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Applying the Integrative Design Process in Architectural Firms: An Analytical Study on Egyptian Firms

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***Abstract*—**An architect carrying the design process alone is the main reason for the deterioration of the quality of the architectural product as the complexity of the projects makes it a multi-disciplinary work; then, the Integrative Design Process (IDP) must be applied in the architectural firm especially from the early design phases to improve the product's quality and to eliminate the ignorance of the principles of design causing the occurrence of low-grade buildings. The research explores the Integrative Design (ID) principles that fit in the architectural practice. Constraints facing this application are presented with strategies and solutions to overcome them. A survey questionnaire was conducted to collect data from a number of recognized Egyptian Architecture, Engineering and Construction (AEC) firms that explores their opinions on using the IDP. This survey emphasizes the importance of the IDP in firms and presents the reasons preventing the firms from applying the IDP. The aim here is to investigate the potentials of integrating this approach into architectural firms emphasizing the importance of this application which ensures the realization of the project's goal and eliminates the reduction in the project's quality.

***Keywords*—**Application, architectural firms, integrative design principles, integrative design process, the project quality.

I. Introduction

NOWADAYS, the design process has encountered a significant change; it is no longer a one-person operation which is carried out only by the architect. Although the architect maintains enough knowledge of buildings, in addition to knowledge of the social, religious and other aspects of his/her society that allows him/her to complete a building design, the complexity of projects highlights the need for more groups of specialists required to integrate and collaborate in order to optimize their efforts to achieve the project goals.

Conventional design processes are not generally capable of delivering the currently required quality of projects, making ID principles essential based on the idea of an optimized teamwork, a qualified design process management, and the application of modern tools and strategies which fit the project goals [1]. The IDP involves this new approach of combining the project's stakeholders together to achieve the best quality. The integration in the very early phase of the project is the most important to help with the assembly of the appropriate organizations and individuals and to help manage their integrative actions to ensure best value creation.

According to [2], the IDP is used in the professional sector and is adapted and applied as a methodological process. The application of IDP in architectural and engineering design firms is advantageous as it has a remarkable impact on quality, time and cost. This integration is difficult when design solutions need to be shared and evaluated by participants who represent different professional views of the project. Solutions may satisfy some goals but might be contradictory to the values of another participant.

II. Integrative Design Process

Buildings are an integration of architectural, structural, and environmental systems, and they require generous assets to assemble and work. All experts required in such activities ought to work cooperatively to realize a desirable built environment through structures. Without a doubt, the workload of individuals changes all through the procedure; however, every expert has a critical part to play at each stage of the IDP [3].

The IDP is a way of redesigning the design process and eliminating its linearity by dealing with the design process of a building as a whole system instead of separate systems [4].

ID is a process which is represented throughout the design phase. The integrative approach typically involves various disciplines who coordinate closely to design and specify systems and assemblies that will meet the owner's needs. It is important for the integration to happen at the early stages as integration at later stages of the process reduces their opportunities to influence the design, as the client and architect will already agree on a sub-optimal solution [1].

Besides creating a successful green design with lower cost over the life of the building, the IDP also saves time, effort, and initial construction costs. This is a great benefit which is touched by those who use the traditional process [4].

The IDP, as any design process, needs to be evaluated. The evaluation of the IDP increases the chances of making right decisions and attaining best solutions. The evaluation process must start with the selection of the quality criteria followed by the evaluation of the criteria for design product, then to generate better solutions to be evaluated again [5].

According to [6], the objectives of a whole building design

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project, which is basically depending on the IDP, are accessibility, aesthetics, cost-effectiveness, functionality, historic preservation, productivity, security, sustainability [6]. These objectives are achieved by optimization during the IDP.

A. The Methodology and Pattern of the IDP

IDP methodology is managed by gathering information and data relevant to the project from all disciplines, by analyzing the information, and by meeting together with the clients, designers, engineers, constructors, and operators in workshops to discuss different opinions. The repeated cycle of research, analysis, and meetings improves the design quality [7].

As shown in Fig. 1, the integrative process approaches each problem from varied viewpoints of multiple participants and the issues that they represent [8].

