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A PARADIGM SHIFT: GENERATION OF OPEN INNOVATION FRAMEWORK FOR BUILDING INDUSTRY

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ABSTRACT

The building industry is globally recognized for its lack of innovation. Either in EU, with an overall innovation and R/D expenditure performance, or locally in Egypt where there is a complete absence of R/D. Although novel materials, new business models and new design and build trends are emerging, yet tangible results of successful innovative works remain hidden inside projects. These results fail to translate to other projects and diffuse within their processes. Currently, many enterprises from different industries face increasing levels of competition. In the process of searching for ways to enhance competitiveness, many enterprises start to adapt a new paradigm shift in innovation named by "Open Innovation". Literature in this area focuses on the building industry innovation framework mainly but does not develop an open framework yet. Critical reviews conclude that collaboration is a crucial factor to improve innovation performance in building industry. This paper looks to develop those innovation framework antecedents following a design science method. This is to synthesize it with the open innovation antecedents and innovative collaborative activities in the building sector. The paper also aims to develop guidelines on how to promote this open innovation framework in the Egyptian building industry contextual field.

KEYWORDS: Building industry, collaboration, open innovation, paradigm shift, innovation framework.

1. INTRODUCTION

The "building industry" is globally recognized as one of the largest industries when considering design, investment, employment and raw materials utilization [1].

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This makes it one of the prime industries for constant development to deal with the ongoing challenges. Yet, its adjustment to new advancements is recorded as rather slow than other divisions. Building industry enterprises manage their challenges in different ways. Some companies tend to control their costs, others to train their laborers, some focus on design practices and some manage their productivity and quality [2]. Even though these studies improve the overall productivity and quality levels. Yet, the building industry lacks core solutions to deal with the increasing pressure especially from high competition.

Critical reviews states that building industry processes generally lack innovation and are burdened by poor performance [3]. The Australian building industry discussions for instance states that even though innovation occurs, yet the rate is not as high as that experienced in comparable sectors. The European research as well criticizes the European context for its low level of innovation in the building sector specifically [4].

In an attempt to address this problem, "Innovative Strategy Thinking" is an important approach that improves the productivity, costs, time and competitive advantage of firms [5]. Accordingly, this paper investigates a new paradigm in studying innovation in building industry named by "Open Innovation in Building Industry". The "Open Innovation Framework" introduces new methods that change the traditional way of any industry. Even though, each industry has its own definition of innovation, yet these definitions share several commonalities [6].

This paper aims to propose a new generation of open innovation framework incidents to be used by building industry firms for the implementation and execution of open innovation in practice. To investigate how the framework could be implemented in the Egyptian building industry context, a questionnaire is then constructed. The survey is through a contextual organization's innovative team.

2. CHALLENGES FACING THE BUILDING INDUSTRY

The building industry recently faces critical challenges. For instance, increased competitiveness between firms that results from emerging new technologies,

applications…etc. Recent researches observe that it is necessary to engage in persistent R/D due to this increased competitiveness. Moreover, contradictory evidence states that a substantial number of building firms do not recognize the generation of new knowledge crucial to competition in general.

"Delay" is considered a serious challenge in the building industry. Even thought, various reasons for the delay occurrence are due to stake materials shortage, equipment failure etc. Yet, in some cases, delays are interconnected and make the situation more complex [7]. The effect of delay is different for parties involved, although the common problems are the loss of time, money and facilities. Therefore, identifying the critical delay factors to overcome them is regarded crucial [8].

When it comes to the environment, numerous challenges are associated with the building industry. Carbon emissions wastes, climatic pressures and others are considered important challenges that require solutions [9].

The building industry constant ongoing challenges demands unconventional ideas. And so, developing core solutions is crucial. Researches show that thinking through "Innovation Strategies", especially that the building industry processes generally lack innovation, could provide broader ways of thinking and ideas [3].

