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Exploring Barrier's to the implementation of Industrialized Building System (IBS) in residential buildings in Pakistan

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A B S T R A C T

A different approach to project construction that is being used by industrialized nations is the adoption of the industrial building system. An industrialized building system is one in which every building component, including slabs, walls, beams and columns, is mass produced in a factory or factory located on the construction site under tight quality control regulations. This study focuses on identifying obstacles to IBS adoption in Pakistani residential buildings. In this research, a questionnaires survey is conducted . The study's conclusions discussed the advantages and difficulties of Pakistan's top-ranked IBS implementation. Furthermore, the report offers recommendations for introducing IBS in Pakistan

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INTRODUCTION

IBS is a construction system in which prefabricated material is used for construction of the projects (Umar Kassima, 2012).This Material is prefabricated and design according to the need of the customer (Umar Kassima, 2012). Material is made off the site by using proper machine and formwork etc. When the Components are manufactured on the site or off the site in a factory then they are shifted to the construction site with very less work(Faridah Ismail, 2012)

Undoubtedly, IBS has several advantages such as safety, quality; cost and time etc. are few of them and their implementation in construction contribute toward better performance in construction industry (Abidin, 2007).

The major advantage of prefabrication of material is the safety of worker and it can also be helpful where the labour is quite expensive and safety management and work management can be improve through industrialise building material (Wajahat Sammer Ansari, 2015) The barriers to implementation of IBS in residential building in Islamabad Pakistan have not been study widely in the past; author wants to explore the barrier present in the implementation of residential buildings in Islamabad Pakistan. economy is largely dependent on labour, the majority of which is unskilled workers. Because of this, Pakistan's construction industry faces a number of challenges, including subpar workmanship, project delays, social issues, and low quality work. Research question are addressed on the basis of our problem i-e the benefits and barriers of IBS and on the methods of IBS the will reduce the barriers. The main objective of the study is to identified the benefits of IBS and the barriers in implementing the IBS. The research also aim is to suggest the method for the reduction of barriers.

Industrialise Building System

In accordance with (Yousre F.Badir, 2000), there are four primary classifications for construction methods.

1. Composite method
2. Conventional method
3. Cast Situ method
4. Full prefabricated system

Except of the conventional method all the other method are considered as nonconventional method and these methods are further defined below

Conventional Construction Method

In this method for the construction of reinforced concrete, formwork of timber and steel is assembled and the reinforced bars are placed in that and concrete is poured in slab, beams, footing and column. This method is quite labour intensive and involving direct trade of workers to complete the work. This method could be hampered by the unfavourable site condition or due to bad weather

Cast in Situ Construction Method

Cast in situ is also one of the conventional method for the concreting of structure. This is a method in which the preparation of concrete is performed on the site and in formwork that concrete is poured and shaped but by this method it is more labor extensive and also even in the result of more consumption of a time (Vyas, 2015)

Composite Construction Method

Composite construction method is a method which is having a composite nature of conventional method and prefabricated method this method is also known as partially industrialize system as some of the material which can be standardize can be made in the factory and the remaining of them can be cast on site. This method is a approach towards improving of quality, shortening the time of construction and also by reducing the cost (Yousre F.Badir, 2000)

Fully prefabricated System

Fully prefabricated or precast is newly system which is extensively used in the world for the concreting of the project. In this concrete is made in a controlled environment and pored and placed in a formwork (Vyas, 2015)

According to (Yousre F.Badir, 2000) Prefabrication system is mainly classified into two categories

- Off Site Prefabrication (Factory producing)
- On Site Prefabrication

Identified Barriers for the Implementation

IBS is a great resource for accomplishing the goal of sustainable site development and for analysing the barriers that have the biggest impact in comparison to other barriers (Milad Samari, 2013).

The barriers that have been noted are

Initial high Cost,Insufficient Knowledge, Transportation, Initial High Cost, Awareness, Planning and Implementation etc.

LITERATURE REVIEW

A quantitative study is made for the collection of the primary data. Questionnaire was distributed among the experts of the construction field to determine the study. 120 questionnaires were distributed among which 116 were responded and data is analysed using SPSS Software.

Demographic analysis

The initiation of the research is with the demographic question which is shown in Table 1

Table 1. Demographic Findings (N=116)

Items		Frequency	Percentage(%)
Respondents Gender	Male	108	93.1
	Female	8	6.9
Respondents Age	18-24	68	56
	24-34	38	32.8
	35-44	7	6
	44-50	3	2.6
	Above 50*	3	2.6
Level Education	H. School,	13	11.2
	Diploma,	35	30.2
	Bachelor,	22	19

	Master,	41	35.3
	PhD	5	4.3
Discipline of Expertise	Engineer	71	61.2
	Architecture	12	10.3
	Project Manager	16	28.1
	Contractor	14	12.1
	Supervisor	5	4.3

Table 1 findings indicate that 93.1% of the gender is male in which in which the age of 24-34 is of 38 from 116 which is 32.8 % The level of education of most of the participants are Masters i-e 35.3%, followed by diploma students of civil of frequency 35. The discipline of expertise of the most participants is engineer is 61.2 %.