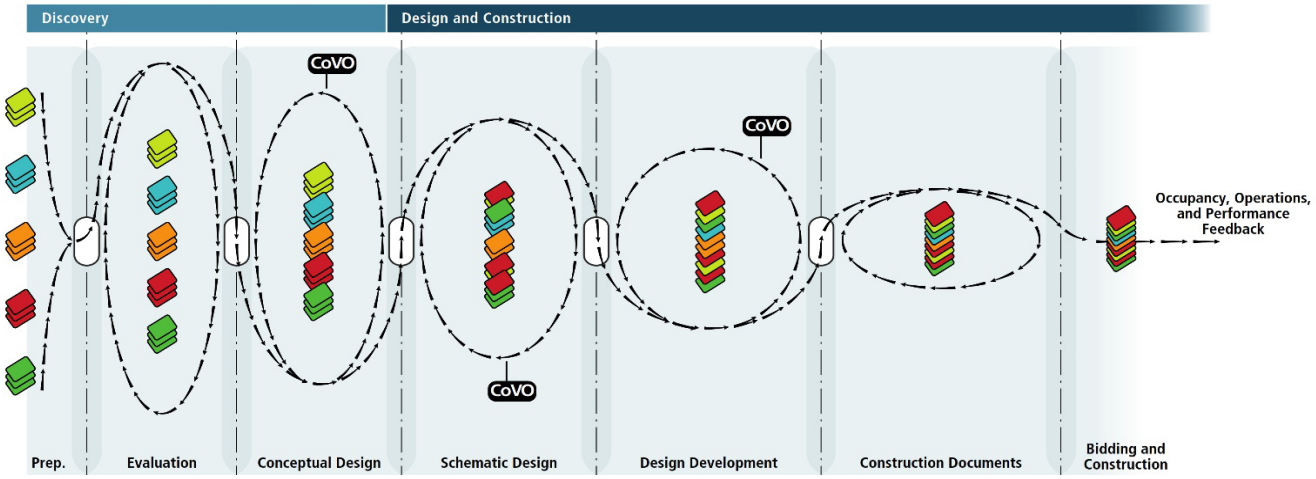


Fig. 1 The Integrative Process sequence along the phases of the project [4].The IDP can be described simply as a repeating pattern of research/analysis and team workshops. The research and analysis stages, requiring provisional integration meetings between various team members, involve analyzing systems in progressively greater detail between workshops [4]

Research/analysis and workshops occur continuously one after the other until the final goal is reached [7]. In each workshop and each research/analysis session, the team members separately determine the project's systems as well as its goals according to the member's profession, and then, they meet in the workshop to present and discuss their ideas and design [8].

For the uniqueness of each project, it requires a specific program to make sure that assignments are accomplished and issues are addressed. Managing the ID workshop in a way that the statement of "the right people are present at the right time" is a must so that not every person attends every meeting, resulting in the saving of energy and money which will be consumed by a large number of team members [4].

B. The IDP Team Members

According to [4], the integration of the team member is called the Composite Master Builder approach in which the ID team can function as a contributed whole system differing from the traditional pyramidal charts. As shown in Fig. 2, the Composite Master Builder consists of three primary groups, the client, the design team, and the builder, which are intersected to collaborate and work as one mind.

According to [9], the IDP team may include the following: the owner's representative, the construction manager, the architect, the civil engineer, the landscape architect, the consulting structural, mechanical, and electrical engineers, and others specialized consultants.

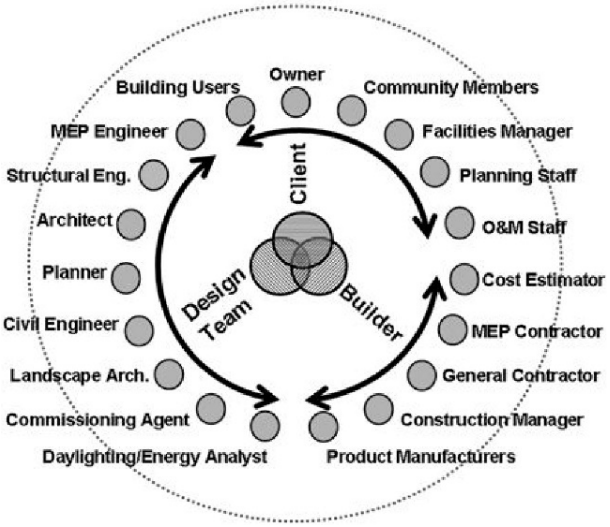


Fig. 2 The Composite Master Builder [4]

The Design Facilitator is added to the team by [10]. A facilitator is engaged to help guide the process, to organize the project's goals, and to manage the IDP workshops. He/she must have leaders' skills and must be aware of the design process and the design values [10]. According to [11], the design facilitator can be the project manager or the architect. Fig. 3 shows the ID team organization with the IDP facilitator at the core of the team relating the other team members together.

