BIM Adoption around the World

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Abstract:

Adoption of Building Information Modelling (BIM) has increased significantly over the last few years, This paper explain the worldwide status of building information modeling (BIM) adoption from the perspectives of the engagement level, the Hype Cycle model, the technology diffusion model, and BIM services. An online questionnaire was published, and 157 engineers from many continents responded. Total, North America was the first among the continents. Countries in Asia perceived their stage mainly as slope of enlightenment (realize) in the Hype Cycle model. In the technology diffusion model, the main BIM-users worldwide were “early majority” (third stage), but those in the Middle East/Africa and South America were “early adopters” (second stage). In addition, the more advanced the country, the more number of BIM services employed. In summary, North America, Europe, Oceania, and Asia were advancing quickly toward the realize stage of BIM.

Keywords: BIM adoption; Hype Cycle model; Challenges of adopting; Adoption failure; BIM services

1. Introduction:

Building Information Model/Modeling/Management (BIM) is a technology (including technique and processes) based on exploitation/exchange of digital mock-up between construction project actors for buildings lifecycle management. It is considered as an emerging technological shift [1] within the Architecture, Engineering and Construction and Operation (AECO) industry. BIM proves its capability to solve AECOM industry issues [30].

Many guides, protocols and mandates have been produced by governmental bodies and industry associations to facilitate BIM adoption [2] but it mainly focus on technical requirements or describe good practices. Connecting BIM diffusion/adoption/Application literature with change management (a domain that provides models and strategies to analyze and conduct change) carries an interesting research potential that is insufficiently checked [3], The following scanning have been using similar pointes, such as BIM adoption rate, the percentage of expert BIM users, and years using BIM, as if they had all implicitly agreed to use these. Despite the similarities between the pointes used in The following scanning, every survey focused mainly on a single country or an industry at a time except for the 2013 SmartMarket Report, which compared the BIM adoption status of ten countries on four

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continents [10], and the 2013 NBS international report, which compared four countries on three continents [10], BIM technology has been studied and applied to building design, construction, facility management, and even demolition (Yabuki and Li, 2006; Park et al., 2009; Huang et al., 2012; Cheng and Ma, 2013).

Many countries around the world have adopted BIM technology. The United States is believed to be one of the leading countries in adopting BIM models. Many public sector bodies at different levels in the United States have established BIM programs, set up BIM goals and Application roadmaps, and published BIM standards. In 2008, for example, the United States National Institute for Building Sciences (NIBS) published the National Building Information Modeling Standard (NBIMS-USTM). Apart from the United States, many countries in Europe have embarked on significant BIM Applications [5]. The United Kingdom government, for example, mandated that all UK government projects should use BIM by 2016. Although BIM adoption in the public sector came later in Asia, BIM has now developed rapidly in Asian regions.This study aims to report the status of worldwide BIM adoption with an expanded scope and additional pointes. In terms of scope, instead of focusing on one or several specific countries. In terms of measurement point, it uses the Hype Cycle model, the technology diffusion model, commonly used models in depicting the adoption status of a technology, and BIM services (also known as BIM uses) in addition to the typical BIM adoption pointes used in previous studies.

2. Previous studies:

BIM technology has been studied and applied to building design, construction, facility management, and even demolition [27, 28, 29]. Many countries around the world have adopted BIM technology. The United States is believed to be one of the pioneering countries for BIM adoption. Many public sector bodies at different levels in the United States have established BIM programs, set up BIM goals and implementation roadmaps, and published BIM standards. In 2007, for example, the United States National Institute for Building Sciences (NIBS) published the National Building Information Modeling Standard (NBIMS-USTM). Apart from the United States, many countries in Europe have embarked on significant BIM implementations. The United Kingdom government, for example, mandated that all UK government projects should use BIM by 2016. Although BIM adoption in the public sector came later in Asia, BIM has now developed rapidly in Asian regions. For instance, Singapore and Hong Kong have established their own BIM committees and published several BIM guidelines. The Mainland Chinese government also included BIM-related topics in the 12th National Five Year Plan in 2012 [5]. Fig.1 Show,"BIM adoption rate", "depth of Application," skill," and"level of "years are used of using BIM" as pointes the for status of BIM measuring throughout these adoption the first point scanning, total status of BIM as reflects the adoption and engagement the others the level of BIM users.

