	1	0	3
2	0	1	1	0	2
3	1	0	1	0	2
4	1	0	1	1	3
Dependence power	3	2	4	1	10

Table 8 Level partitions

S. No.	*Dimension*	*Level*
1	Intrapersonal	III
2	Interpersonal	II
3	Leadership	I
4	Technical	IV

Figure 2 Di-graph for dimensions and competencies



Step 3: *Level partitions*

The level partition for criteria Table 8 used to get the levels for each factor (dimension). This table includes columns – Reachability Set, Antecedent Set, and Intersection. The Reachability Set for given factor (dimension) includes factors where 1's are there in a respective row of a Reachability Matrix. Similarly, the Antecedent Set consists of factors where 1's are there against the respective column. The Intersection set includes factors that are common to both the Reachability set and Antecedent set.

The factor which has the same set of factors in both the reachability set and Intersection set considered as factors at Level-I. Further, the factors which levelled taken out, and step 3 repeated until all factors grouped in levels.

Step 4: *Di-graph*

The dimensions were connected and depicted in the form of Di-graph, as shown in Figure 2.

MICMAC diagram

Chandra et al. (2018) evidenced that Duperrin and Godet introduced the MICMAC method in 1973. The MICMAC (Matriced'ImpactsCroisés Multiplication Appliquée á un Classement, i.e., cross-impact matrix) diagram indicates the position of the competency/dimension based on driving power and driven power of the reachability matrix. This diagram has four quadrants, namely autonomous, driver, linkage, and dependent. Each quadrant equal in an area that divides maximum driving power and dependent power numbers into two halves. The driving power of a competency/ dimension is a row-sum and signifies the power of competency/dimension to drive other competencies/dimensions. Competency/dimension's dependence power is a column-sum and signifies the power of different competencies/dimensions to drive.

The competencies in the autonomous quadrant are with less power of both driving and driven. They are less reactive to other competencies. The competencies in dependent quadrant have less driving and more with driven power and are more dependent on other competencies. The competencies in driver quadrant are powered to drive other competencies. Lastly, the competencies in linkage quadrant are more powered by the driver and driven and dynamic. Hence, this method helps the decision-makers to gauge the influence and impact of competencies.

4 Results and discussions

As per the second iteration towards the development of a competency Framework for the MBA program, the 40 responses analysed and for each competency respondent-competency-weight (RCW_{ij}) was computed and thus obtained RCW_{ij} of all respondents were averaged and termed as Mean-RCW_{ij} ($MRCW_{ij}$) of given (i, j) competency. Results from the assessment shown in Table 4, excluding overlapping competencies, the competencies above the mean of $MRCW_{ij}$ 25 out of 48 considered as essential competencies. These competencies considered for student assessment and development in an MBA program of tier-II and III institutions of north Karnataka.

To establish a relationship among the identified dimensions and competencies using the ISM approach. OECD (2018) report mentioned that after finding relevant constructs (dimension and competencies), the study has to find out how each factor develops in relationship with other constructs. The results of the ISM technique in the form Di-graph for dimensions and competencies within dimensions presented in Figure 2. It interpreted as follows: the level of a dimension indicates the driving power and dependent power. The work-dimension at level-I indicates that it has more driving power. The leadership-dimension at level-IV indicates that it has more dependence. It indicates that to attain leadership-related competencies, the other dimensions and their competencies are vital. Further competencies within each dimension inferred on the level within dimensions. This Di-graph used as a base for developing program outcomes in the design and delivery of the MBA program.

The MICMAC method was applied to classify the 25 essential competencies and to understand the driving and dependence power. Figure 3 depicts positions of competencies depending on both powers (driving and dependence power within each dimension), and results discussed below:

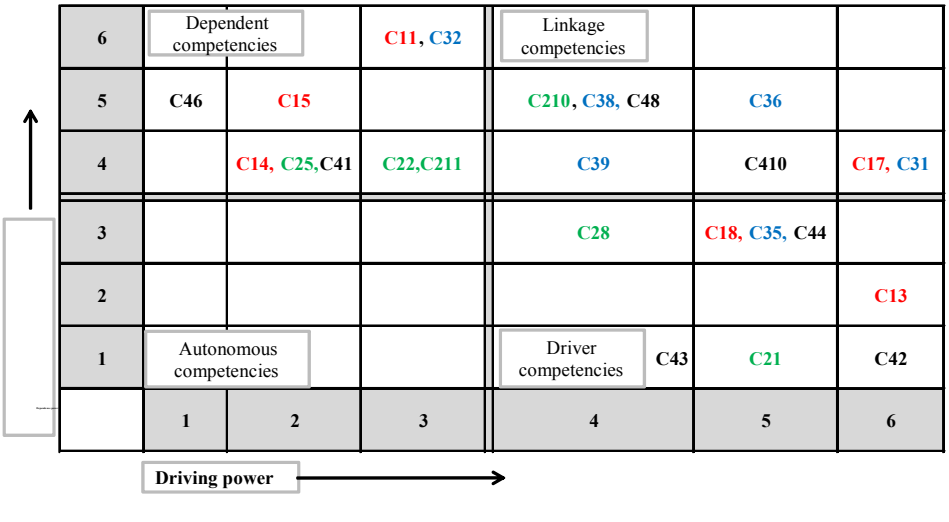
Autonomous competencies: There were no autonomous competencies, i.e., no independent competencies.

Driver competencies: These competencies influence on other competencies to a greater extent in the system. There were 8 competencies all dimensions together, which have high driving and low dependence power.

Linkage competencies: There were 8 competencies, all dimensions together, which have high driving and dependence power. These competencies are more dynamic due to their influence on and by others.

Dependent competencies: 9 out of 25 were dependent competencies are characterised by their weak driving and high dependence power on other competencies.

Figure 3 MICMAC diagram (see online version for colours)



5 Conclusion

Typically, an outcome-based education (OBE) system follows the top-down process (Program Educational Outcomes (PEOs), Program Outcomes (POs), and competencies) to design the program to attain the desired outcomes. This research signifies that a program design must start with the desired competencies to reach the POs and PEOs. The same approach applies to the design and delivery of an MBA program to attain POs. The proposed competency Framework aids in identifying the competencies needed for MBA graduates for a better career. This framework is flexible to use different impediments based on user requirements. Thus obtained competencies can be essential inputs in the new direction of the program design, delivery, and assessment to make the program more sustainable, contemporary. The graduate with the right competencies developed through the program can deliver what industry demands. The study results in Win-Win for students, institutions, and industry, and society.

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