3. INNOVATION IN BUILDING INDUSTRY STATE-OF-ART

In search for studies to face the challenges through innovation strategies as previously stated, innovation frameworks applied in building industry is discussed below. The literature review below is classified into two parts. Part one reviews the available innovation antecedents' framework in building industry. Part two defines the categories of innovations that results as outputs of the innovation framework.

3.1 Building Industry Innovation Framework

The classical model of the innovation antecedents includes several types of predictors for building industry firm's innovativeness. With the multitude of possible innovation antecedent variables, a framework model that combines all variables of all

types would be too extensive. And so, this study focuses on three main antecedents which are “Factors, Drivers and Inputs”

3.1.1 Factors

They are factors that contribute to collaborative innovation, influence of the organizational environment, and impacts of individual roles on the innovation process. Building industry frameworks deal with collaboration as the innovation prime factor. This is because building industry involves a lot of parties and each is with independent interests and expected incentives. For instance, the lack of collaboration between the design team and contractors results in lots of Requests for Information (RFIs), which lengthens schedules and project budgets. Other factors are such as the organizational state factors and culture factors, however they are not the center of study of this paper [10].

3.1.2 Drivers

Innovation frameworks drivers are investigated from different levels of organizations and classified to three categories. These categories are: environmental pressure, technological capability and knowledge exchange [3]. For example, the building sector is now considered significantly responsible for environmental degradation and environmental pressures [11].

3.1.3 Inputs

Inputs in building industry framework are categorized as enterprise strategies, R&D and human resources. Enterprise strategies: is defined as the specific innovation strategy input of every company, such as marketing and employees’ strategies. Resources are identified through the human resources, external knowledge and technological resources [3].

3.2 Framework Outputs Categorization

Outputs of the building industries innovation framework are categorized into six core attributes as shown in Table 1. These attributes act as controlling points of the

building industry to face challenges. They are materials, machinery and techniques, time, ecology, product performance and management. Attributes categorization is showed in the table below.

Table 1. Innovation outputs categorization state-of-art.

Categorization	Description	Innovation State of Art
Materials	Material innovation is one of the main debates in building construction and architecture design through history. Research and development on materials have a main role in the innovation process.	Space Materials Concrete structures resist pressure and temperature on Mars. Pollution Absorber MIT students developed the 'Eco BLAC brick.
Machinery and Techniques.	Minimizing costs and enhancing the building quality could be reached by using innovative machinery.	3D Printing Machinery Chuck Hull is the inventor of stereo lithography (3D Printing) Robotic Machinery (Lifting – Assembling – Maintenance)
Time	Performance of parties, resources availability, environmental conditions and contractual relations are considering delay factors. It is uncommon to submit within time schedule.	LEAN Software Production system to minimize materials, time and effort for ultimate value. Off-Site Fabrication Components fabricated in shop rather on-site. Toyota Home invented 3D space frames.
Ecology	This attribute refers to ecological factors related to the construction as a process or as a product.	Innovative Wall Systems Innovative systems having lower impact on Co2 footprint Climate Modeling Construct a passive design, selecting products based on their R-value.

Performance	A recent increasing demand for performance evaluation at the enterprise level has raise.	Performance Indicators Indicates customer satisfaction, and effectiveness of planning are becoming more important aspects of this time. Performance Measurement CCI KPI Engine judges the project performance.
Management	Any minor changes affecting the organization affects the management attributes as well.	Building Information Modeling (BIM) BIM has a major influence on reducing claims, like design drawings errors and quantity Cloud Applications Base-stone app is a system allowing the remote sharing of data on a construction site in real time and allows for better collaboration.

It is clear now after this critical review that successful innovation happens according to collaboration, external resources, communication, exchange and culture. And so, some building industries are recorded not to be on the right track because they did not succeed to transfer, collaborate or share knowledge [12]. Therefore, according to the above critical review, the paper illustrates a paradigm shift named as “Open Innovation”. It is known as a framework based mainly on “collaboration” as shall be discussed in the following part.