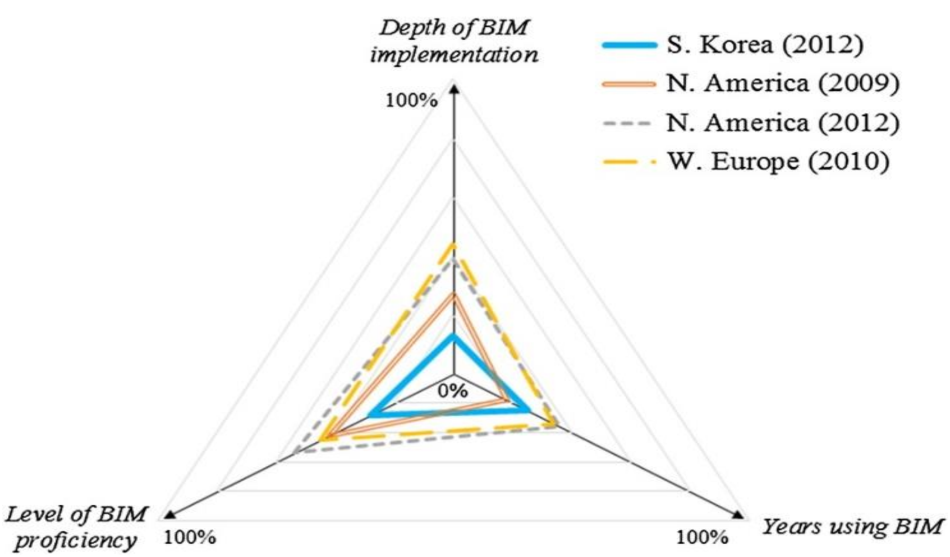

Figure 1. the total status of BIM adoption,Resource:Journal of Computing in Civil Engineering (2015)

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3. Metheology:

An online questionnaire was used to collect BIM pundits' responses. The survey was published in many languages, to a total of 1,315 potential respondents. Potential respondents included 156 authors from 73 searches found via the keyword "BIM"onwww.sciencedirect.com(1996-2014)and scholar.google.com (2004-2014) and 1,153 members who were registered as "BIM Manager," "BIM Specialist," "BIM Coordinator," or any profession related with "BIM" in the BIM Pundits group on LinkedIn (2003-2014). This statistic was done from June 23 to June 4, 2014. We received 167 responses out of 1,215 solicitations (11.6%). Among 167 responses, 153 responses were valid (89.2%). By continent, 26 responses were from North America, 42 from Europe, 48 from Asia, 13 from Oceania, 15 from the Middle East/Africa and 7 from South America. Table I shows The states in which the respondents worked and the distribution of states on the continents.

Several countries responded, 2 North America,, 16 countries in Europe, 8 countries in Asia, 7 countries in the Middle East/Africa, 5 countries in South America.

Table 1- Listed countries in each continent,Resource:Reference 18 (2015)

Continent	Listed countries
North America	U.S., Canada
Europe	Netherlands, France, Italy, Finland, Sweden, Denmark, U.K., Russia, Iceland, Portugal, Turkey, Germany, Spain, Belgium, Poland, Slovenia.
Oceania	Australia, New Zealand
Asia	Republic of Korea, India, China (Hong Kong included), Philippines, Taiwan, Singapore, Thailand
The Middle	Saudi Arabia, Egypt, Lebanon, Jordan, Iran, UAE, South
East/Africa	Africa, Qatar
South America	Argentina, Mexico, Brazil, Chile, Costa Rica

we used the engagement level "depth of Application," "level of skill," and "years of using BIM" and excluded "adoption rate" Because the adoption rate should include responses from users who do not use BIM in the survey set, whereas the other pointes focus on BIM users. The "depth of Application" is measured in a ratio scale ranging from 0.0% to 100.0%, with a 5.0% increase. The level of skill is categorized as "beginner,"
"moderate," "advanced," and "expert." The year of using BIM is measured as an integer number.

The Hype Cycle Model and Technology Deployment Model were also used to visualize BIM development stages and knowledge of key BIM users. Also, a list of frequently used BIM services has been proposed, the statistical results in these models and in BIM services will be compared. The Hype Cycle model, introduced in 1994, has been used extensively to measure the potential of this technology. This model represents a common technology adoption pattern when an industry adopts a new technology.

