

## **E2construct-Application for Better Construction in United Arab Emirates Using Indian Skills**

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**Abstract:** The tool “e2Construct” was developed as part of research work and was validated initially with select contractors to help construction industry in the United Arab Emirates (UAE). Substantial use of this tool to the construction industry would help better use Indian and other labor forces in the UAE and save billions of dollars. This paper concludes the series of papers, in which the model was developed to include the current practices and standards of UAE construction Industry in relation to labor skill development and recruitment strategy. The model was tested initially with three construction companies independently to validate their understanding. Their acceptance was the basis of using this tool in the future work towards industry-wide application of the e2Construct tool. This paper describes results of initial testing and stages that were followed for successful implementation in the industry.

**Keywords:** construction projects, quality factors, labor skills, recruitment and skill development  
Keywords: Effective Use of Indian Skills, better construction, Construction in United Arab Emirates

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### **I. Introduction**

This paper concludes the sequence of the research work and series of publications (1-5), which give details of the research work. The main purpose was to develop and test the eConstruct model for assisting the construction industry with their participation. The reason being that the large part of the labor force in United Arab Emirates (UAE) comes from the Indian sub-continent (Pakistan, India, Bangladesh and Sri Lanka). These workers are hard-working and have contributed to the success of industry in the UAE; however, there is a need to train them for desired qualifications and working environment to higher and more successful results. The entire development was carried over several years of work. It comprised of analysis of the data using scientific methods to interpret and apply them with more success (3,4,5). Earlier papers mentioned essentially laid the foundation of this paper and their results are summarized in this paper to help understand the final step in the e2Construct model and its industry acceptance by their participation and verification. This application document with technical input from the engineering society is adopted by the UAE as a building code. The regulation development includes a comprehensive review and redevelopment of all relevant area specific to the UAE and forms the basis of the eConstruct program. The regulations developed in UAE are based on the established and recognized building code such as the IBC and in consultation with the UAE Society of Engineers. They include an application document to account for all local requirements. Objectives in this program are listed below with detailed explanation follows:

First objective was to understand the current practices and standards of UAE construction Industry in relation to labor skill development and Productivity. Second objective relates to determine the skills required to handle the materials/engineering/architecture and construction needs. The third objective was to identify the capacity and potential of the existing migrant workers from India. Final objective was to propose and test the unique model for the training and development of labors prior to arrival to UAE.

Development of e2Construct Model:

The execution of e2Construct model proved be a great challenge. To close the gap and enhance the quality driven knowledgeable workforce, the e2CONSTRUCT was implemented in two stages.

Stage 1: Start with a pilot study contracting with a major construction company in UAE to be their e2Construct trainer for the upcoming construction project. e2Construct to have contract for training the recruited labor force from India through the proposed Model and further enhancement of training throughout the project. Once this pilot study is completed i.e., once the undertaken project completes or during the mid-phase of the project, it can be certain the success of the e2Constructon Training Model in the Construction Industry.

Stage 2: With the success for the stage 1 development, feasibility study of establishing this model was conducted considering other financial parameters and other requirements. However, this thesis was limited to only the study report based on the author's industrial experience and identification of unavailability of a proper training in the construction industry.

It has been identified and well-established fact that the lack of training and development is a major concern. This initiative to establish the e2Construct model, provided an opportunity to link up with the suitable government agencies to establish such a Model of training for the Construction Workers. The effect of e2Construct Model prepared in this research was implemented in construction industry in Abu Dhabi (UAE) for its approval. Few construction companies have given positive response regarding the implementation of the model.

It is not uncommon for construction to fail on various levels and still succeed. e2Construct's alternative reasoning is to distribute the 'Vision' to all concerned, providing motivation and sharing the common concept of 'what' is to be built and allowing them to make the process a 'good' work. To that end, e2Construct will show all operational procedure on its website with and without the language. The techniques will be shown in voiceless components, as well as, with voice for clarity. A reasonable assumption can be made that a great deal of the worker's reading skills to be deficient. Analogical training will be key to student understanding and retention. e2Construct will serve as the distributor, depositor, and dispenser of construction knowledge and build execution. The special need to provide service and educational resources for workers at the site and prior the employment (in India if necessary) is a concerted effort made possible by the webpage approach. To further their skill sets for possible future work, the site will provide testing and reference to other pertinent links of value – thereby maximizing global resources.