Table 2. Benefits of IBS (Descriptive analysis)

Benefits of IBS	**N**	**Mean**	**Std. Deviation**	**Ranking**
Reduction of site Labour	116	2.5965	.88357	6
Minimal Wastage	116	3.3860	.81026	1
High Quality material Use	116	3.0351	.94425	4
Clean Environment	116	3.3860	.81480	1
Lower construction Cost	116	3.2807	1.04803	2
Enhance Efficiency	116	3.2456	.95020	3

In this section respondents were asked for the Benefits of IBS by asking several questions and instructed to rank. The ranking result is found in the form of mean value and standard deviation. Mean value is representing the overall ranking expressed by the respondents' lower mean value of 1 shows strongly disagreement and highest mean value of 5 indicate the strongly agree. Moreover, to find more accurate result of the data standard deviations is the square root value of mean in mathematic but here this indicate the importance of the factor below 1 more closer value to 0.01 indicated strongly agreement. Factors were ranked as shown in Table where two factors have same mean finding of 3.38. The respondents of the study claim that it has a huge benefit in reduction of labour

and has a huge benefit in IBS. Study findings shows that most of the benefits were ranked neutral and the highest 3.38mean and 0.81.

METHODOLOGY

Barriers to Adoption of IBS

The employees' low quality is caused by a lack of knowledge and abilities, which is also one of the main impediments to IBS adoption in Pakistan. Government always played a significant role in system creation and promotion, but this scenario analysis discovered that the lack of government promotion in the commercial and public sectors was one of the biggest obstacles to IBS adoption in Pakistan. The top five barriers are displayed in Figure 4.7. The study also discovered that the absence of technology was the second-lowest ranked barrier, coming in at 3.38, after legal and cultural difficulties. According to the study, the least important considerations and hurdles to the adoption of IBS in Pakistan are cost, time, and material waste. The lowest influencing barrier, as discussed above among cultural and legal issues, is one that R-respondents deny.

Table 3. Barriers to Adoption of IBS

Barriers to Adoption of IBS	N	Mean	Std. Deviation	Ranking
Legal and cultural issues	116	3.1754	.96590	9
Poor skill and knowledge	116	4.1053	.71971	5
Lack of manpower	116	4.2807	.82107	3
Low quality	116	4.2632	.93592	4
Lack of Technology and Readiness Issues	116	3.3860	.92107	8
Lack of awareness among people	116	4.7018	.45510	1
Cost and finance	116	3.4561	.82527	7
Lack of government incentives and promotion	116	4.4211	.60529	2
Cost and time delay	116	3.4561	.94624	7
Wastage of material	116	3.4737	1.01955	6

Method to decrease the current Barriers in IBS Implementations

The respondents were asked to rank the most effective strategy for overcoming current obstacles to the adoption of the (IBS) in Pakistan in the questionnaire's last section. The outcome is displayed in Table 4;

Table 4. Method of Barriers Reductions

Method of barriers reductions	N	Mean	Std. Deviation	Ranking
Offer more incentives for user	116	4.6140	.80147	3
Offer flexible financing	116	3.7544	.98707	7
Conduct codes and standard	116	3.8772	.90771	6
Create awareness programs	116	4.7842	.72886	1
Formal education in business process	116	4.6868	.76826	2
H*-ire professional consultant to avoid cost and time delay	116	3.5789	.82261	8
Flexible design	116	3.4737	.70976	9
Training program for local labors	116	4.4035	.88357	4
Proper communication with all parties to avoid delay and mistakes in construction process of IBS	116	3.5789	.75468	8
Scientific supply chain management	116	4.1035	.82313	5

The outcome showed that spreading knowledge among the general population, with a 4.70 mean, was the most effective way to lower obstacles to IBS adoption in Pakistan. Formal business and engineering education came up second on the respondents' list of influential methods. 4.68 mean will greatly lower the obstacle preventing IBS from being implemented in Pakistan.

CONCLUSIONS AND RECOMMENDATIONS

This research study followed with three objectives and in the past chapter each objective findings were discussed in detail. The first objective of the study was to explore industrialized building system (IBS) benefits. Benefits of IBS: Study concluded that benefits of IBS in Pakistan is poor because of several factors. The result shows that most of the respondents accept the benefits of IBS. Study further found that IBS will lead to a clean envoirment and minimal wastage of material that leads to reduction in cost. Therefore, based on the findings study concluded that benefits of IBS are accepted among the people but one with lower value of benefits need more research.

In the regard of industrialized building system facing barriers were documented in past chapter. In the conclusion of the barriers study found five most common barriers in the implementation of IBS in Pakistan and concluded that lack of public awareness is top barrier amongst other. Study further concluded that lack of government incentives found the second common barrier in IBS, followed by lack of man power, poor quality of construction and employee's skills and less knowledge found the most common barriers in the implementation of IBS. Lack of technology and cost of finance were found the moderate barriers to the adoption of IBS in Pakistan.