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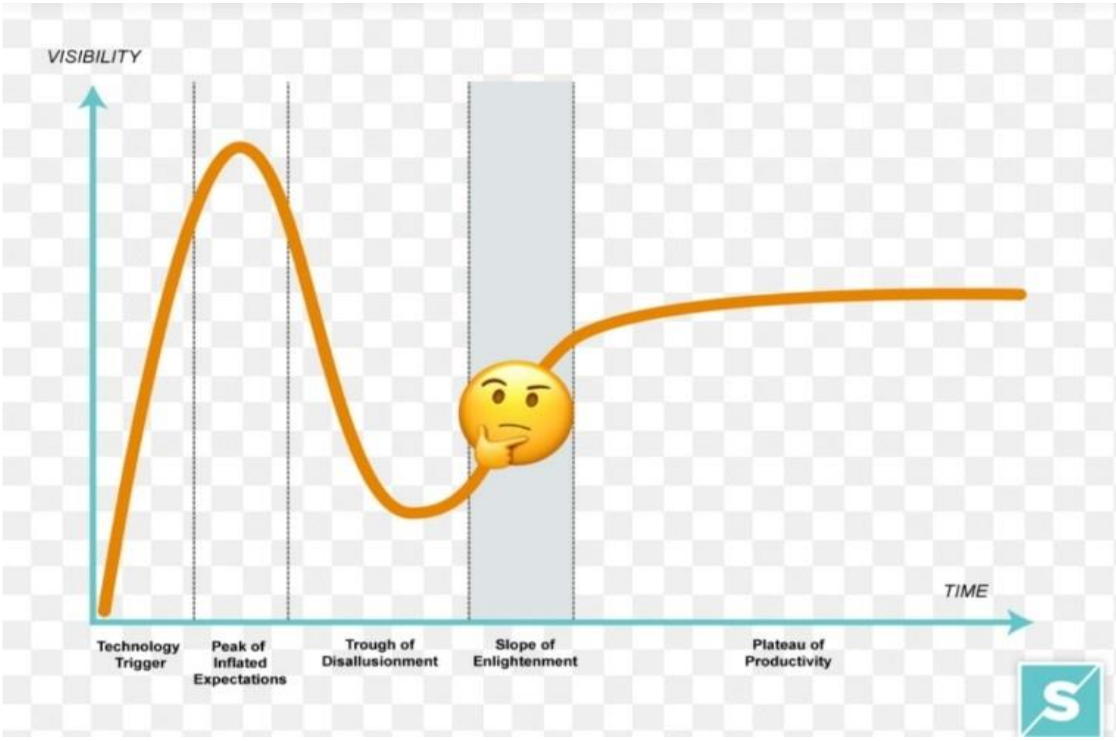

Figure 2- Models for Predicting the Future: Gartner's Hype Cycle, Resource: Smith House Design (2018)

Technology Trigger: Someone invents a new technology and word spread with quickly with other technologists.
Peak of Inflated Expectation This is the absolute peak of visibility. Never will there be more buzz about this technology than at this stage in the cycle.
Trough of Disillusionment: Things start to fall apart. Companies built around the technology start to close.
Slope of Enlightenment: Notice that there is very little visibility for the technology. It's level of exposure in the news and the business chatter is nearly as low as it was before the hype cycle began.
Plateau of Productivity: As time passes, the technology succeeds and becomes "life as usual," but without any of the fanfare as years before. It happens slowly. There is no explosive, magic moment when everyone adopted the technology.
Fig.2 show that at first, new technology make interest from the press and industry (technology trigger). After that, heightened expectations overcome reality (peak of inflated expectations). However, The expected barrier to reality seems higher than technology adopters think, So public expectations are dropping (trough of disillusionment). Some early adopters are beginning to be patient in overcoming obstacles and learning how to use this technology (slope of enlightenment), With the settlement of productivity and benefits, adoption increases (plateau of productivity). The first and second stages are generally considered as"early" stage, the third as "moderate," and the fourth and fifth as "realize" and "very realize" We use the percentage of users in stages 4 and 5 to judge BIM adoption status.
Research shows that BIM is being broadly adopted across the construction industry with over 50% of every survey segment - architect, engineers, contractors and owners utilizing the tools at moderate levels or higher (Liu, 2010). Liu (2010) also identified that architects are the heaviest users of BIM with 43% using it on more than 60% of their projects in 2009. In addition, the study also reveal that contractors are the lightest users of BIM with nearly half (45%) using it on less than 15% of projects and a quarter (23%) using it on more than 60% of projects. At the

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moment, there are variety of BIM software packages available in the market for AEC industry. According to Pinheiro (2013) and Penn State University BIM Research Group (2013), BIM software can be grouped under 6 categories such as Architecture, Sustainability, Mechanical, Electrical & Plumbing (MEP), Construction, and Facility Management.

Figure (3) illustrates 25 possible uses of BIM throughout building lifecycle (Rohena, 2011). Due to the variability of BIM functional, it is essential to identify the appropriate BIM uses for a target project from Planning to Operating Stage.

We conducted a survey that included these three commonly used BIM status pointes, two technology adoption models, and BIM services. The next section describes the survey results.

4. Survey results:

4.1 The Engagement Level:

As mentioned earlier, we used three pointes for the engagement level: "depth of Application," "level of skill," and "years of using BIM."

table 2 Explains the results. North America surpassed other continents in all pointes. Among respondents, 24.12% had more than 10 years of experience and 42.9% evaluated their skills at the "expert" level. The depth of Application was over 73.0%. Moreover, 51.6% of respondents had applied

BIM to over 91.0% of their projects. Oceania ranked second.

Their experience and skill levels were less than North America: 25.0% of respondents had more than 10 years of experience, and 27.5% applied BIM to over 90.0% of their projects.

Taking into account that the majority of BIM users in the Middle East were at the "beginner" level and in the "early adoption" stage in The Middle East/Africa was third.

They have used BIM for an average of 5.8 years, 62.0% of projects have performed BIM, and 80.0% of users rate themselves as having an 'advanced' or 'expert' skill level.