Some of these resources will consist of *Returning Workers from Site (RWS)*, who represent a turnkey 'solution' set, and which will allow these veterans to go to any site based on their previous experience and training. Thus, this method will prove to be an additional leverage to the previous learning and help placement services directly to other needed areas of construction. Local Indian institutes will be able to provide them identities, specialties, training education and prior work experience. These workers will then be classified by a structured 'grading' system based on the newly acquired skill sets, thus becoming additional developed resource while extending overall service accordingly. This RWS may become the working tool that would deliver to each worker concentrated specialization and produce a world-class and construction savvy workforce. In making e2Construct specifically targeted to the "Working Man's" level of operation, with emphasis being on direct training and in supplementing field skills learned and honed.

Various operational performances of e2Construct must be accepted as standard to define 'templates' and accepted forms that will work in the field. Ultimately, the program's vision is simple: put skilled workers into the workforce or in 'the' preferred profession or position. e2Construct is a cohesive and detailed construction technology 'blueprint' based on reality foundations. Its 'live' instructors will support the building of sophisticated construction platforms. This integration, will be the nexus of the on-site training to provide dimensionless 'how-to' technology, capable of building and installing vast segments of construction. The e2Construct will have internal elements that are interchangeable while featuring interdisciplinary skills for better site preparedness and faster inclusion of construction principles. Legacy (established) 'technique modules' will propagate better quality in general buildings. The e2Construct design will thus represent the integration of all known fields of construction since the goal is to build with the best efficiency and economy.

## **II. Implementation**

This effort will integrate vendor efforts, targeted resources, construction scheduling, available personnel and the site standards using proper protocol:

**Communications:** A suitable physical entity is established to upgrade and distribute information and knowledge. The formation of an independent communication networks is the 'backbone for all education, training and their co-ordination. Such a communication network will be combined with smart cell phones, wireless laptops, and walkie-talkies to be established and will be active and flexible.

**Video and Construction Media:** An 'On-Demand' library is an essential part at every site so that the workers can 'browse' through videos and 'how-to' references at their own convenience. Operational hours and availability must be coordinated using smart cards for attendance and to control proper use.

**Basic Supplies:** It is important not to overlook the essentials for successful workers to succeed. (Solar) calculators and measuring tapes become tools of each worker as well as the previously mentioned smart card. Each worker will be educated about the operation and the uses of the devices and must be tested for proficiency routinely.

**Power Systems:** A basic education needs to be provided on Power and Electrical technologies. This is required so that everyone has the basic understanding in regard to the standardized practices. Should an emergency develop, this will allow the entire work force to help identify and assist to solve the problem.

**Safety Operation:** The need for site education must be raised along with the integration of technology. Safety is a function of all areas of concern at a job site. All electrical security devices, including limited security applications, must be considered as a possible point of failure, and therefore the objective of the education in the e2Construct process.

**Transportation:** The perceived simple task of moving through any mode of construction elevators or scaling frames is not simple when hundreds of workers inhabit a site. Basic education of personnel lifts, elevators, trolleys, suspensions, and 'framing structures' are discussed in working details later. The total work force must be a part of this education framework to successful completion of the project.

The e2Construct thus had to consider the disruption of service and the suitable contingency plan. When there are design changes, resources must be provided and/or arranged for to limit losses in regard to time and loss of construction capital. Detailed risk assessment in construction was analyzed using strategies to recover all educational and training aspects. The e2Construct Model prepared in this research was then implemented in construction industry with participations of local construction companies, who agreed to check the proposed model and to give feedback and positive response after checking the implementation of the model.

