Studying the Inter-relationships amongst the various Barriers Faced by Existing and Upcoming Interior Designers in Developing Countries using ISM Methodology and the use of Interior Design Softwares in Overcoming the Barriers

Poonam Aggarwal
Recventures Education Services Private Limited
Delhi, India

V. K. Aggarwal
Recventures Education Services Private Limited
Delhi, India

Remica Aggarwal
MIT-SOER
MIT ADT University
Pune, India

Arnav Jain
Techture Structures Private Limited
Indore, India

ABSTRACT
Present article explores the various barriers faced by existing and upcoming interior designers of India as well as Interior Design industry in general . Thereafter, it studies the inter-relationship amongst them using ISM methodology.

Keywords
Indian apparel industry ; ISM methodology ; Men's wear ; Indian Retail and Denim industry

1. INTRODUCTION
Decades ago, the interior designers was accessible only by rich. However, over the years, there has been a wide-spread growth of services and consumption, making interior designing a necessity rather than a luxury. The architecture and interior design sector have seen some dramatic changes over the years. It's currently evolving at a faster pace than ever before, since the sustainable design revolution at the tail end of the 20th century. In the modern design environment, it's commonplace to see everything from innovative re-use and preservation to cloud-based services and community-led projects. To create spaces that are both functional and beautiful, new creative methods team with advances in research, data mining, neuroscience, health and building performance etc. This brings a lot of benefits to the table but creates new challenges as well. Startups such as Houzz, Home-polish and Hutch are evolving interior design so that it is quicker, more affordable, and more convenient for customers.

Despite this growth, there a few problems that still afflict the interior decoration industry and its high time that all stakeholders come together to resolve them . Present research focuses on such barriers and challenges and thereafter it studies the inter-relationship amongst them using ISM methodology. The research paper is organized as follows : Section2 presents the literature review. Section 3 works on the ISM methodology. Section 4 presents the future directions.

2. LITERATURE REVIEW[1-6]
Present section presents some of the challenges faced by interior designers in various categories and sub-categories .

2.1. Difficulty in managing time (DMT): For interior design firms, time management skills are a must. There are only so many hours in a day and dozens of things need to get done. Organizing time helps in effectively handling the project tasks and staying on schedule.

2.2 Difficulty in selling your big ideas (DSYI): One of the biggest challengers interior designers face is selling big ideas. It's hard to sell something that doesn't physically exist. In such scenario, clients appreciate the hard labor and effort put in to convince them about your vision.

2.3. Difficulty in handling the accounting tasks (DHAT): Many interior designers handle the accounting tasks ranging from invoices to purchase orders etc. on their **own .** They also makes use of accounting software created specifically for designers.

2.4. Difficulty in maintaining client expectations (DMCE): Being an interior designer is all about working with people and managing expectations. Setting boundaries , working within budget and sticking to timeline is the mantra for success. Now days , designers extensively makes use of visual implementations and visual representations which help them in convincing their clients about their current and future activities and the time line associated with it . this helps in getting a clarity about how things are working.

2.5. Mastering in introducing and setting trends (MIST): Staying on top of trends and knowing how to tastefully introduce them is one of the greatest creative skills for designers to master and therefore a big challenge. The industry of interior design is quite a competitive one, and the schedule you have can be quite intense. Those two things alone can take a heavy toll on interior designers, especially those who are new to the game.

2.6. Difficulty in managing Costs (DMC): Interior designers have to monitor budgets very closely particularly managing the changing expectations of the client. Every aspect of a firm needs to run efficiently in order to ensure no money is wasted in the process of creation. For most interior design firms, managing the costs of materials is the biggest challenge. This could include the out of control labor costs or the inefficiency in the workflows in terms of both time and money.

2.7. Difficulty in Self-Promotion/ Online promotion (DSP): From Pinterest to Instagram, there are endless outlets for self-promotion. However, knowing how to master them for designers can be tricky. Get online and see what other interior designers are doing and how they showcase their designs. A personal website, complete with a blog, is a great way to tear

down the barriers of business hours and geographic location, and gives you the greatest brand reach possible.