In the 2011 survey [17], it made rapid progress in terms of the level of participation. Asia experienced BIM longer than South America, which had the shortest experience period, but other Asia indicators were lower. In terms of skill, Asia was the only continent that had no more than 70.0% of "advanced" and "expert" users. It also had the lowest execution depth (46.5%).

According to the participation level results, North America, Oceania and the Middle East/Africa were the most developed countries and Asia and South America were the least developed.

Table 2-The averages and standard deviations of the level of participation,Resource: Reference 18 (2015)

	North America	Europe	Asia	Oceania	The Middle East/Africa	South America
Year (stdv)	8.3 (5.3)	5.3 (3.3)	4.9 (2.9)	7.7 (3.5)	5.7 (3.7)	3.3 (1.0)
Depth (stdv)	73.0% (29.4)	55.9% (35.0)	46.5% (33.3)	65.5% (34.6)	62.0% (36.7)	55.8% (33.1)
Skill	82.3%	75.0%	46.4%	81.8%	80.0%	71.4%

Year: the average years of using BIM

Depth: the average depth of implementation

Proficiency: the ratio of users with "advanced" and "expert" level Stdv: standard deviation

4.2 Hype Cycle Model:

We also analyzed the results from the Hype Cycle model. Table 3 shows the results for each continent that relate to the Hype Cycle model. As analyzed at the level of participation, we find that America has most evolved. Although some differences were detected, Europe, Oceania, and Asia showed similar results: the "dip-enlightenment" stage

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was the most selected - more than 52.0% believed they were in the "slope of enlightenment" and "productivity plateau" stages. The Middle East/Africa showed converging answers, with the exception of the third option, which received no response. South America indicated that the first stage was the most selected (50.0%),Each continent had its own field of development (Table 4).

Although the build phase was the most advanced in North America (75.0% Phases 4 and 5), 65.0% answered that the Hype Cycle in the design phase was in Phases IV and V. According to the SmartMarket Report Series, Asia has made significant use of BIM in the build phase [8], [10]: for example, the build phase was in the "realization" phase of BIM adoption.

The level of BIM use in Europe, Oceania, and the Middle East/Africa was most advanced during the design stage.

4.3 Technology Diffusion Model:

Table 5 shows the results representing how each respondent sees the main BIM users. In all, 41.3% of respondents answered that the "early majority group" was the primary BIM user. North America also recognized that the "early majority group" primarily uses BIM (50.0%). Oceania and Asia were similar. On the other hand, BIM users in the Middle East/Africa and South America in general were the "first adopter group". South America had the same percentages of 'innovators' and 'early majority group', but the majority of responses were in 'early adopters group'.

Table 3- Perceived Statue of BIM adoption in the hype cycle model,Resource: Reference 18 (2015)

	Total	*North America*	*Europe*	*Oceania*	Asia	*Middle East <fe Africa*	*South America*
Technology Trigger	11.3%	0.0%	11.2%	10.0%	9.5%	■■ 28.7%	50.0%
Peak of Inflated Expectations	2.7%	3.6%	6.6%	0.0%	6.2%	20.0%	0.0%
Trough of Disillusionment	20.1%	7.5%	22.3%	20.0%	29.6%	0.0%	33.2%
Slope of Enlightenment	38.7%	■48.2%	33.2%	40.0%	■ 42.9%	28.7%	16.6%
Plateau of	21.5%	40.7%	22.3%	30.0%	4.7%	35.6%	0.0%

Table 4- Each continent's most developed phase in the Hype Cycle model, Resource: Reference 18 (2015)

	North America	**Europe**	**Oceania**	**Asia**	**Middle East & Africa**	**South America**
The most developed stage	Constructi on	Design	Design	Constructi on	Design	Constructi on
Technology Trigger	5.0%	13.7	14.2	12.2	■ 30.0%	33.2
Peak of Inflated	10.0	13.7	0.0%	■	10.0	33.2
Trough of	10.0	13.7	0.0%	12.2	10.0	0.0%
Slope of Enlightenment	■ 40.0%	22.6	42.8	45.3%	■ 30.0%	0.0%
Plateau of Productivity	34.0	36.3	42.8	6.2%	20.0	33.2

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Table 5- Perceived major BIM user in the technology diffusion model ,Resource: Reference 18 (2015)

	Total	***North America***	***Europe***	***Oceania***	***Asia***	***Middle East & Africa***	***South America***
Innovators	7.5	7.8	8.8	0.0	4.9	7.2	33.2%
Early	30.89	26.8	37.2%	40.0	22.0%	42.8	33.2%
Early	41.3	50.0	34.2%	50.0	43.8	28.5%	33.2%
Late	16.3	15.3	20.0	10.0			0.0
Laggards	4.3	0.0	0.0	0.0%	9.6	7.1	0.0

4.4 BIM as a service:

In total, the BIM services provided increased from 25.8% in 2011 to 54.5% in 2015.

the top 5 BIM services were phase planning, design reviews, site utilization, 3D coordination, and cost estimation, and they did not change over 5 years. The average adoption rate of the top 5 BIM services was approximately 70% in 2011. In 2015, this rate increased to 85%.