### **III. Implementation Details**

#### **a. Selection of software:**

To test the effectiveness of the proposed model, the viability of trusted software is a necessity. With the feedback from training providers and checking with researchers at the universities, three available Software were selected to check the model. These are: Mindflash, Proprofs Training Maker and e-Electa. Mindflash for Contractors Empower the contract workforce with knowledge of best practices, products and systems, anytime, anywhere, on any device. Flexible course delivery options publicly or privately. The software also set specific course passing and completion requirements. Leverage customizable assessment and reporting features to easily track progress, demonstrate regulatory compliance and create a historical archive of contractor educational history. Proprofs Training Maker is a powerful online course creation & learning management system that allows trainers and educators to make courses and administer learners. As online training software, educational institutions and businesses can use it to create online courses and training programs, online assessments, surveys, courses and polls to deliver comprehensive training and educational programs. ProProfs Training Maker offers powerful features such as the ability to upload existing learning materials including presentations, PDFs and videos, as well as online content. This web-based training software comes bundled with advanced tracking features including compliance reports and more. Additionally, ProProfs Training Maker offers pre and post-training support with a powerful Knowledge Base Software, which trainers can use to allow new employees to access product manuals, company policies and other training materials from a centralized and well-categorized knowledge base. e-Electa Live is a professional virtual classroom and a real-time online collaboration environment designed for teaching and training over the Internet. Arrange live online classes and lectures, online meetings, group sessions, individual one-on-one sessions and webinars – all taking place over the web. For live online meetings only need a computer with an internet connection. Far beyond a basic video conferencing tool Electa Live provides advanced web-based management and scheduling tools along with rich collaboration tools in virtual classrooms: Crystal clear high-quality audio, multiple simultaneous talkers, Interactive whiteboards with multiple markup and annotation tools, File and document sharing, live presentations, screen sharing, Breakout rooms, text messages, virtual hand rising, and plenty of other.

Following the detailed study of the above three software's and endorsements from training providers/universities and a lot of alternatives accessible from the mentor on intelligent learning through the use of web-learning tools, e-Electa was selected for validity of e-2construct model.

#### **b. Training Details**

The three UAE companies were selected for their feedback using to validate the model; they have their own recruitment agencies in Mumbai, India. However, these agencies only recruit the qualified skilled workforce based on their qualification and experience, but do not guarantee the level of knowledge. The next challenge for the researcher is to identify a training center in Mumbai. The researcher after various discussions and negotiation agreed into contract with CSS a Mumbai based training provider. The role of CSS is to facilitate the e-2construct training and to provide an expertise trainer onsite during the online program plus a one-day testing and one day training for all the selected workers, that should be carried out by CSS and to submit a report. This report allowed the instructors to prepare precise learning materials for the training to be effective. These include the following