4. OPEN INNOVATION MODEL

Innovation as a term is regarded as a closed process that relies on each industry`s own resources and knowledge. Recalling to the previous discussion, innovation was developed to a broader term named by “Open Innovation” [13].

Open innovation model focuses on the possibilities and limitations for industries to transfer from a closed innovative approach to a more open approach. Application is through the open innovation two main pillars defined as: collaboration and knowledge exchange. Open innovation redefines the boundary between the firm

and its surrounding environment. The relation is then more absorptive, collaborative and individually acting towards new knowledge [14].

5. BUILDING INDUSTRY OPEN INNOVATION FRAMEWORK

According to the previous definition of open innovation two main pillars and to shift the state or art framework from closed to open innovation. This paper aims to apply the open innovation model to the building industry framework. First, the paper investigates a selection of successful projects, organizations and systems innovations with respect to the open innovation pillars during case study selections. Second, the paper lists the open innovative outputs from this application for each project. After that, the paper illustrates subtitles under the innovative framework antecedents (factors, inputs and drivers) as shown in Table 2, in order to draw the new open generation framework.

As per the previous analysis the new generation of open innovation framework main elements is described.

Table 2. Innovative framework antecedents' subtitles.

Projects/ Organizations /Systems	Innovative Output	Framework sub-elements	Open Framework Antecedents
Nasa Spinoff +Birdair+Owens-Corning+ Dupont+ Chemfab	Cheerful Architectural Membrane	- Material -Technological Capabilities	Factor
Amsterdam City Council+Dutch Designer Joris Laarman+ Heymans	1st 3D Bridge	-Software -Technological Intensity	Factor
British Property Federation + Construction Clients Group	Innovation In Building Construction	-Client Knowledge -Collaboration	Input
Isledon + Teenagers Experience	Isledonplatform /Innovative Special Architecture Experience	-Client Conversations - Outcomes Insights"	Input
JAP And PGI + Citizens	Urban City Lab / Innovative LPW System	-External Sources Inputs	Input
Foster +Partners	Innovation Performance and Success	-Internationalism Impacts	Factor

Co-Create IKEA and Boot-Camp	Digital Platform, Collaborating University. And Innovative Labs	-Innovative Business Model	Input
BIM Collaborative Technique	Cross Rail/ Louvre, Terminal Abu-Dhabi/Others	-Technological Capabilities	Driver
Joseph Paxton + Prince Charles	Crystal Palace	-Trust Between Stakeholders	Factor
Data.Gov.Sg Portal	Open Data Portal	-External Knowledge Transfer	Input
Ideon Innovation +External	Innovative Openings	-External Parties	Input
GBIM Green Building Collaborative Technique	Green Projects /	Sustainability	Driver
Georgia Tech MATIN E-Collaborative Tool	E-Collaborative Platform/ Innovative Material Products	-R&D External Resources	Factor
Emaar + Government + External Experts	Burj Khalifa	Knowledge Transfer/ Collaboration with Suppliers/	Input
Sagrada Familia + Public	Tensile Bricks	Financial Support	Factor
H. Clark Center (Basic Science + Medicine+ Engineering)	“Convergence”	Employees	Driver

5.1 Factors

Building industry is described as a sector with low “Absorptive Capacity” factors. It is identified as the ability to recognize the new information value, readjust it and finally apply it [15]. Regulations in developing countries are often complex and not clear. Industry can act as an enabler or barrier towards open innovation. High level of expertise has high demand and expectations for the project. On the other hand, lack of technical competencies and conservative practice is viewed as a barrier [16].

“Building Information Modeling (BIM)” factor contains adequate geometry and data required for design, procurement, fabrication, and construction. It can also be used for operations and maintenance after completion [17]. As technologies become

more complex and expensive, “Financial Support” is regarded as a main collaboration element [18]. Economics and lack of finance are considered the most serious innovation barriers in developing countries. For instance, the Sagrada Familia construction plan is delayed due to funding. Recently a tensioning stone new material is innovated. It allows the project to be finalized by 2026 [19].