2.8. Difficulty in sourcing products (DSoP): Finding the desired products, furnishings and accessories is the biggest project-related challenge. Some professionals resort to the internet, where search engines return thousands of results, leaving them to swift through seemingly endless products and websites. Depending on location, access to good furniture and unique decorative pieces is limited. Add on to it the varying demands and varying decorating styles which makes even the astute designer to strive to find good furniture with great designs by physically roaming from one shop to another.

2.9. Difficulty in generating a consistent paycheck (DGCP): As an interior designer with your personal website up and running and your social media accounts singing your praises, there can still be a distance to go before you become reliably profitable. The reason is that many designers, till today, do not have a personal brand identity and shy away from exploring the many benefits of marketing.

2.10. Difficulty in finding right people (DRP): Another problem the design community commonly faces is finding the right people for the job. Whether they are contracting out work or looking to hire someone credible for their own offices, finding people with the same work ethic, passion, and values can be very difficult.

2.11. Lack of brand identity and client experience (LBICE): Most of what you do as an interior design company will depend greatly on the experience the client will have and your brand identity. When working on a design project, it is imperative that you infuse the identity of your brand at all times and in everything you do. Doing that will allow your design to tell a story, which is something that a lot of clients crave for these days.

2.12 Challenge of designing "smart" buildings (CDSB) : Easy access to information and growing environmental, health and sustainability concerns have led to some revolutionary changes in the design sector. Modern 'smart' buildings are designed to be intuitive, scalable, user-friendly and most importantly, health-oriented. Designers also need to consider emotional and mental health benefits of lighting, ventilation, orientation, indoor air quality and various other factors.

2.13. Promise and delivery mismatch (PDM): The decorator and clients will have different perceptive capabilities. The former being seasoned, the latter a novice. Thus, even if both are looking at the same layout and plan, a client may end up imagining it differently. While 3D renders have improved this gap drastically, much is still left to be done so that customer satisfaction is not affected.

2.14. Challenge in explaining vision and process (CEVP): Designers often face the challenge to really give client a good, concrete idea of what the overall vision is and thereby to demonstrate certain aspects of a design to them . Explaining as much of the process as you can to the client will gain their appreciation that you care enough to make them understand as much as possible.

2.15. Lack of transparency (LoT): While customers tend to expect deliveries to be in a certain price range, the decorators struggle with bargaining, negotiating and arriving at a reasonable cost of customization. Over and above this, there is a constant pressure of price comparison from clients. This creates a sense of mistrust.

2.16. Challenge of accommodating benefits for Local and Global Communities(CAB): In addition to environmental concerns, they are also expected to maximize their positive impact on social justice, both on a local and global scale. Industry demands need to be balanced against social ones, keeping the larger picture in mind.

2.17. Problem in finding qualified clients/prospects (PQP)[5]: More than half the designers surveyed indicated their clients or prospective clients struggled to understand the value of the designer's services. They are demanding and slow to respond when making decisions. These services have become more competitive and many consumers have adjusted to spending less and expecting more. Add to this that with Pinterest, Houzz and Instagram, consumers have access to a wealth of free design advice and designer projects.

2.18. Challenges of handling changing requests by clients (CHCR)[5]: For a client, the decoration of their dream home is probably a once in a lifetime project. It is not surprising then, that they seek perfection and keep asking for changes on the plans, till they are satisfied. The changes translate into a domino effect of having to inform suppliers, revising quotations, affecting the changes in the execution and so on and so forth.

2.19. Challenge of keeping tight quality control throughout supply chain (CTQC): Designers often face the need of tight quality control so as to provide manufacturers the benefit of economies of scale through mass production . This may require submitting designs to manufacturers instead of supervising local carpenters.

2.20: Challenge of allotting different design styles (CDDS)[8]: Designers often face the challenge to distinguish between the different styles in interior design, especially between *modern and contemporary.* Modern is more in reference to the early 20th century as it somewhat arose from the industrial revolution. This style is associated with distinct, clean lines and warm neutrals. On the other hand, contemporary interior design is more linked to the trends in interior design and could be a combination of influences from many time periods.