The team experts may differ according to the size,

complexity, and specialization of the project; however, their involvement must be at the earliest phases of design [9].

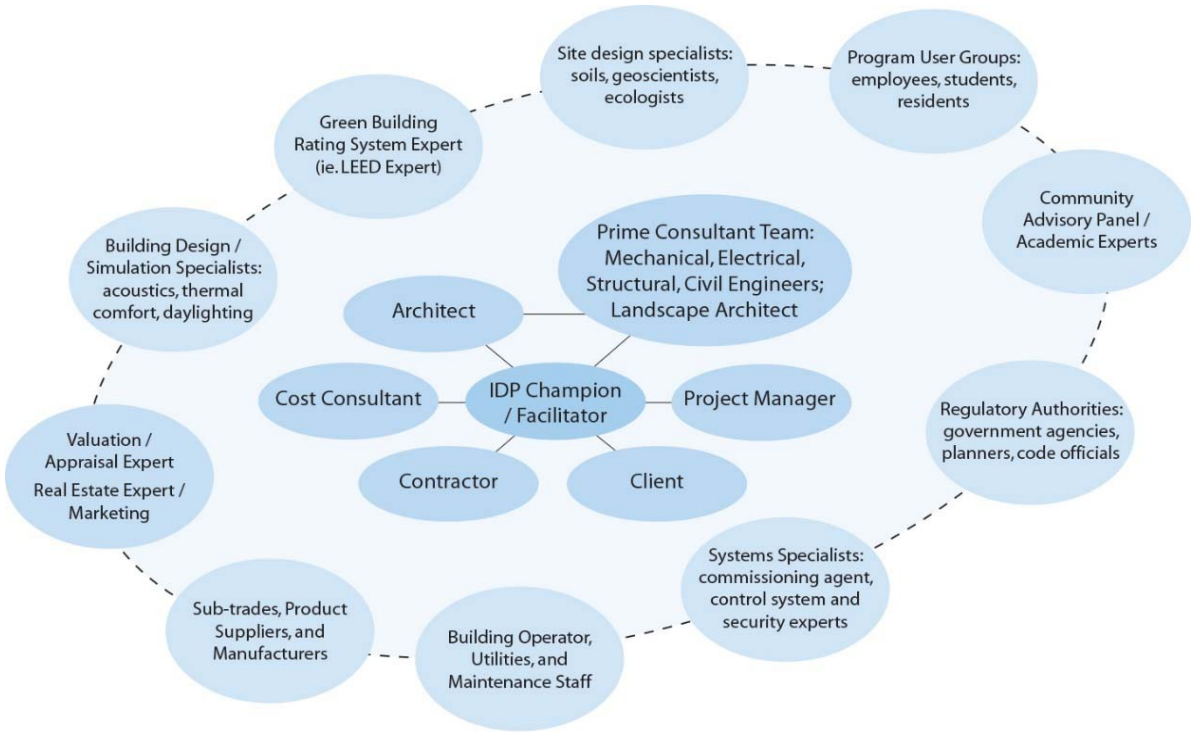


Fig. 3 The Integrative Design Team Organization [10]

III. Application of the IDP in Firms

The IDP could be applied differently from one firm to another. It depends mainly on the person or group who is responsible for the integrative process.

The IDP could be applied by an in-house approach or by ID Charettes. The in-house approach is realized when the firm has the whole team members in its organization including the design facilitator; in this case, the IDP steps are held inside the firm, only special workshops with the client and the owner are required. On the other hand, the ID Charette facilitates the communication and collaboration between team members by combining all the projects' stakeholders and professionals who are not from the same firm. It is applied early during the Pre-design phase [12]. It is very useful in large scale projects where every discipline is represented by a separate firm.

Working alone is more comfortable and effective from the architect's opinion, but in fact, IDP is the way forward and has significant advantages. The optimization here is to clarify the benefits to the owner and the architect [13].