“Trust” is a capital factor for innovation and collaboration. For a trustable social environment, leaders must be very successful at maintaining trust. Relationship between staff, clients, suppliers and competitors in some cases is vital. Accordingly ideas can be generated easily, and open innovation strategy can be executed successfully [20] for example, Joseph Paxton’s Crystal Palace, one of the most innovative buildings of the 19th century. Prince Albert self-financed the building. Even with the criticism about building safety and probability, yet trust was the main factor to convert the architecture at that time [21].

Studies show a significant positive relationship between “Internationalism”, “Foreign Ownership” and “Performance” [22], affiliates of foreign multinationals show higher propensity to partner than domestic enterprises [23]. For example, Foster and Partners make use of multinational experience, co-workers and designers. Foster declared that it positively impacts innovation performance in his organization.

Studies highlight that “R/D” must be integrated within firm’s activities, to profit from the innovation external sources [24]. For instance, the Georgia Tech Institute is supporting development of open source software tools. It`s e-collaborative platform seeks to support high throughput materials discovery, development and deployment by combining open source approach with in-house tools [25].

5.2 Inputs

An “Innovative Business Model” is how a firm organizes itself to create success values in a profitable manner [26]. For example, the IKEA innovative business model uses several strategies to ensure competitive pricing. For instance, “Optimization Variety”, where the products design library has common components and optimized dimensions to save material wastes. Yet, the customer still has the option to customize

their own design. Moreover, the success of this model lies in lowering cost by using standard elements yet achieving customers' satisfaction even though they use prototypes elements. Other strategies, such as flat-packed product, reduces logistics costs result when storing and moving products that occupy the least possible volume.

Open innovative inputs can be obtained using "Client`s Knowledge". The classic approach is to identify the degrees of client`s involvement: design for users, design with users, and design by users. Even though arguments state that relying on clients to innovate is generally not accepted in the building industry. However, In Singapore, for example, the authority plays an important role in developing an industry open innovation strategy with client`s knowledge as a factor. The same approach is applied by both the British and Australian [27].

"External knowledge" plays a significant role as an open innovation input. Exchanging knowledge stimulates the development of strategies. Innovations are not only influenced by the individual behavior of participants but also by the knowledge transfer that results from their collaborative relationships [28]. "Open data" is a successful method for data sharing, research centers share knowledge with manufacturers and create innovative products together [9]. For example, the innovative winning proposal Low Panel Wall LPW photovoltaic wall system developed by JAP and PGI Engineering. The prize allows the developing companies to implement a pilot project in a municipal building in Barcelona. Barcelona transferred into an urban laboratory where innovative products and services are implemented [29].

5.3 Drivers

The American construction industry states that "Employees" stimulates the development of open innovation [30]. For instance, employees demand for innovative office spaces has a massive drive in the architecture and interior design. As an example, James Clark Center unlike traditional research buildings that keep disciplines separate intends to inspire collaboration between employees. This is through connecting disciplines and allowing creative science to flourish in this "collaborative space" as named by the National Academies [31].

Stakeholders concern to fulfill “Sustainability” requirements is vital, either for green records, regulations or accreditations. From here, the Green Building Information Modeling (GBIM) is an important model for open innovation drivers. It meets the present needs without compromising the future generations’ ability to meet their own needs. Examples are heating energy, cooling and building equipment [18].