3. INTERPRETIVE STRUCTURAL MODELLING METHODOLOGY

Proposed by Warfield in 1974 , ISM methodology is a technique for establishing inter-relationships amongst the criteria of interest . This is done via a number of steps . The process begins with the identification of relevant elements and thereafter establishing contextual relationship amongst them . after that the structural self – interaction matrix is created using the VAXO concept which is then followed by the creation of initial reachability matrix . Final

4. DEVELOPMENT OF ISM MODEL CASE EXAMPLE

In this section we will develop the ISM model for the various challenges faced by interior designers . As mentioned in section 2 , 20 important metrics viz. Difficulty in managing time (DMT); Difficulty in selling your big ideas (DSYI) ; Difficulty in handling the accounting tasks (DHAT) ; Difficulty in maintaining client expectations (DMCE); Mastering in introducing and setting trends (MIST) ; Difficulty in managing Costs (DMC) ; Difficulty in Self-Promotion (DSP)/ Difficulty in online promotion ; Difficulty in sourcing products (DSoP); Difficulty in generating a consistent paycheck (DGCP); Difficulty in finding right

people (DFRP); Lack of brand identity and client experience (LBICE); Challenge of designing "smart" buildings (CDSB) ; Promise and delivery mismatch (PDM); Challenge in explaining vision and process (CEVP); Lack of transparency (LoT); Challenge of accommodating benefits for local and global Communities(CAB); Problem in finding qualified clients/prospects (PQP) ; Challenges of handling changing requests by clients (CHCR); Challenge of keeping tight quality control throughout supply chain (CTQC); Challenge of allotting different design styles (CDDS) have been studied for exploring the possible inter-relationships using ISM methodology .

4.1 Construction of Structural self-interaction Matrix (SSIM)

This matrix gives the pair-wise relationship between two variables *i.e. I and j* based on VAXO. SSIM has been presented below in Fig 1.

4.2 Construction of Initial Reachability Matrix and final reachability matrix

The SSIM has been converted in to a binary matrix called the initial reachability matrix shown in fig. 2 by substituting V, A, X, O by 1 or 0 as per the case. After incorporating the transitivity, the final reachability matrix is shown below in the Fig 3.

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	11	12	13	14	15	16	17	18	19	20
		DMT	**DSYI**	**DHAT**	**DMCE**	**MIST**	**DMC**	**DSP**	**DSoP**	**DGCP**	**DFRP**	**LBICE**	**CDSB**	**PDM**	**CEVP**	**LoT**	**CAB**	**PQP**	**CHCR**	**CTQC**	**CDDS**
1	DMT		O	O	V	V	V	V	A	V	X	A	O	V	V	V	O	O	V	V	V
2	DSYI			A	V	X	V	V	O	V	A	A	O	V	V	O	V	A	O	O	V
3	DHAT				V	A	V	V	V	V	O	O	O	O	O	O	V	O	A	O	O
4	DMCE					A	V	V	V	V	V	O	O	V	V	O	V	V	V	V	V
5	MIST						V	A	V	V	A	A	O	O	V	O	O	V	V	V	V
6	DMC							V	V	V	V	V	V	V	V	V	V	V	V	V	V
7	DSP								O	O	O	A	V	V	V	V	V	V	V	V	V
8	DSoP									A	A	A	V	V	O	V	V	V	V	V	V
9	DGCP										A	A	V	V	X	V	V	V	V	V	X
10	DFRP											A	X	A	A	A	A	A	A	A	A
11	LBICE												V	V	V	V	V	V	V	V	V
12	CDSB													A	A	A	V	V	X	A	X
13	PDM														A	A	A	A	A	A	A
14	CEVP															X	V	V	V	V	V
15	LoT																V	V	V	V	V
16	CAB																	V	A	V	A
17	PQP																		A	V	A
18	CHCR																			V	X
19	CTQC																				O
20	CDDS																				