1. Concept with Mathematics
2. Basic Construction Tools
3. Power Introduction
4. Blueprints and Media

5. Communications

6. Industrial Skills

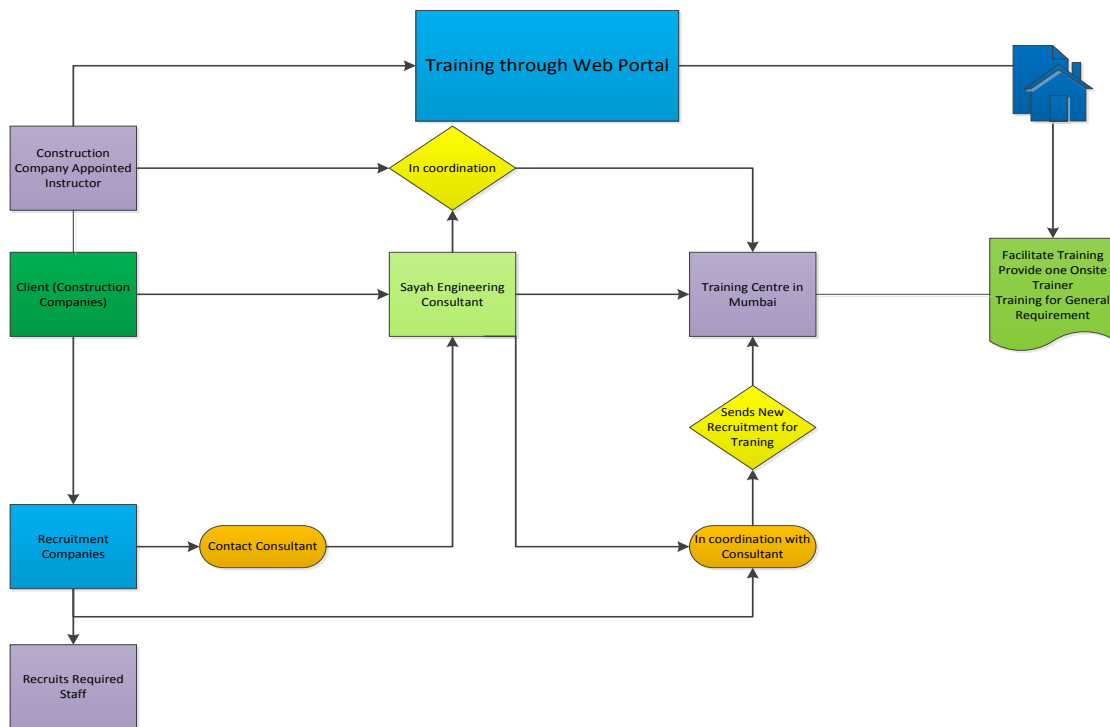
CSS noted that around 80% of the recruited workers have expertise in their field and are aware of the basic elements in the construction sector, and only 20% of the new recruits require some additional training in relation to the concept with mathematics and enhancement of general communication. With this success, next step of online training was ready to go.

Three selected UAE companies were instructed to work with their recruitment agencies to send the new hires to CSS for testing their skill and knowledge levels and further arranging the training. CSS in coordination with Sayah Engineering then successfully conducted the e-Construct Training program with the process flow-chart illustrated here and details of various actual categories are shown in Appendix 1 along with the details of training conducted for each group. Training details related to the safety is attached in the Appendix 2.

It should be noted that these training sessions were carried out individually for each company. Once the workers arrived UAE, further training would be conducted on site for more awareness related to the construction site and these exercises would be repeated from time to time to accomplish the project goal of Success.

Other training elements include

- 1) The description of general requirements of each category
- 2) The expected productivity from each category
- 3) The reporting structure of each companies
- 4) Government regulations that needs to be strictly followe



**Figure 1** Flow-chart for the application of eConstruct

c. Conclusions and Effectiveness of e2Construct Model

All the three companies have expressed the effectiveness of the e-2Construct Model in similar manner to draw important conclusions. They are also based on the personal discussion with the company representatives.

- e2Construct is an effective tool and may be highly recommended for construction sector
- The system will reduce the time span in conducting the onsite training
- The outcome will be a knowledgeable workforce, that may start the work immediately upon their arrival in the UAE and will save a considerable time
- Gaining knowledge of the company’s work culture, other detailed technical and safety aspects of the project prior to joining, provided great advantage to the workers in the UAE in general about the expectations from them and to be successful.
- The worker’s previous knowledge will make easy for the continuation of trainings onsite

The model prepared in this research and verified by few construction industry companies in Abu Dhabi (UAE) and was indicated by their letters of endorsement (in Appendix 3).

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APPENDIX 1 Details of the safety training