In previous chapter study discussed several methods to reduce the barriers present in the adoption of IBS in Pakistan. In the sum up conclusion awareness among public has been found the most influential method of enhancing barriers. Formal education in business process has been ranked second most influential method to enhance and reduce barriers to implement industrialized building system in Pakistan. Thirdly, study shows that offer more incentives to the clients and public to encourage IBS, followed by training program to the local employees to improve their skills in the result the skills and knowledge barrier can be reduced. In the process of IBS scientific supply chain management is significantly important to reduce the barriers of industrialized building system. The others method such as standard and codes, flexible design, hire professionals to avoid delays and over cost of the project are the method ranked moderate influencing on the IBS barriers improving methods.

REFERENCES

Abosaad. H, Underwood. J and Boveny. S (2009); Towards an information system representation of OSM in facilitating the virtual prototyping of housing design. BuHu9th International Postgraduate Research Conference (IPGRC): Salford, United Kingdom, 509-520,

BeedleLS , Mir M. Ali , Armstrong PJ . (2007); the Skyscraper and the City: Design, Technology, and Innovation. Books 1 and 2 . Lewiston, NY: The Edwin MellenPress ;

Chung L. and P.Kadir.M, (2007); "Implementation strategies for industrialized building system" Phd thesis university of Malaysia

CIB report (2010); "New perspective in industrialization in construction a state of the art report CIB Publication 329,

Construction Industry Development Board, Malaysia (CIDB),(2007) "IBS Digest at Malbex", IBS Digest, Special Issues on 24th Malaysian International Buildin Exposition, pp. 19-22,

Haas, C. T., &Fagerlund, W. R. (2002) preliminary research on prefabrication, pre-assembly, modularization and off-site fabrication in construction. The Construction Industry Institute, The University of Texas at Austin

Hamid, Z., Kamar, K.A.M., Zain, M., Ghani, K., Rahim, A.H.A., (2008) "Industrialized Building System (IBS) in Malaysia: The Current State and R&D Initiatives" Malaysia Construction Research Journal (MCRJ), Vol. 2 (1), pp 1-13

Hong chin Ong, (2006); "Analysis of IBS for school complex" Master thesis university of Malaysia

IBS Roadmap Review (Final Report) (2007), 2007, IBS Centre, Construction Industry Development Board, Malaysia, Kuala Lumpur (unpublished)

JabarIzatullaili, Faridah Ismail, ArniatulAiza Mustafa, (2013); Issues in Managing Construction Phase of IBS Projects, Procedia - Social and Behavioral Sciences 101

KamarulAnuarMohdKamar, ZuhairiAbd Hamid, Mohamed Nor, AzhariAzman, MohdSanusi S Ahamad, (2011); "Industrialized Building System (IBS): Revisiting Issues of Definition and Classification" Int. J. Emerg. Sci., 1(2), 120-132,

Kamar, K. A. M., Alshawi, M.and Hamid, Z, (2009); "Barriers to industrialized building system (IBS): the Case of Malaysia" International Postgraduate Research Conference (IPGRC 2009), The University of Salford,

Kiong Ng Ban and ZainalAbidinAkasah,(2011); "Maintenance Management system for industrialized building system" International Building & Infrastructure technology conference

Kong Xi Haw, (2009); "Barriers in the implementation of Industrialized building system in Malaysian construction industry" Master thesis: University Technology Malaysia

Majzub (1977); "Modular housing systems used around the world" International Journal of Housing Science

Malaysian Productivity Report, (MPR) (2013); Malaysian productivity Coorporation, KualalLumper

NFPA. (2006). Life Safety Code 101. National Fire Protection Association.

NawiMohdNasrunMohd,, Angela lee, Mohamed Nor, Azhari azman3, KamarulAnuar Mohamad Kamar, (2014); "Fragmentation issue in Malaysian industrialized Building system (IBS) project" Journal of Engineering Science and Technology

Nachmias, D and Nachmias, C (1993); Research Methods in social science, st Martins, New York.

Pan W., Gibb, A., Dainty, A. R. J. (2008) Perspectives of UK housebuilders on the use of off-site modern method of construction, Construction Management and Economic, 25, 2, 183-19

Rahman A.B.A and Omar.W (2006); "Issues and challenges in implementation of IBS in Malaysia" Journal of Structure engineering

Senturer, A. (2001) Which Industrialized Systems Are Appropriate for Turke y. Available at: www.emu.edu.tr/academic/publicat/archpub/arch-32a.htm

Shaari. SN and Ismail, (2003); E. Promoting the usage of Industrialized Building System (IBS) and Modular Coordination (MC) in Malaysia. Construction Industry in Engineers (Board of Engineer Malaysia)

Thanoon, W. A. M., Peng, L. W., Abdul Kadir, M. R., Jaafar, M.S. and Salit, M.S. (2003), The Experiences of Malaysia and Other Countries in Industrialised Building System in Malaysia, Proceeding on IBS Seminar, UPM, Malaysia

Warszawski A (1999);"Industrialized and automated building system. E & FN Spon: TechnionIsraelInstitute of Technology,

Yahya Muhamad Azani& Muhamad NurSafwanShafie, (2012); "Level of acceptance towards industrialized Building system (IBs) in Malaysia" International Journal of Sustainable Construction Engineering & Technology