Fig 1: SSIM matrix for pair wise relationship amongst barriers

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	11	12	13	14	15	16	17	18	19	20
		DMT	**DSYI**	**DHAT**	**DMCE**	**MIST**	**DMC**	**DSP**	**DSoP**	**DGCP**	**DFRP**	**LBICE**	**CDSB**	**PDM**	**CEVP**	**LoT**	**CAB**	**PQP**	**CHCR**	**CTQC**	**CDDS**
1	DMT	1	0	0	1	1	1	1	0	1	1	0	0	1	1	1	0	0	1	1	1
2	DSYI	0	1	0	1	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	1
3	DHAT	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0
4	DMCE	0	0	0	1	0	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1
5	MIST	0	1	1	1	1	1	0	1	1	0	0	0	0	1	0	0	1	1	1	1
6	DMC	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	DSP	0	0	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1
8	DSoP	1	0	0	0	0	0	0	1	0	0	0	1	1	0	1	1	1	1	1	1
9	DGCP	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1
10	DFRP	1	1	0	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0

11	LBICE	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	CDSB	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	1	0	1
13	PDM	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0
14	CEVP	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1
15	LoT	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1
16	CAB	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	1	0
17	PQP	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0
18	CHCR	0	0	1	0	0	0	0	0	0	1	0	1	1	0	0	1	1	1	1	1
19	CTQC	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0
20	CDDS	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	1	1	1	0	1

Fig 2: Initial reachability matrix

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	11	12	13	14	15	16	17	18	19	20	
		DMT	**DSYI**	**DHAT**	**DMCE**	**MIST**	**DMC**	**DSP**	**DSoP**	**DGCP**	**DFRP**	**LBICE**	**CDSB**	**PDM**	**CEVP**	**LoT**	**CAB**	**PQP**	**CHCR**	**CTQC**	**CDDS**	**D.P**
1	DMT	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	16
2	DSYI	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	15
3	DHAT	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	14
4	DMCE	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	14
5	MIST	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18
6	DMC	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18
7	DSP	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	15
8	DSoP	1	0	0	0	0	0	0	1	1	1	0	1	1	0	1	1	1	1	1	1	11
9	DGCP	1	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	14
10	DFRP	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	15
11	LBICE	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	CDSB	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	1	1	1	1	1	13
13	PDM	0	1	0	0	1	0	0	1	0	1	0	1	1	0	0	1	1	1	0	1	13
14	CEVP	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	15
15	LoT	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	14
16	CAB	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	1	1	0	1	0	11
17	PQP	0	1	0	1	1	1	1	1	1	1	0	1	1	0	0	1	1	0	1	0	10
18	CHCR	0	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	14
19	CTQC	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	1	1	1	1	1	13
20	CDDS	0	1	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	12
	De.P	8	18	4	10	17	11	11	20	19	20	3	20	20	13	14	20	20	18	19	18	

Fig 3 : Final reachability matrix

D.P : Driving power ; De.P : dependence power

4.3 Level Partition

From the final reachability matrix, reachability and final antecedent set for each factor are found. The elements for which the reachability and intersection sets are same are the top-level element in the ISM hierarchy. After the identification of top level element, it is separated out from the other elements and the process continues for next level of elements. Reachability set, antecedent set, intersection set along with different level for elements have been shown below in table 4.3.1 to table 4.3.6.

Table 4.3.1: Iteration I

S. No.	**Reachability set**	**Antecedent set**	**Intersection set**	**Level**
1	**8,10,12,13,16, 17**	**1,2,3,4,5,6,7,8,9 ,10,11,12,13, 14,15,16,17,18, 19,20**	**8,10,12,13, 16,17**	
2	8,9,10,12,13,16, 19,17	1,2,3,4,5,6,7,8,9 ,10,11,12,14, 15,16,17,18,19, 20	8,9,10,12,1 6, 19,17	
3	8,9,10,12,13,16, 17,18,19,20	1,2,3,4,5,6,7,8,9 ,10,11,12,14, 15,18,19,20	8,9,10, 12, 18,19,20	