an analysis of the top BIM services with the highest variations was conducted to find the newly introduced BIM services in 2013 and 2015. In 2013, the adoption rates of services related to building system analysis, asset management, space management tracking, maintenance scheduling, and design authoring significantly increased. In 2015, many companies adopted services related to design authoring, code validation, programming, site analysis, and engineering analysis. Few companies used operation and management services in 2011; however, in 2013, more than half of the companies adopted these services. Similarly, less than 10% of companies used design- related BIM services in 2011; however, approximately 40% of the companies adopted these services in 2015. Therefore, there was a significant increase in the services adopted related to the operation phase in 2013 and those related to the design phase in 2015.

the relationships between each BIM service were analyzed using Fisher's exact test. The analyzed BIM services were grouped into five. Table 6 explains the five groups of related BIM services.

Table 6- Rankings of BIM services each year,Resource: Reference 17 (2017)

BIM Services	2011	2013		2015	
	Change Ranking	Change	Ranking	Change	Ranking
Existing Conditions Modeling	. 10	▼ 4	14	▼ 5	19
Cost Estimation	. 4		4	▼1	5
Phase Planning	. 1		1		1
Programming	. 16		16	▲2	14
Site Analysis	. 16		16	▲2	14
Design Reviews	. 3	▲1	2	▲1	1
Design Authoring	. 16	▲2	14	▲7	7
Engineering Analysis	. 16		16	▲2	14
LEED Evaluation	. 9	▼4	13	▲4	9
Code Validation	. 16	▼4	20	▲6	14
3D Coordination	. 2		2	▼1	3
Site Utilization Planning	. 5		5	▲1	4
Construction System Design	. 6		6		6
Digital Fabrication	. 8	▼4	12	▼2	14
3D Control and Planning	. 11	▼8	19	▼1	20
Record Model	. 7	▼4	11	▲3	8

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5. Posspillty of application Bim in Syria:

Despite the benefits of Building Information Modelling (BIM), the adoption level of BIM remains much lower than expected.[24]

mandating BIM in the near future. A quantitative statistic did achieve the research aim using both open and closed questionnaire. The research showed that Syrian construction and engineering workers know a little about the BIM. However, more than 44 % via 89 respondents reported that the full adoption of BIM in Syria will be within the next five years with the emphasis on the need to develop the BIM standard before the start.

About 61 % of the respondents believe that BIM can be useful in the design stage, while 21 % indicated that they can implement BIM in both design and construction stage of the project. Unfortunately, 8 % said that it is impossible to use BIM now (fig 3).[23]

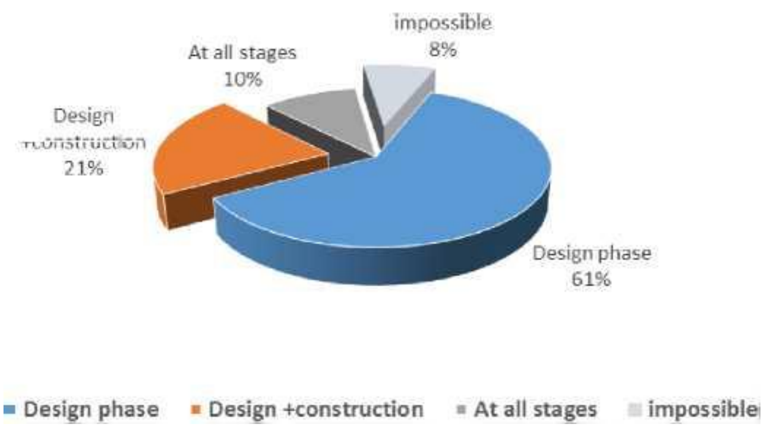

Figure 3- Preferred BIM application now,Resource:Reference 22 (2018)

The conducting survey covers BIM adoption between Syrian engineers and both public and private building sector; the result represented that 57% of responders consider their selves as BIM user (fig.4) but in fact, they know a little about BIM. In spite of this, 44% think that Syria can be adopted BIM during the next five years. With emphasizing to the government role in the compulsory mandate of BIM. Revit is the most famous BIM tool among Syrian engineers; about 61% of the respondents believe that BIM can be useful in the design stage while 21% indicated that they can implement BIM in both design and construction stage of the project. Unfortunately, due to the lack of the budget allocated for the training and rehabilitation of employees, or fear of the high cost of adopting this technology and the use of programs. 31% of staff rely on self-training, and only 24% of them receive formal training in addition to their effort [21].