Researches reveal that “Technological Competence” is recorded as a success driver in ten innovative building industry projects in the United States. It aids the implementation of the new solutions and ideas in building industry [32]. In other words, firms that want to be innovative should follow a technology leadership strategy according to studies. For example, “Birdair” improved fiberglass fabric options for architectural use. They collaborated with Owens-Corning, DuPont, and Chemical Fabrics Corporation on a modified, stronger version of the “Glass Fiber Fabric” developed for NASA. The resulting fabric is lightweight, tensile membrane roof structures, skylights, and canopies. It was inspired from NASA’s effort since over 40 years earlier to achieve the first manned Moon landing when a fire broke out on the Apollo One command module. NASA engineers redesigned the Apollo module and searched for ways to enhance the safety performance of the nylon space suits. That original innovation has gone on to become a unique component in architecture [33]. Another example, the old-Europe charm of Amsterdam has been a threat to tourists all over the world, until the city was manifested harmoniously in a one of a kind project, the first 3D printed bridge. The first fully functional 3D-printed bridge is being built in collaboration with the Amsterdam City Council, Dutch designer Joris Laarman, Heymans and Autodesk MX3D.

“Competition” in building industries is a dominant driver for positive change. A survey stated that 80 percent of CEOs believes innovation leads to competitive advantage and efficiency. In open and competitive markets, firms are driven to offer new and improved products and services to customers. Competition in the building construction is shifted from the form “Highest Skyscrapers”, for instance: Borg Khalifa in Dubai, to more technical innovation trends, for example: the 3D printing

technology. According to the “Economic World Forum”, it was announced that 25 percent of Dubai City will be 3D printed by the year 2025 [34].

After illustrating and discussing projects, applications and organizations that deals with open innovation main pillars the study draws and synthesis the concluded elements (factors, inputs and drivers) to draw the open innovation generation in the building industry as shown in Fig.1.

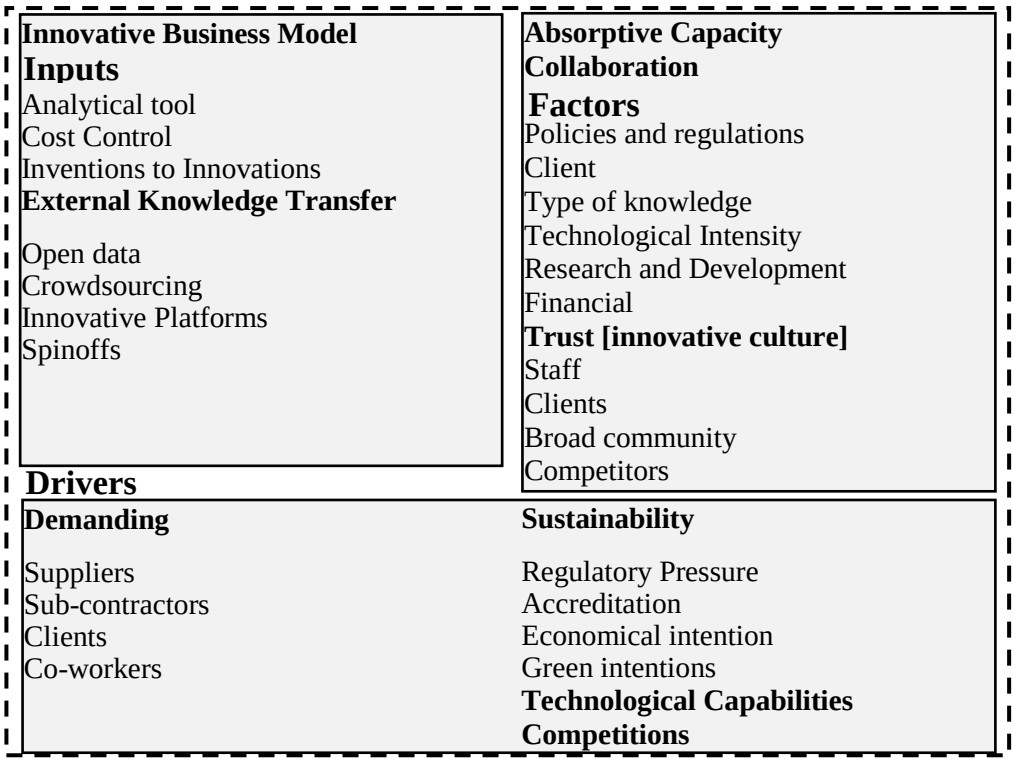

Fig.1. Open Innovation generation Framework in Building Industry.