4	8,9,10,12,13,16,17,18,19,20	1,2,3,4,5,6,7,8,9,10,11,12,14,15,18,19,20	8,9,10,12,18,19,20	
5	2,8,9,10,12,13,16,17,18,19,20	1,2,3,4,5,6,7,8,9,10,11,12,14,15,18,19,20	2,10,12,18,19,20	
6	2,5,8,9,10,12,13,16,17,18,19,20	1,2,3,4,5,6,7,8,10,11,12,14,15,18,19	2,5,8,10,12,18,19	
7	2,5,8,9,10,12,13,15,16,17,18,19,20	1,2,3,4,5,6,7,8,10,11,14,15	2,5,8,10,15	
8	2,5,8,9,10,12,13,14,15,16,17,18,19,20	1,2,3,4,5,6,7,10,11,14,15	2,5,10,14,15	**I**
9	2,5,8,9,10,12,13,14,15,16,17,18,19,20,6,7	1,2,3,4,5,6,7,10,11	2,5,10,14,15	
10	2,5,6,7,8,9,10,12,13,14,15,16,17,18,19,20	1,2,3,4,5,6,7,10,11	2,5,6,7,10	
11	1,6,8,9,10,12,14,15,16,17,18,19,20	1,3,10,11	1,10	
12	1,3,6,8,9,10,12,14,15,16,17,18,19,20	1,3,11	1,3	

Table 4.3.2: Iteration II

S. No	Reachability set	Antecedent set	Intersection set	Level
2	**9,19**	**1,2,3,4,5,6,7,9,11,14, 15, 18,19,20**	9,19	
3	9,18,19,20	1,2,3,4,5,6,7,9,10,11,14,15,18,19,20	9,18,19,20	
4	9,18,19,20	1,2,3,4,5,6,7,9,10,11,14,15,18,19,20	9,18,19,20	
5	2,9,18,19,20	1,2,3,4,5,6,7,9,11,14,15,18,19,20	2,18,19,20	
6	2,5,9,18,19,20	1,2,3,4,5,6,7,11,14,15,18,19	2,5,18,19	
7	2,5,9,15,18,19,20	1,2,3,4,5,6,7,11,14,15	2,5,15	**II**
8	2,5,9,14,15,18,19,20	1,2,3,4,5,6,7,10,11,14,15	2,5,10,14,15	
9	2,5,9,14,15,18,19,20,6,7	1,2,3,4,5,6,7,10,11	2,5,10,14,15	
10	2,5,6,7,9,14,15,18,19,20	1,2,3,4,5,6,7,10,11	2,5,6,7,10	
11	1,6,9,14,15,18,19,20	1,3,10,11	1,10	
12	1,3,6,9,14,15,18,19,20	1,3,11	1,3	
13	1,3,6,9,11,14,15,18,19,20	1,3,11	1,3,11	

Table 4.3.3 : Iteration III

S.No.	Reachability set	Antecedent set	Intersection set	Level
3	**18,20**	**1,2,3,4,5,6,7,10, 11,14,15, 18,20**	18,20	
4	18,20	1,2,3,4,5,6,7,10, 11,14,15, 18,20	18, 20	
5	2,18,20	1,2,3,4,5,6,7,11, 14,15,18, 20	18,20	
6	2,5,18,20	1,2,3,4,5,6,7,11, 14,15,18	2,5,18	**III**
7	2,5,15,18,20	1,2,3,4,5,6,7,11, 14,15	2,5,15	
8	2,5,9,14,15,18,20	1,2,3,4,5,6,7,10, 11,14,15	2,5,10,14,15	
9	2,5,9,14,15,18,20,6,7	1,2,3,4,5,6,7,10, 11	2,5,10,14,15	
10	2,5,6,7,9,14,15,18,20	1,2,3,4,5,6,7,10, 11	2,5,6,7,10	
11	1,6,14,15,18, 20	1,3,10,11	1,10	

Table 4.3.4 : Iteration IV

S. No.	Reachability set	Antecedent set	Intersection set	Level
5	**2**	**1,2,3,4,5,6,7,11,14, 15**	2	
6	5	1,2,3,4,5,6,7,11,14, 15	2,5	
7	5,15	1,2,3,4,5,6,7,11,14, 15	2,5,15	
8	2,5,9,14,15	1,2,3,4,5,6,7,10,11, 14,15	2,5,10,14, 15	
9	2,5,9,14,15, 6,7	1,2,3,4,5,6,7,10,11	2,5,10,14, 15	
10	2,5,6,7,9,14 ,15	1,2,3,4,5,6,7,10,11	2,5,6,7,10	
11	1,6,14,15	1,3,10,11	1,10	**IV**
12	1,3,6,14,15	1,3,11	1,3	
13	1,3,6,11,14, 15	1,3,11	1,3,11	