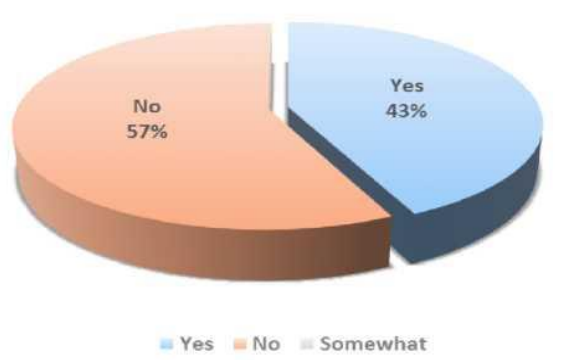

Figure 4- Percentage of BIM users,Resource:Reference 21 (2018)

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Currently, after conducting studies and statistics, we notice good indicators of the development of BIM in Syria, as shown in the (fig.5) Respondents (49%) in 2014 claimed that BIM has the potential to solve 50-75% of existing construction problems , but today in 2021 the results showed that BIM can solve 75-100% of existing construction problems.

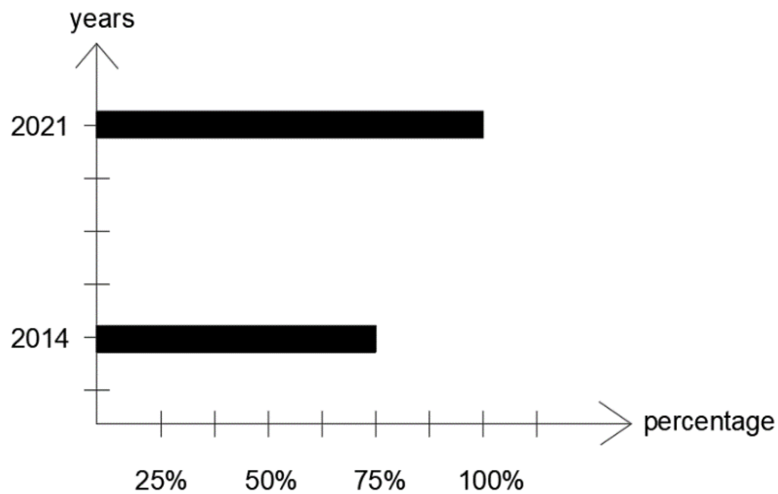

Figure 5- Indicators of BIM development in Syria, Resource: Creations by authors (2021)

5.1 BIM application in the Syrian Ministry of Education:

Today, the architectural, engineering, construction, and operation (AECO) industry is motivated to employ graduates educated about Building Information Modeling (BIM) tools, techniques, and processes, which help them to better integrate visualizations and data into their projects. In line with today's AECO industry necessities and government mandates, active BIM educationalists and researchers are designing BIM educational frameworks, curricula and courses. These educationalists and researchers are also generating solutions to the obstacles faced during integration of BIM education into tertiary education systems (TESs). However, BIM researchers have taken few efforts recently to provide an overview of the level of BIM education across Syria through review and analysis of the latest publications associated with BIM education in TESs. Hence, This investigation reveals the most significant barriers against BIM adoption as Lack of expertise, Lack of standardization and protocols to mention but a few and attempts to fill this gap by providing a review of the efforts of active educationalists and researchers to educate AECO students about BIM in the context of advanced engineering education with visualization.[26] (Fig 6) shows the application of the BIM methodology in Syrian universities, where we have made statistics for master's, doctoral and graduation projects for BIM for civil engineering students until 2020.

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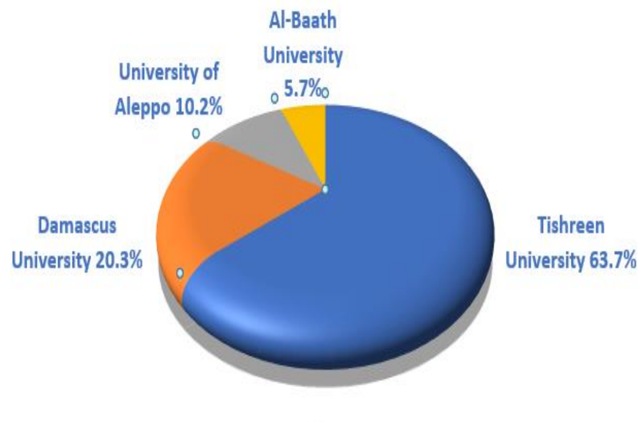

Figure 6- the application of the BIM methodology in Syrian universities,Resource:Sonia Ahmed (2020)

In addition to creat a master's degree program in Building Information Modeling and Management (BIMM) by the Syrian Virtual University, The program aims to qualify staff in project management and supervision of its Application by using building information modeling. It, also, aims to qualify in the construction project management and by using BIM some specialists who are able to:

1. Develop learners' skills regarding project management and follow-up by using BIM technology.
2. Enhance the ability to use information technology.
3. Develop work skills individually and collectively and communicate with co-workers effectively.
4. Provide consultations in the field of gradually transferring and developing companies and institutions towards BIM technology.
5. Enhance learners 'abilities to negotiate, design and complete BIM activities projects that meet their needs and employers' needs, and the ability to participate in technology adoption negotiations.
6. Develop the skills of conducting scientific research at the national, regional and international levels.