The table gives details of the training conducted for each group

Sl No	Category of Workers	Details
1	Safety Officers	The company appointed instructor joined online from UAE through the e-Electa Portal and conducted 2-day training. The class begins with the explanation of the company culture, the process and their current running project. Further detail training for general safety awareness and mandate required by the UAE government has been conducted. The onsite tutor has further briefed all this in a traditional live lecture.
2	Scaffolders	A one-day training program carried out with the online company tutor. The class begins with the explanation of the company culture, the process and their current running projects, their requirements have been briefed. All technical requirements with the help of visualization in context to scaffolding have been briefed. The onsite tutor further briefed all technical and safety aspects that the scaffolders should follow
3	Carpenters	A one-day online lecture started with the explanation of the company culture, the process and their current running projects, their requirements have been briefed. All technical requirements with the help of visualization in context to carpentry works have been briefed. The onsite tutor further briefed all technical and safety aspects that the carpenters should follow
4	Painters	A one-day online lecture started with the explanation of the company culture, the process and their current running projects, their requirements have been briefed. All technical requirements with the help of visualization in context to Painting works have been briefed. The onsite tutor further briefed all technical and safety aspects that the painters should follow
5	General Labours	A one-day lecture started with the explanation of the company culture, the process and their current running projects, their requirements have been briefed. All technical requirements with the help of visualization in context to labour assistance have been briefed. The onsite tutor further briefed all technical and safety aspects that labourers should follow

Appendix 2: Details of various aspects covered in eConstruct validation

## Workplace Safety Guidelines

### Why Work Safety?

- Work safely for the most important people in your life, your family.
- Work related injuries cause not only time away from production activities at work but also time away from activities with your family.



### What is working safely?

- Wearing required PPE
- Completing every task the correct way, not taking hazardous shortcuts
- Paying attention to the task at hand
- Asking for instruction when completing unfamiliar tasks.

### Emergency Evacuation

- Evacuation of the building may be required if an emergency situation threatens the life or safety of employees.
- Situations that may require evacuation: fire or smoke; chemical spill – (five (5) gallons or more); bomb threat; violence; power failure; terrorist attacks.

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### Emergency Evacuation

*If there is an emergency:*

- Proceed to the nearest EXIT. Do not stop to pick up personal property.
- After exiting building, proceed to the assigned outside Evacuation Area.
- The Emergency Coordinator will verify all employees are accounted for.
- The Emergency Coordinator will notify the Manager on the status of employees.

### Fork Lifts & Manlifts

- Only licensed and certified operators are authorized to operate forklifts & manlifts.
- Do not operate mobile equipment until you pass the required training and are certified.
- Never stand on raised forks or on a pallet on the fork lift.
- Never place any body part under raised forks, pallet or other load.



## Fork Lifts & Manlifts

- Always keep a buffer distance of at least 6 feet from all directions of possible travel.
- Always insure the lift operator knows you will walk in front of or behind the lift.
- Never stand in an area where a load could fall off forks and strike you.
- Never ride on a fork lift as a passenger.

## Death Zones

- These areas are called death zones because if the load fell or shifted and you were in a death zone you would be killed.
- Examples of Death Zones are as follows:
  - Positioning yourself between a raised load and a fixed object.
  - In an area where the load would strike you if it fell.

## Personal Protective Equipment

- Safety Glasses/Face Shields
- Hearing protection
- Gloves
- Hard Hats
- Steel Toe Boots
- Respirators/Dust Masks



THESE ARE THE PIECES OF YOUR UNIFORM

## Care of PPE

- Inspect all PPE prior to using each time.
- If any part of your PPE is damaged, seek repair or replacement
- Store all PPE in a clean, dry and secure place.

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## Limitations of PPE

- Hardhats will protect you from falling bolts from cranes but not heavy falling objects.
- Dust, airborne dirt, and sparks can travel underneath and around the lens of safety glasses.
- Leather gloves can be cut through.

## Eye Safety

- Never rub your face or eyes with dirty hands or while wearing a glove.
- If you get something in your eye never rub it with your finger, this will only make it worse.
- If something is in your eye blink it several times then use an eye wash.



## Hearing Conservation

- Always wear hearing protection in required areas.
- Prolonged exposure to noise without protection will cause permanent hearing loss.
- To insert earplugs pull up on top of ear and insert.
- Earmuffs should cover the entire outer ear and be snug.

## Electrical Safety

- Only trained maintenance employees are authorized to conduct trouble shooting or electrical repairs.
- Do not attempt any maintenance activities you are not trained or authorized to conduct.
- Never use a damaged extension cord or any other piece of damaged equipment.
- Never used electrical equipment in damp or wet areas.