A. Obstacles Affecting the IDP Application

According to [13], there are some obstacles that make it hard for owners and design and construction professionals to foster IDP resulting in the occurrence of some deficiencies and unsuccessful collaboration. The following obstacles are the most common affecting the successfulness of collaboration:

1) Interoperability

The ability of computer systems, software, and applications is a critical factor affecting the IDP. The lack of technology, large file sizes, secure access to the model, and the integration between different tools of modeling and workflows makes it harder for team members to integrate [13].

2) Workflow

The IDP is for many firms an obstruction to a well-organized workflow as it may delay the project's tasks and make the flow more complex; however, a disturbance to a firm's workflow is better than the continued use of traditional processes leading to the inevitable changes and subsequent opportunity for errors occurring at every change [13].

3) Firm Culture

A major obstacle in applying the IDP is the firm culture; it could promote or disturb collaboration. A company should adopt the culture of collaboration to be able to work with the IDP [13].

4) Autonomy

All stakeholders, who participate in the design process, have the nature of preferring to work alone and believe that compromising is the meaning of collaboration; especially the architect who prioritizes to be the sole creator of any project [13]. Autonomy or individuality is a crucial factor affecting the IDP.

5) Education

Collaboration and ID must become a significant part of AEC education. The AEC schools have the lack of collaborative learning which makes it difficult for students to work together in practice, affecting the IDP application [13].

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6) Technological Challenges

By the rise of BIM and new technologies, collaboration is now considered by some people a matter of software causing many professionals to avoid it for the reason of their limited knowledge with this new technology and their unwillingness in practicing new software [13]. According to [14], the process of integration needs the use of visualization and modeling tools to encourage collaboration among team members.

7) Working in Teams

Working cooperatively and transparently, trusting and respecting each other, and accepting the ideas of others, those are the impediments of working in teams [13]. These factors must be accomplished by building an adequate team who must consider the project success as their own success. The team building step must be an essential phase in the process as it affects the whole project [15].

8) Communication

The IDP is fundamentally dependent on communication. Nowadays, the design process is more likely to be applied at a distance; team members are either in different offices, firms, or countries. The distance was a difficulty long time ago, but now communication tools make it easier [13]. Reference [16] has developed a computable design process communication methodology to achieve effective and efficient communication and to prevent communication struggle improving the multidisciplinary collaboration.

9) Trust

Trust needs expressive social relationships between team members, and it is very difficult for those members to discuss any trust issues which make the situation more complex [13]. In the IDP, trust is an outcome, not a precondition, so it depends on the successfulness of the process and the transparency between team members [17].

10) Etiquette

According to [13], etiquette is playing a paramount role in the IDP and in determining how team members will work together.

Some rules must be outlined and agreed from the beginning by the team members to decrease the probability of conflicts.

11) Cost

The collaboration between team members causes extra cost on the firm. This is why when facing any economic obstacles, firms begin to take a step away from new approaches to save money [13]. Early involvement of design team means greater costs during the initial design stages in the IDP, while time, money, and energy are minimized during these early stages in the conventional process [11].

B. Advantages of the IDP

There are many reasons for using the IDP in project delivery. According to [13], the following points are the expected advantages resulting from using the IDP:

- It *delivers the quality expected* by owners which cannot be achieved by traditional design processes.
- It boosts the probability of *meeting the project's goals*, resulting in the owner satisfaction.
- It *controls the project time* and produces an optimized schedule.
- It *decreases the project's cost* by *eliminating errors, changes*, and the need for rework.
- It *enhances the project's quality* by increasing the shared goals achieved.
- It *organizes the data shared between the design phase and the construction phase*.
- It *magnifies the collaboration* and cooperation between team members.
- It helps *to exchange the information at the right time* when it is needed.
- It *minimizes conflicts* between consultant, contractor, and owner.
- It enhances the understanding of workflow by all team members, forming *a safe working environment.*
- It *integrates the building components* into a whole building organism.

C. Strategies for Better Collaboration

To achieve buildings which bring out best solutions for all involved, the following key strategies can be used [13]:

- Eliminate the ego of design professionals and the idea of one person as the sole creator of the project.
- Prioritize the project and put it before any other issues.
- Give a close attention to the project's needs.
- Elaborate the collaborative intelligence, which is a combination of social intelligence and technical intelligence. A team member should be able not only to collaborate with the team but also to use the collaboration tools and technologies to do so.

IV. The IDP Application in Egypt: A Field Survey

A field survey was performed to explore the attitudes and perceptions toward the IDP existent among the directors of the consulting firms in the architectural practice in Egypt, and to understand the challenges and limitations of the current practices in identifying and communicating the IDP.