Table 4.3.5: Iteration V

S. No.	Reachability set	Antecedent set	Intersection set	Level
6	5	1,3,4,5,6,7,11,14,15	5	
7	**5,15**	**1,3,4,5,6,7,11,14,15**	**5,15**	**V**
8	5,9,14,15	1,3,4,5,6,7,10,1	5,10,14,15	

		1,14,15	
9	5,9,14,15,6,7	1,3,4,5,6,7,10,11	5,10,14,15
	5,6,7,9,14,15	1,3,4,5,6,7,10,11	5,6,7,10
11	1,6,14,15	1,3,10,11	1,10
2	1,3,6,14,15	1,3,11	1,3
13	1,3,6,11,14,15	1,3,11	1,3,11

4.4 Classification of factors

The critical success factors described earlier are classified in to four clusters *viz*. autonomous factor, dependent factors, linkage factors and independent / Driving factors are mentioned below.

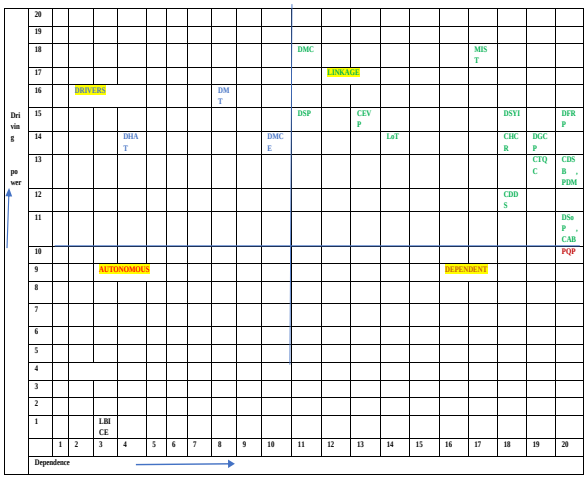

Fig. 4.Driving Power and Dependence Diagram

The critical success factors described earlier are classified in to four clusters *viz*. autonomous factor, dependent factors, linkage factors and independent factors are mentioned below.

4.5 ISM model

An ISM model is developed (as shown in fig. 5 below) after arranging the elements as per their interaction or dependence relationships.

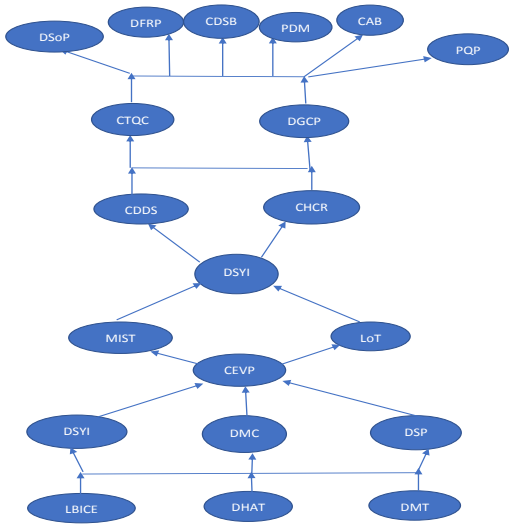

Fig 5 : ISM Model

5. RECOMMENDATION TO HANDLE CHALLENGES AND FUTURE DIRECTIONS

5.1 Creating and Executing a Clear Marketing Plan

Interior designers need to create and execute a clear marketing plan. After years of consulting with and advising interior designers about their businesses, it continues to amaze me how many neglect the marketing side of their business. The results of our survey reveal that revenue will improve when designers apply basic, tried-and-true business practices.

5.2 Designing the Future

New technologies are showing a lot of promise for the future of interior design. It'll certainly involve healthy doses of 3D printing both augmented (AR) and virtual reality (VR) and smart homes. VR would be ideal for an interior designers as it would allow them to walk their clients through a room they've created, or show them hundreds of different wallpaper designs. On the other hand, Augmented Reality (AR) has already made its way into the industry. While AR can't stimulate total immersion into a virtual world created by software, it can fuse together the virtual and real world by placing virtual features over the actual ones.