5.2 the important obstacles to the application of BIM in the Syrian AEC industry:

the AEC industry is facing myriad challenges due to the vast construction [25].

we have four factors (fig 7), namely: "the poor of the culture and importance of the application of BIM among the workers in the construction industry." This fact is that the spread of this culture is limited to university students and new graduates, the actual application or experience in the construction industry on a limited scale. This factor obtained the largest value of the frequency ratio/rate with an average value of 4.39. The "cost of training on the new system" came in third place and this reflects the urgent need to train cadres/crews on this new technology before starting to apply it on a large scale, especially in light of the migration of expert engineering cadres during the long Syrian's crisis years. Furthermore, although there is limited training on this technology by the Engineers Syndicate and others. The fourth issue is

"Intellectual property of creative designs and ideas": The issue of intellectual property or "engineering compatibility/context" is not yet in the engineering field in Syria. Engineering work, especially design, is creative. It is, therefore, necessary to develop intellectual property protection systems to include the design works of the projects as well, especially at the present time, as it is possible to easily steal and reproduce as the design today is electronic mostly, and in the fully performed BIM system, the problem seems larger and clearer. In this case, some parts of the finished or semi-final design are electronically traded between the project parties, except for the access of the other stakeholders (from the owner, contractor, etc.) to the project database , In the past or the traditional drawing paper system, the engineer kept a transparent copy of the drawing documents "transparent drawing paper"

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and the owner or other cannot obtain additional copies without returning to the design engineer, which preserves his professional or intellectual rights. Currently, because of technical development, it is easy reproduction and photocopying of engineering drawings though Another decent project.

Therefore, this matter is very important and requires special legislation by the supervising bodies concerned with practicing the engineering profession such as the Engineers Syndicate [22].

The next factor, "The difficulty of implementing the BIM system in the execution stage / lack of qualified contractors", which ranked fifth in terms of impact, reflects the inability to apply BIM now in the execution stage due to the lack of qualified contractors to deal with the BIM system.

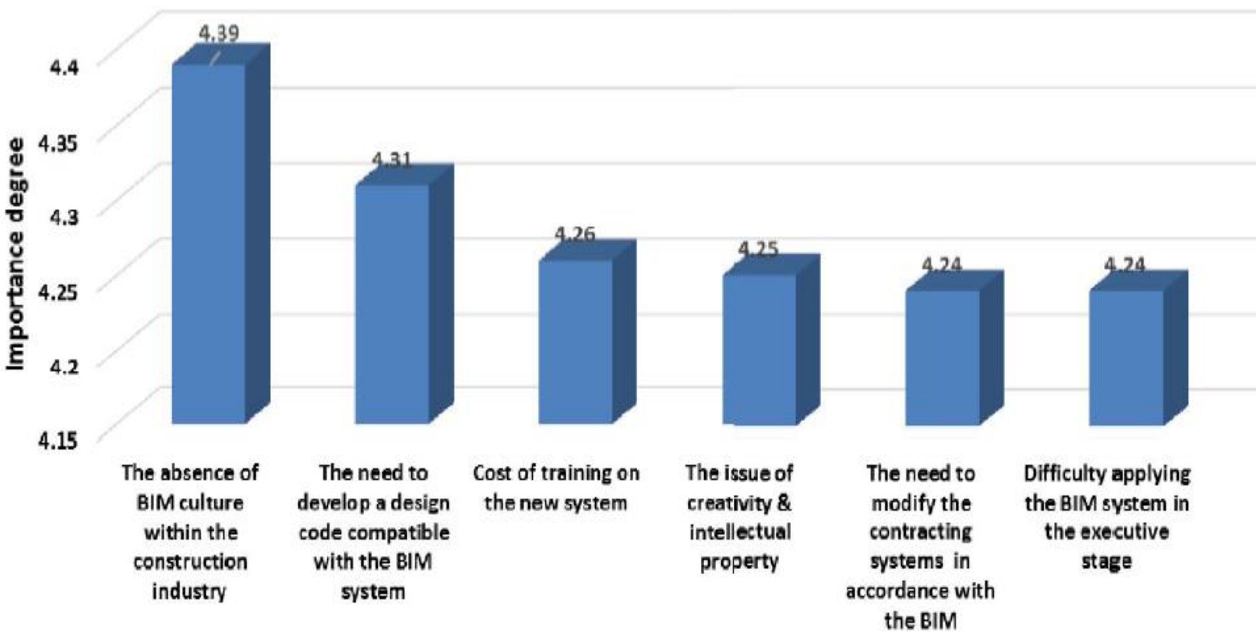

Figure 7-the very important obstacles to the application of BIM in the Syrian AEC industry,Resource: Reference 22 (2018)

6. Discussion:

Innovation diffusion models and technology acceptance models have been progressively appropriated in BIM-specific literature. However, diffusion, adoption and Application processes are insufficiently defined and described. Based on Roger's model [8, 10], we consider that BIM Adoption is a process (fig.8), which begins with the awareness of the existence of this innovation (stage 1), followed-up by the eventuality of the intention (stage 2) and decision to adopt

(stage 3). The Decision of Adoption (DoA) is an important moment, when the company's management begins to bring about change in the company; it also marks the beginning of the Application process.