Interviews were carried out with a selected sample of six respondents at six different Egyptian AEC design firms; respondents were either the owner, who is an architect, or the project manager. The interviewees were selected based on their professional experience as programmers, designers, and project managers.

A. The Interview Design

Face to face interviews, with a decision-maker from each firm, have been used here as the main instrument of data collection. Those personal interviews granted valuable first-hand information from the field.

The interview includes eight questions discussing the IDP, its advantages, disadvantages, and its application. The interviews took place in the firm's offices in June 2017. The interviews were transcribed, translated, analyzed using a

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simple form of qualitative analysis.

B. The Interview Discussion

- *In your opinion, how important is the occurrence of the IDP in the AEC firms?*

The first respondent states:

"It is very important especially for the three main groups of the AEC field, who are the contractor, the consultant, and the owner/operator, to collaborate together".

The second respondent indicates:

"It is very helpful to prevent stepping back, but a layout for the project must be done before the integration to have something solid to work on".

Furthermore, the third one says:

"This integration will prevent the lack of the synchronizations and the liaisons between the architect (designer), the execution drawings (artisans), and the site (workshop), which affect the project's phases".

The fourth respondent adds:

"The IDP is more important when the owner and the operator are not the same person so the integration is more complicated".

The fifth respondent declares:

"The IDP prevents the presence of modifications and problems. All the project's stakeholders study the project and agree on all its details from the beginning".

While the sixth one said:

"It is very important to link between stakeholders, but, in fast-track projects, it is hard because they have a strict time interval".

- *Could you identify the advantages and disadvantages of the IDP that will be reflected on the project?*

One respondent says:

"It helps to achieve the best quality of the project as well as achieving the goals and objectives which could be unclear without this collaboration, in addition to the consumption of the wasted time. It does not have any disadvantages except for the time consumed in the workshops taking place in the early project phases; however, without these workshops, the project could take more time and money on account of mistakes".

The other respondent indicates:

"The application of the IDP intensifies the project's quality and prevents the wrong interaction between different systems of the building, so it does not have any disadvantages".

Similarly, another respondent mentions:

"The IDP has a great effect on the project as new elements and uncommon demands can be fulfilled. It helps to solve the conflict between several project's goals".

The fourth respondent states:

"The advantage of the IDP is the guaranty that when finishing the design process, the rest of the project's processes will continue smoothly; the appearance of problems in operation and consultation is rare. As well as, any project without this integration will not achieve the required quality. The only disadvantage is that this process took time so if the project is small and simple, no need for it".

Another respondent says:

"The IDP guarantees the commitment to the project's estimated time as there is no waste of time or unplanned activity, in addition to the öphıprevention of the problems in construction phase due to the well-studied process of the project and the knowledge of the problems from the beginning. The disadvantage of the IDP is that the project will cost more due to all the teams and firms working on the project, also the pre-construction phases will take more time".

The last respondent declares:

"The IDP helps the optimization of the management triangle (quality, cost and time) which will lead to the client's satisfaction, but the project will take more time in the pre-design phases".

- *Could you identify the advantages and disadvantages of the IDP that will be reflected on the firm?*

The first respondent states:

"The amount of work is less because, without this collaboration, the same work is done several times because of the lack of communication, also the firm's goals are well achieved, but it takes more time which is not wasted".

The other respondent declares:

"It reflects only advantages on the firm as a lot of work is consumed".

Another respondent announces:

"The IDP can solve a lot of management problems between the different specialists by preventing the professional prejudice. Also, it helps to solve conflicts between different firm's goals."

Furthermore, the other respondent says:

"The only disadvantage is the delay in the design process due to the time consumed in integration, while the most important advantage for the firm is the ability to integrate diverse specialists according to the project's need".

The other respondent indicates:

"The significant advantage is that the design will not be done several times, as it is studied and supervised from the beginning, saving the firm time and money. And the disadvantage is that allowing all stakeholders to give their opinions at every stage of the project will cause confusion for the firm and for the client".

The final respondent declares:

"The integration between the firm and the client helps determine the client's desire as well as the project's goals, so the client's satisfaction will be achieved. Furthermore, it makes the firm ready for problems; instead of making emergency meetings which solve problems lately, the gradual meetings study any constraints while occurring. Although the IDP takes more time, it solves more problems".