5.3 Smart Designs

Smart homes are already everywhere, with Google Home and Amazon Echo empowering people to interact with their homes by voice, controlling the temperature and lighting. Over the last few years, 3D printing has become increasingly efficient and accessible.

5.4 Future Directions :Auto CAD in interior designing

Interior designers use a variety of design software to design indoor space. The most commonly used design software is Auto CAD. Using Auto CAD drawing can not only make the picture succinct, the view is beautiful, but also be easy to modify, and the reuse rate is high. If designers are proficient in Auto CAD, they will greatly improve their productivity when designing and drawing interior space. By mouse click, production drawings and bills of material are immediately available after finishing the design. An impressive photo realistic visualization provides not only a smooth communication with architects or building owners, but a successful sales or prototype presentation. Further benefits include : Room planning, photo realism; Parametric & free designing; Simple operation allows a quick solution of construction Tasks and fast and secure design due to an extensive library with intelligent and parametric connections

6. ACKNOWLEDGMENTS

Our thanks to the anonymous reviewers whose comments have helped us in improving the manuscript . Co-author Remica Aggarwal also pay her sincere regards to Prof. S.P Singh of DMS , IIT Delhi for disseminating the knowledge about ISM methodology.

7. REFERENCES

[1] "India Business of Fashion Report 2018 – The Blending

[2] Warfield, J. N. 1974. Developing interconnection matrices in structural modeling. IEEE Transactions on System, Man, and Cybernetics, SMC-4 (1), 81-87.

8. APPENDIX
Sample questionnaire

The purposes of this study were to survey interior design professionals in order to determine: (1) the demographic characteristics of interior design professionals, including; (a) employment status, (b) scope of design work; (c) level of education; and (d) type of program graduated from; (2) which CAD software programs interior designers are using; (3) what are the CAD requirements for entry-level employment are; (4) if firm size has an impact on; (a) gross volume; (b) scope of work; and (c) CAD use.

The following questionnaire s for educational purposes only .

Employment

1. Design employment status: (Check one)

   • Full time

   • part time

   • Contract

   • Other (please specify)

2. Scope of design work: (Check all that apply)

- Commercial

• Institutional

- Retail

• Residential

- Other (please specify)

3. How long have you been a practicing interior designing ?

   - 0-1 years
   - 1-3 years
   - >3 years

Education

4. Highest degree completed: (Check one)
   - Graduation
   - Post- graduation

   • professional degree

   - Doctorate
   - Other (Specify),

5. What year did you graduate?.

6. What type of program did you graduate (please specify any one)

   - Non-accredited Interior design
   - Accredited interior design
   - Architecture
   - Art
   - Other

7. How did you receive your CAD instruction? (Check one)

   • Required academic class

   • Integrated into other design classes

   - In-house training

   • Other (Specify)

Resources

8. What primary software programs are you using for CAD? (Check one)
   - AutoCAD

   • Micro Station

   - Other (Specify)

Procedures

9. Who initiated the original idea for CAD use within your institute / firm ? (Click one)

   • Principal/partner

   - Senior Designer
   - Junior Designer
   - Business department
   - Others (specify)

10. How is CAD used with your firm? (Check all that apply)

    - In design preliminaries
    - In construction drawings i.e. dimensioned plans, lighting and electrical etc.
    - Modelling

• Presentations

    - Others (specify)

Outcomes

11. What do you consider are the firm's advantages from the use of CAD? (Check all that apply)

    - Cost savings in reduction of design/drafting time

    • Ease in creating presentations via drawings, 3D modelling or slides

12. If your firm does not use CAD, indicate reason. (Check all that apply)

    - Limited scope within firm
    - Software too costly
    - Training Incomplete / time consuming

13. Would your firm hire a graduate with some CAD training over another if all else were equal? (Check one)

    - Yes
    - No
    - No preference

Organization

14. How many designers in your firm work with CAD? (Check one)

    - 1-3
    - 4-6
    - 7-9
    - 10-l5
    - Other / higher (Specify)