The question is “How to Implement This Open Framework on The Egyptian Building Industry Field?” From here, the paper, as will be shown below, investigates the open innovation framework antecedents through a survey conducted with expert participants in the building industry context.

5.4 Method

A survey was conducted on September 2018 through a questionnaire. Twenty employees (architectural engineers, BIM and finance experts) in Innovation Team at Daar El-Memaar Group “DMG”. Participants were intentionally selected according to

their position in the innovative team for the nature of the topic. The questionnaire composed primarily of close-ended, multiple choice questions. It was designed in three main sections. The first section includes questions about the collaboration deals, agreements, types and its main factors towards innovation as preferable knowledge and regulation barriers. The second section inquiries about patterns of internet usage (frequency of internet access, daily hours of use, locations of access, different purposes of use, etc...). The third section inquiries about the impact of internet use on the amount of time spent at home. The fourth section includes questions to explore the impact of the Internet on patterns of social interaction with close friends and family. Finally, the last section investigates the offline to online migration of activities focusing on work or study related activities, shopping, and watching movies as an example of leisure activities.

5.5 Egyptian Open Innovation Guidelines

In response to the question of "The Level of Agreement towards Sharing Knowledge and collaborate with Research Centers, Universities and Competitors", the majority agrees on collaboration. Otherwise it is stated that an increased knowledge on the adoption of open innovation in less developed countries as Egypt is required. As for collaboration deals priorities, as shown in Fig. 2 the major value is given to research and users, while thirty percent of participant's voted for universities and material industry. Government has the limited number of votes. Gaining data from external resources is proper for innovation, participants were required to arrange priorities of data sources. The majority of responds believes in trusting stakeholders, colleges are the second higher followed by votes for the public community, competitors are the lowest value. As for "The Financial Priorities towards Innovation", as shown in Fig. 3, majority of result was to establish applications and mockups, followed by workshops and collaboration deals. Seminars are considered lowest to be funded.

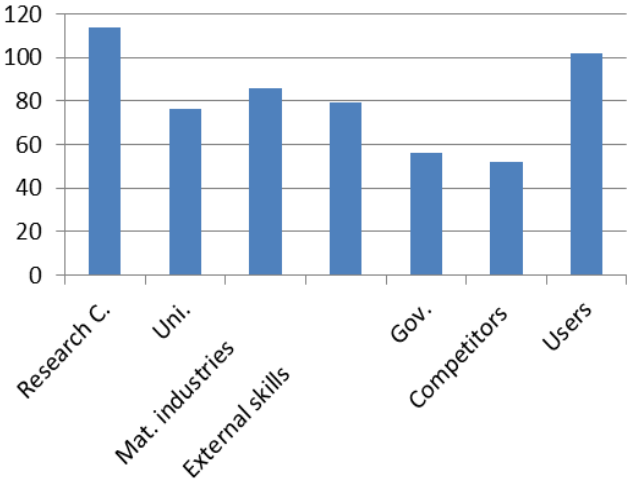

Fig. 2. Collaboration deals.