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- *If the ID team is composed, who would be the participants? And who will be the integrator?*

The first respondent says:

"All stakeholders must participate, but they must enter into the process gradually. For the preliminary "avant-projet", the architect, the owner, and the operator should be the team; then, in the design phase, the structural and electromechanical and HVAC consultants should participate".

Another one states:

"The ID team should be composed of the owner, the architect, the project manager, the construction manager, the contractor, and the consultants who are the structural, HVAC, electrical, mechanical, and plumbing, while the architect is the integrator".

Another respondent declares:

"The architect, the contractor, the subcontractors, in addition to the artisan who makes the execution drawings to realize the design into a building which can be constructed. Also, a cooperation must be done by professional expertise linking between different stakeholders".

The other one says:

"The ID team is the contractor, the owner, the operator, the user, and the architect who is the consultant. While the team leader depends on the nature of the project; he/she can be the owner if he/she is involved, or the consultant".

The other respondent proclaims:

"The team should be composed of the architect, the electromechanical, someone responsible for sales, someone responsible for regulations, and the civil engineer who could join from the beginning only if the building's structure is not ideal so, his/her presence is based on the project's size and type as well as the contractor".

The last respondent indicates:

"The architect, interior designer, structural engineer, electromechanical engineer (mechanical, lighting, electrical, and HVAC), project manager, infrastructure and landscape engineer, and a planner who is specified in determining the constraints and requirements. And the project manager could lead this integration".

- *Is it better for the ID team to be in-house or to be separate from the firm?*

The first two respondents think that it is better for the ID team to be separate from the firm to have the chance to get the best specialists in each profession by collaborating with other specialized firms and to save the overhead cost that will be spent to have a specialist in each sector. While the second respondent adds:

"if the firm can afford the cost and the specialists, the in-house team will be helpful in timing because the participant will be working only on the firm's projects".

The other respondent states:

"This depends on the project's type; large-scale projects will need separate professions or separate firms, then the management problem will be magnified. In multinational companies, the project processes could not take place in the same country which makes the coordination more sophisticated, but the technology simplifies this problem and makes it easy to communicate".

The other two respondents agree on the separate firms owing to be certain that each profession has its specialists; however, the last respondent declares:

"It is better for the IDP to be in-house because it has been proved that the coordination between the different departments of the design is better to be handled if they are close to each other, but the new technology and 3D visualization programs, like Revit, make it easier to link between designers even if they are apart, but the work efficiency is less than the in-house".

- *Is it better to involve the whole ID team during the programming phase?*

One respondent says:

"Involving the team members during the programming phase is required, but some obstacles will appear as they have different goals, objectives, and missions causing conflicts. Then, involving each member in the right timing will prevent those conflicts".

Another respondent states:

"Yes, it is better for decreasing the amount of work consumed in redesigning, though the contractor must not integrate from the beginning as he/she will affect the cost, so it is better to involve the contractor at the end to compare between different prices".

The other respondent indicates:

"It is better to involve the ones who will influence the design during the programming phases".

Another respondent declares:

"The owner, operator, consultant, and users should integrate during the programming phase, except for the contractor who must be involved after determining the rules and constraints to control the project cost and quality".

While the other respondent says:

"It is better to integrate after the schematic design to have a solid ground for disputation and discussion". Another one mentions: "This integration must be parallel with the project phases to prevent any delay and to be ready for any changes in the project's circumstances".

- *Does the IDP affect the quality of the project? And how?*

The first two respondents state:

"Yes, it helps to achieve better quality by achieving the project's goals and preventing mistakes".

The other respondent says:

"Yes, definitely the IDP affects the quality of product and minimizes the quantity of time and money spent on correcting mistakes, so it helps to compromise the three aspects of management which are quality, time, and cost".

Another respondent mentions:

"It affects the visual and functional quality by

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compromising between the owner/operator who thinks about the aesthetics and the architect who consider the function as well".

Similarly, the other respondent says:

"Yes, it enhances the quality of the project as there is no conflict between diverse solutions so no problem will appear".

The last respondent declares:

"It affects the quality in a better way, preventing the delay of the project".

- *In terms of application, could you outline which phases are adopted by your firm?*

According to the first firm:

"Each project begins with the programming phase in which the operator is involved, then preliminary phase in which schematic design is produced, afterward the design phase, then the working drawings followed by the BOQ, and finally the construction phase. The integration occurs on a small scale, by involving the participants when needed". The respondent adds: "The application of the IDP depends on the culture of the client and his/her operation team and in Egypt this culture is not well recognized, then we suggest an awareness program to be organized, gathering owners and different associations to ensure this culture".