## Lock Out/Tag Out

- Lockout/Tagout refers to specific practices and procedures which safeguard employees from the unexpected energization or startups of machinery.
- If you ever see a red lock, yellow lock or a danger tag on a machine it is locked out for repairs.
- Never try to start a locked out machine.
- Never remove locks or tags.
- Only trained and authorized maintenance employees can lock a machine out.



## Lifting and Moving Material


- Always check the weight of an object prior to lifting it.
- If it seems heavy get help from another person, use a fork lift or a crane.
- Stretch and plan the path of travel before the lift.
- Always lift with your legs keeping your back straight.
- Never twist while carrying a load.

## Hazard Communication

- All chemicals must be labeled with the name of the chemical & manufacturer
- Bulk chemicals and chemicals with a hazard must be labeled with the Hazard Management Information System Label shown on the next page.
- The higher the number rating the more hazardous the chemical.



## Specific Hazards

- The marking in the bottom white square
- OXY - Oxidizer (causes fire through release of oxygen)
- ACID - Acid
- ALK - Alkali      CORR - Corrosive  
(both CORR & ALK material create burns on human skin)
- W - Use No Water
-  - Radiation Hazard

## MSDS

- MSDS = Material Safety Data Sheets
- In-depth information on health hazards, reactivity, flammability chemical properties, guidelines on usage and storage.
- MSDS for all products used at facility are in binders onsite.
- See supervisor/manager for MSDS binder location.



## Confined Spaces

- Never enter an area labeled as a Confined Space
- Confined Spaces need to be locked out and checked to insure the atmospheric conditions are safe before an entry is made.
- Only trained and authorized employees may enter a confined space.



## House Keeping

- It is important to maintain a high level of housekeeping throughout the facility.
  - Trip hazards
  - Water/Spills cause slip hazards
  - Clean up or immediately notify your supervisor of these conditions.



## Working from Heights

- Never enter an area with a fall hazard of 4 feet or greater without appropriate PPE.
- Training is required for all employees prior to using fall protection.
- Fall protection is also required to be worn at all times in manlifts.



## Heat Stress – Stay Cool



## Fire Procedures

- If you find a fire smaller than a small trash can you can try and put it out.
- Anything larger sound the alarm, notify your manager and evacuate the building.
- Assemble in your designated area outside
- Report any missing coworkers to manager



## Fire Extinguishers

- Fire extinguishers only have a minute of retardant in each extinguisher.
- So you will only be able to put out fires the size of a small trash can.
- To use a fire extinguisher Remember **PASS**
  - Pull the pin
  - Aim at the base of the fire
  - Squeeze the handle
  - Sweep the base of the fire



## Injuries & Accidents

- All injuries and accidents must be reported to your manager immediately.
- This includes first aid injuries and close calls.
- Accidents and injuries resulting in medical treatment must be documented on a accident investigation form (OSHA 300 log).


## Disciplinary Action

- Disregarding safety rules or established safety practices can result in immediate dismissal or other action receiving a formal, written notice.
- Examples of violations:
  - Not wearing required PPE
  - Not immediately reporting an injury or damage
  - Committing an unsafe act such Standing in a Death Zone or removing a guard
  - Operating a piece of equipment you are not authorized to operate such as a crane or fork lift

APPENDIX 3 – Pilot Study Participating Companies and Results

ISD 9001, 14001, 18001 CERTIFIED

**AL LAYTANI**  
Gen. Cont. & Maint. Co. L.L.C.



شركة الليطاني  
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09<sup>th</sup>. April. 2017  
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Subject:


**The use of the e2CONSTRUCT: A Model for Indian Skill  
Development and Construction Labor in UAE**

Dear Sir,

Reference to the above subject, we are pleased to inform you that we had a successful experience in using the e2CONSTRUCT: A Model for Indian Skill Development and Construction Labor in UAE in our projects and we found it to be practical, profitable and cost-effective.

Best Regards,

Al Laytani General Cont. & Maint. Co. L.L.C.



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Thank you & best Regards

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