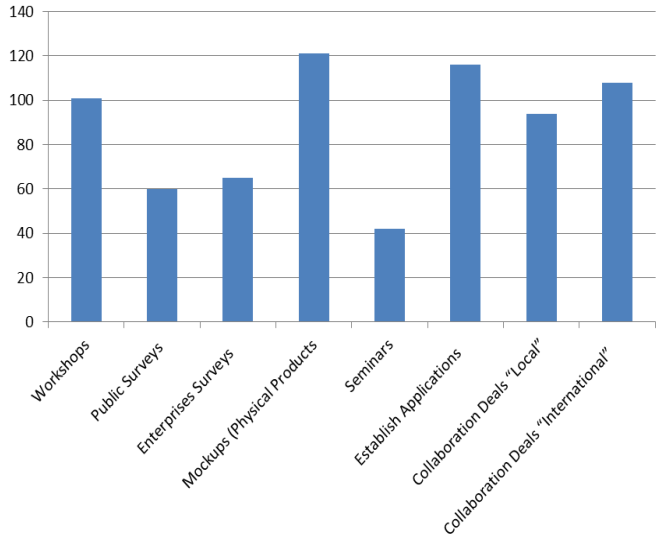

Fig. 3. Financial priorities.

For the question about “The Priority of Research Areas”, majority selected design and construction research material innovation and green systems. “Orascom Development” for example researched in the renewable energy sector. Accordingly, it established” Multiple Applications by Thermodynamics MAT” solar panels in Borg Elarab cofounded by the United Nations. It is clear now that producers and suppliers are the most partners to share knowledge in order to innovate while consultants are the lowest. For example, (NOVA) is Saint-Gobain’s external ventures, dedicated to identifying and fostering partnerships with startups incubators.

For client involvement the majority believed in involvement of client in design stage and material selection, while limited number refused involvement in the financial cost. As for the data transfer techniques, the majority selected establishment platforms/crowdsourcing and open platform techniques to share data. Some examples are: SolvEGYPT, a world bank funded platform for organization and individuals to collaborate with solutions for challenging in Egypt which is a web based interactive space to knowledge leading resources. According to DMG (client involvement) clients driven innovations works through the creation of a library with products they offer.

Product elements define the ticket pricing according to the client needs as per client affordability and needs (garden / open terraces/ etc.) According to technologies that drive innovation in building industry field, the majority selected BIM and it was clear there is a high demand to establish unconventional competitions for instance, financial, smart, green, innovative structure systems and managerial competitions.

Open Innovative Framework Guidelines in Egypt.

After illustrating and discussing the questionnaire results within an Egyptian building industry innovative organization, the paper draws guidelines as shown in Table 3 in order to draw a path for the contextual organizations to implement the new open innovation generation framework in the building industry field.

Table 3. Open innovation framework guidelines.

Sharing Knowledge	Collaboration deals
Producers / Manufacturing	Research centers / universities
Contractors	Users and Clients
Suppliers	External Suppliers
Client Involvement	External Source of data:
Architecture Design “design with client”	Scientific journals, magazines
Material Product selection	Material product and data sheets
Financial Cost	Enterprises contact
Open data sharing techniques	Seminars
Open portal	Workshops
Crowdsourcing	Financial Priorities
Innovative platform	Apps (mobile applications)
Spin-offs	Mockups
Technology applications	Workshops
BIM	Public surveys
Smart Materials	Enterprises surveys

Required competitions:	Collaboration with international experts
Financial and cost reduction	Research Areas
Architecture and urban Design	Construction systems
Managerial and Corporation	Design standards
Environmental Studies	Material innovation products
	Green systems
	Regulations and laws
	Time management
	Collaboration deals

6. CONCLUSION

"Innovation in Building Industry" is vital for facing ongoing challenges such as competition, culture, delays and sustainability. The paper literature review illustrates the innovation current state of art through categorizing outputs into seven attributes: materials, machinery and techniques, time, ecology, product performance and management. Attributes are important as they act as innovative solutions to the building industry challenges. Machinery, performance and management are reactions to "Competitive Challenges". Ecology, machinery, techniques and management are reactions to "Culture Challenges". Finally, machinery, time, performance and management are reactions to "Delay Challenges".

The paper after that investigates innovation framework incidents factors, inputs and drivers through a collaborative theories study. The dominant nature of successful innovation always follows collaboration factors, inputs and drivers of innovation to develop the attributes with the challenges.