As concerning the second firm:

"We try to manage the quality and to have a system of integration, but we failed to make this integration professional with the separated firms who work with us for the reason of the lack of control on quality and time and the individuality of the architect in Egyptian firms".

The interviewee then mentions:

"The client is also influential as he/she refuses to give money to all these participants from the beginning of the project so he/she decides to postpone their participation".

In regard to the third firm:

"We try to optimize between the primitive processes which are the traditional design processes and the high-tech processes to prevent any extra cost or time".

As maintained by the fourth firm:

"In the first stage, the feasibility study takes place in addition to the study of market value and the business development; in this stage, the marketer and the owner integrate to help to make the project's program. The second phase is the comprehensive design process; the operator is chosen if he/she is not the owner, and the integration takes place between the operator and the consultant. Then, the design phase where the architect works with the help of other consultants, and the contractor joins at the end to begin the construction phase".

As stated by the fifth firm:

"The IDP is adopted on a small scale or in critical cases. If there is a new uncommon project which needs special stages, a team of specialists is adopted but after the pre-design phase which is done by the architect".

The respondent adds:

"In Egypt, it is difficult to integrate the contractor from the beginning because he/she may benefit from this situation, and he/she is not trusted by the client".

In accordance with the last firm:

"The first step is a meeting between the client and the programmer to listen to the client's requirements and it is better to be written. The second step is the collaboration of different departments to discuss and explain the new project, without any drawings or contracts, then each department works on his/her own part to obtain the time and cost required in addition to schematic drawings representing the project's vision. Another meeting with the client takes place to discuss those outputs and if agreed the contract is done. The third step is an outline for the shape of the building to present an undetailed proposal to the client to modify before the final design, and then the technical offer is presented by the department's managers to the client to agree upon. The fourth step is the design phase starting with the "avant-projet" which is presented to the client in a meeting with explanation and a Basis of Design Report (BODR) which is a detailed explanation with drawings, specifications, and costs, ending with the final design with its execution drawing. During the design meetings, each department presents his/her work to match all the drawings together; those meetings involve the specialist contractors. And finally, the construction phase is followed by the operation phase. We use "Minutes of meetings" which are regular meetings with the client; they can be weekly, monthly or as report. The client can observe the project's condition regularly to prevent any dissatisfaction at the end".

C. The Survey Analysis

Comparing the survey results to the literature review, it is obvious that a major amount of answers agreed with the literature review. Fig. 4 presents the ID team members from each respondent opinion; the total number at the right column indicates the number of respondents who agree with the same member. The respondents' opinion about the integrator varied between the architect, the owner, the consultant, the project manager, or a professional design facilitator.

Fig. 5 displays the methods of application of the IDP, the ID charrettes were preferred by the respondents than the in-house team.

The respondents agreed on the crucial effect of some obstacles, being causes for not applying the IDP despite its advantages. Also, some interviewees added the time and the client's culture as obstacles in applying the process. It is then recommended to raise the clients' awareness of the importance of the IDP, as well as to disseminate its benefits among architectural consultants and businessmen. Fig. 6 represents the effect of each obstacle on the application according to its frequency in the interview. The time is the most effective, followed by the trust and the cost, then the autonomy, communication, and the client's culture. And the least effective are firm culture and working in teams.

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Team members \ Respondent		1	2	3	4	5	6	Total
Client group	Building users	-	-	-	√	-	-	1
	Owner	√	√	-	√	-	-	3
	Community members	-	-	-	-	-	-	0
	Facilities manager	-	-	-	-	-	-	0
	Planning staff	-	-	-	-	-	-	0
	Operation and maintenance staff	-	-	-	-	-	-	0
	Operator	√	-	-	√	-	-	2
Design team	MEP engineer	√	√	-	-	√	√	4
	Structural engineer	√	√	-	-	√	√	4
	Architect	√	√	√	√	√	√	6
	Planner	-	-	-	-	-	√	1
	Civil engineer	-	-	-	-	-	-	0
	Landscape architect	-	-	-	-	-	√	1
	Commissioning agent	-	-	-	-	-	-	0
	Energy analyst	-	-	-	-	-	-	0
	Artizan	-	-	√	-	-	-	1
	Interior designer	-	-	-	-	-	√	1
Builder group	Cost estimator	-	-	-	-	-	-	0
	MEP contractor	-	-	√	-	-	-	1
	General contractor	-	√	√	√	√	-	4
	Construction manager	-	√	-	-	-	-	1
	Product manufacturers	-	-	-	-	-	-	0
	Project manager	-	√	-	-	-	√	2