In the study of BIM adoption, the focus is often made on adoption decision factors (factors that influence decision of adoption). They can be summarized in four categories: perceived BIM characteristics, adopter characteristics, internal environment characteristics and external environment characteristics (including inter-firm diffusion of innovation) [13].

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Table 7- Implementation factors categories names in various literatures,Resource: Reference 16 (2018)

	Internal context	*External context*	*Application strategy*
Population ecology theory	Inertial pressure	External pressure	Nature or reorganization
Risk management	Endogenous risk	Exogenous risk	Endogenous risk
Change management	Characteristic aspects of a company *culture, interactions,*	Characteristic aspects of a company *external context*	Change characteristics

Decision of a company's top management that the people in the firm will use BIM is not sufficient to make an organization adopt it or to explain the rate of BIM adoption in AEC industry. Some elements involved in the adoption process are beyond
the control of the decision-making group and may cause the adoption to success or to fail, after the DoA. Application factors affect Application (stage 4), under or beyond the control of the decision-making group.Application factors have been explored in different fields and models, presented in this article. They can be classified into three
categories, that do not carry the same name in the various literatures, but refer to the same concepts: internal context, external context and Application strategy (table 7).
The adoption process can be interrupted (Adoption failures) after stage 3 at different steps:
Stage 4: Adoption can fail at the beginning of Application, for example if resistance to change is very strong in the company; it can also fail during Application, if the company is not fast enough to operate change, if the company returns to previous practices or dies because of disruption created by change (fig 8). [12]
Stage 5: Adoption can fail after Application, during the confirmation stage (fig 8).

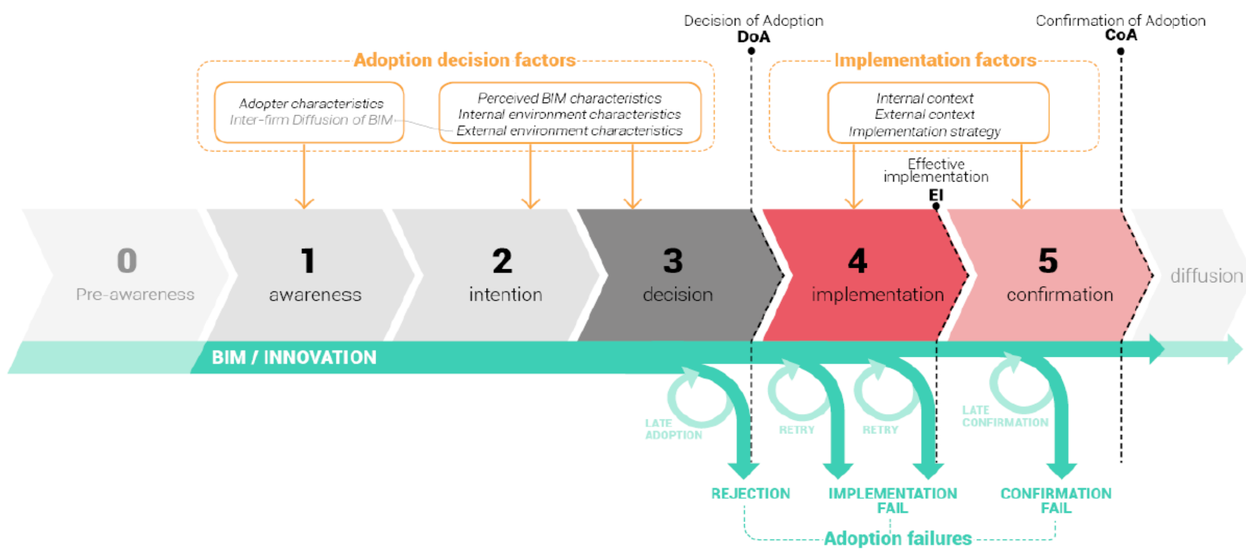

Figure 8- Model of the BIM Adoption process with possible adoption failures,Resource: Reference 16 (2018)

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7.Conclusion:

We conducted a survey using four different sets of pointes: engagement level, the Hype Cycle model, the technology diffusion model, and BIM services.

Every method evaluates different issues (percentage of BIM projects, expertise, years of using BIM, technology stage, main user, and use), but basically, the purpose was the same. As a result, North America apparently ranked as the most advanced continent in every approach. Oceania and Europe were considered the next most advanced and were especially strong in the design stage. Although Asia ranked 5th amongst 6 continents in the engagement level and BIM services, it perceived its status of BIM adoption similarly to other advanced continents. On the other hand, in the Middle East/Africa, the engagement level was third and even quite similar with the first and second, but they still considered their status of BIM adoption to be in the "beginner stage." Lastly, South America was the lowest.

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