After that, the state of art of building industry innovation framework shows that innovation framework lacks collaboration which is discussed through studies as a prime innovation element. And so, it is concluded that building industry should be reshaped through an "Open Innovation Approach". After introducing case study projects and organizations and studying the outputs, collaborative theories are reached, whether governmental or organizational. Governments such as the European Union, Britain, Australia, Singapore and Abu Dhabi introduces open portals to collaboration and knowledge sharing with the public towards initiating new cities. From here, they created the idea of open collaboration between cities and communities. Organizations

as well aided collaboration between firm, architectural studios and other industries. For example, NASA in 1994 publish “Spin Off” magazine that shares the influence of the innovations with people. Some organizations and governments made use of these ideas and utilized them through collaboration with experts to add innovative output to their industry.

Following the above theories and findings, the paper introduces a new generation of “Building Industry Open Innovation Framework” based on collaboration as a main element. Open innovations antecedents are then introduced and analyzed. A new generation of inputs, drivers and factors is discussed as well.

Finally, a survey is conducted to investigate the impact of “Open Innovation Antecedents” on the Egyptian context. Findings highlight that the Egyptian market has a high demand for collaboration in general but not with clients and governments. It is in need to collaborate more with users, universities, research centers and innovative material industries. External knowledge sharing with scientific journals, material data sheets, internet browsing, and enterprises is required as well. It is reached as well that the Egyptian market prefer funding to focus on mockups, mobile applications and workshops with a medium interest on surveys. There is a high demand for multinational collaborations. There as several barriers such as financial issue, social skills and self-confidence. There is need for R&D in many fields. For instance, construction systems, green systems, regulations and laws, design standards, material production and time management. Otherwise sharing knowledge with supply chain (producers, sub-contractors and material supply). Client involvement collaboration is needed (design with client), applying BIM innovative technique is also a major demand.

This paper paves the way for future researchers to investigate and promote open innovations in architecture design and building industry in the Egypt context.

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تحول النموذج: جيل من الإطار الابتكارى المفتوح لبناء صناعة المنشاءات

صناعة البناء الإنشائى تبدو وكأنها منحصره فى الهياكل والتقنيات عالمياً ومحلياً منذ القدم وحتى الآن، وبالرغم من تلك التقنيات المستحدثه فمازالت تعانى من التأخر الإبداعى مقارناً ببقاى الصناعات ولذلك فمن الضرورى أن تفتح صناعة البناء بأكملها بواباتها إلى نُهج ابتكارية جديدة تواكب النظم الابتكاريه المعاصره حيث اتضح ان الوضع الراهن للمنهجيه الابتكاريه فى مجال صناعه المنشاءات هى منهجيه تم ابتكارها من خلال تطبيق نظم ابتكاريه منغلقه بالرغم من ظهور نظام ابتكارى مستحدث وهو "الابتكار المنفتح" و بالتالى تهدف الورقه البحثيه لتطوير و إنشاء منهجيه ابتكاريه منفتحه عالميا تواكب العصر وتحدياته من خلال اتباع طريقة علم التصميم من خلال مراجعة نظريات الابتكار التعاوني التي تجذب عناصر إطار الابتكار المفتوح وبناءً عليه تقوم الورقه البحثيه بتحليل اهم عناصر الابتكار المنفتح (العوامل – المعطيات – المولدات) من خلال تحليل مشاريع ذات طابع ابتكارى نابع من "التعاون المشترك" وهو اهم عناصر الابتكار المنفتح ومن ثم يتم تجميع تلك النتائج لرسم منهجيه ابتكاريه منفتحه ومن ثم تقوم الورقه البحثيه بأستبيان لوضح ارشادات واقتراحات لكيفيه تطبيقه محلياً من أجل مواكبه صناعه البناء والمنشاءات محلياً للصناعه والمنافسه محلياً وعالمياً.