Fig. 4 The ID team members from the respondents' opinion [The researcher]

Respondents \ Method of application	In-house team	IDP Charettes
Respondent 1		√
Respondent 2		√
Respondent 3	√	√
Respondent 4		√
Respondent 5		√
Respondent 6	√	

Fig. 5 The respondents' reaction concerning the methods of application of the IDP [The researcher]

Fig. 7 shows the advantages of the IDP. The responses agreed with most of the significances especially when focusing on the enhancement of the quality, the achievement of the project's goals, the elimination of errors and the need for rework, the linkage between design and construction phases, the magnification of collaboration, the minimization of conflicts, and the integration of building components; however, the majority does not agree with the ability of the process to exchange the information in the right time and the safe work environment. Half of the respondents doubt the ability of the process to decrease the time and cost, seeing it a disadvantage of the IDP.

Obstacles \ Respondent	1	2	3	4	5	6	Total
Interoperability	-	-	-	-	-	-	0
Workflow	-	-	-	-	-	-	0
Firm Culture	-	-	-	-	√	-	1
Autonomy	-	√	-	-	√	-	2
Education	-	-	-	-	-	-	0
Technological Challenges	-	-	-	-	-	-	0
Working in Teams	√	-	-	-	-	-	1
Communication	√	-	-	-	√	-	2
Trust	-	√	-	√	√	-	3
Etiquette	-	-	-	-	-	-	0
Cost	-	√	√	-	√	-	3
Time	√	√	√	√	√	√	6
The client's culture	√	√	-	-	-	-	2

Fig. 6 The respondents' reaction concerning the obstacles facing the IDP [The researcher]

Advantages \ Respondent	1	2	3	4	5	6	Total
Expected quality delivered	√	-	-	√	-	√	3
Project's goals achievement	√	-	√	-	-	√	3
Controlled project time	√	-	-	-	√	√	3
Controlled project cost	√	-	-	-	√	√	3
Elimination of errors & rework	√	√	-	√	√	√	5
Quality enhancement	√	√	-	-	-	-	2
Linkage between design and construction phases	-	-	√	-	√	-	2
Magnification of collaboration	√	-	-	√	-	√	3
Information exchange in the right time	-	-	-	-	-	-	0
Minimization of conflicts	-	-	√	√	-	-	2
Safe working environment	-	-	-	-	-	-	0
Integrated building components	-	√	-	-	-	-	1

Fig. 7 The respondents' reaction concerning the advantages of the IDP [The researcher]

The examination of the interview proves that most of the respondents insisted on the application of the IDP during the programming phase to take all the benefits of the process.

The final question shows that the IDP is not realized by every firm. During the interview, the firms mentioned the following reasons for not being able to apply a successful IDP:

- The inability to integrate the contractor who will think about his/her own benefits and will affect the project's cost without attention to the project's goals.
- The wasted time and money make the process better to be applied to large-scale buildings and uncommon projects.
- The client could not be aware of the IDP's benefits to spending more money and time.
- Small firms cannot afford the assistance of other participants.
- The architect's conviction that he/she can have all the work done alone, either he/she is the designer or the contractor.

- The lack of awareness.
- AEC firms are not appreciating the IDP benefits.
- Trust issues between the client and the contractor are leading to the inability to integrate together.

Facing these issues can result in an appropriate application of the IDP; these obstacles can be prevented by taking them into consideration.

V. Conclusion

The ID is an advantageous approach helping with the assembly of the appropriate organizations and individuals; it helps to manage their integrative actions to ensure best value creation. The application of the IDP into the architectural practice is facing some constraints obstructing the integrative team from cooperating and contributing their ideas and technical knowledge. This paper presents a survey exploring the additional factors and obstacles that could affect the application of the IDP in design firms. One of the results that is emphasized at the end of this survey is the importance of the IDP in architectural and engineering design firms to improve the project's quality. In addition, some recommendations were presented in the survey demanding to increase the awareness of the stakeholders with the IDP and its benefits to lessen the constraints facing the firm.

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