FIDIC Jakarta

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1-3 OCTOBER 2017

THE REFLECTION OF YOUNG PROFESSIONALS

FIDIC 2017 International Infrastructure Conference Booklet

Jakarta, October 2017

YPFSC Booklet Task Group:

Chair: Adam Bialachowski, Jomanah AlBtoush, Wafaa Balla, Arash Emambakhsh, Cosmin Tobolcea & Rafat Bouri

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GREETINGS,

Thank you for attending the **FIDIC 2017 International Infrastructure Conference** in **Jakarta** which is one of the important and unique events in international scale for the engineering sector. At this conference all business leaders, stakeholders, decision makers, subject matters experts, funding agencies, young professionals, etc. meet to face and tackle the global business challenges within a positive, diverse and resilient environment.

This year is considered one of the distinctive and remarkable years for the Young Professionals Forum (YPF). By providing **Young Professionals (YPs)** a high level of support and a real space to present and discuss their points of view with all of you. This will be accomplished through different conference activities, which benefit and improve knowledge sharing for all attendee's.

This booklet is a first time experience for our young professionals, may be it is small in term of size but is big in **spirit, thoughts, dreams, diversity and efforts**…. It is the collection of **YPs reflection**. It is a summary for the main YPs papers that were received as a result of the call for papers process, which was initiated, announced and managed by Young Professionals Forum Steering Committee (YPFSC) for all YPs worldwide to select the best papers to be presented here at the Jakarta conference during both the YP Open Forum and the 1st International YPs Symposium Sessions. In addition to other important papers and schedule for YPs activities.

Hope that you will enjoy reading it and find it interesting and valuable.

Looking forward for your support and attendance at the YP activities

Kindest Regards

Jomanah AlBtoush

Do you or your company want to become a sponsor of future booklets like these and other YP activities? If so please contact us at YPF@FIDIC.org and a.bialachowski@vintageconsulting.eu.

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YPS PROGRAM

Date: 1 Oct. 2017			
YPF Open Forum			
Time	**Time Distribution**	**Activity Details**	**By**
08:30-10.00	8:30-8:40	Welcoming & Introduction	Moderator
	8:40-8:55	YPFSC Progress in 2017	Jomanah AlBtoush, YPFSC Chair
	8:55-9:05	Voice of YPs in ASPAC Region for resilient future	Takashi Matsuo ASPAC YPFSC Chair
	9:05-9:15	The Journey To Green Field The Role of Consulting Engineering in the Decommissioning of Nuclear Facilities	Ahmed Stifi
	9:15-9:25	Resilient infrastructures in Italy – The Challenge of Retrofitting in Historic Contexts	Eleonora Smargiassi L
	9:25-9:35	A System Dynamics Framework for PPP Concession Evaluation Framework for Highway Facilities	Tanaphat Jeerangsuwan
	9:35-10:00	Q&A	Moderator & All
1st International YPs Symposium			
Session 1			
14:00-15:30	14:00-14:10	Welcoming & Introduction	Moderator
	14:10-14:25	Future of How Engineers Work Key to Resilient Infrastructure and Improving Life	Cosmin Tobolcea and Adam Bialachowski
	14:25-14:35	Proposal for resilient infrastructure maintenance from Japanese YPs through the experience of "The Great East Japan Earthquake"	Eiji Sawamoto
	14:35-14:50	Humanitarian Engineering to Rescue	Jomanah Albtoush & Wafaa Balla Beshir Ahmed
	14:50-15:00	Evaluation the Effect of Changes in Natural River Flow for Downstream Areas after Construction of Hydropower Plants in the Central Highland – Vietnam	Hung Pham Ngoc
	15:00-15:10	How design led thinking by YPs can contribute to resilient infrastructure in Africa	Keamogetswe Mmekwa
	15:10-15:30	Q&A	Moderator & All
15:30-16:00	15:30-16:00	**Coffee Break**	

Time	Time Distribution	Activity Details	By
Session 2			
16:00-17:30	16:00-16:15	FIDIC and YPs	Arash Emambakhsh
	16:15-17:30	FLW/ YPMTP 2017 participants	YPMTP
	18:00-19:00	**Meet & Greet -Jakarta Convention Center ("FIDIC Global Town")**	

Date: 3 Oct. 2017		
7:00-7:30	7:00-7:30	**EC Meeting With YPFSC**
7:30-8:30	7:30-8:30	**EC Breakfast with YPs**

About the Author

ELENORA SMARGIASSI

Project Manager, Lenzi Consultant- Italy
Since May 2007 works with Lenzi Consultant in Rome where she carries out project activities as a Project Manager. She is one of the project manager for hospital and hotel projects, national and international.
Since 2008 she is the responsible for the sustainable architecture, having taken part in many professional classes, according to the Italian norms.
In 2010 she organised the OICE exhibition "Italian high design and high technology" during the EXPO in Shanghai, inside the WTCA Pavillion, in order to export the Italian way of life, the know how that makes Italian different through over two thousand years of history.
She's now collaborating with CNETO (National Center for Construction and Technology Hospital), in the CNETO NoteBook series where recommendations, suggestions and concrete proposals are drawn up to design, implement and manage a new hospital model and improve the Italian hospital and health care system.
In the 2017, with OICE, founded the new Italian FIDIC YP group, trying to start a series of initiative, like BIM courses, strategies to participate the Word Bank public notices etc.

RESILIENT INFRASTRUCTURE IN ITALY: THE CHALLENGE OF RETROFITTING IN HISTORICAL CONTEXTS

By Elenora Smargiassi, Italy

The theme of resiliency has in Italy his own meaning. Italian cities have an history to preserve and maintain, are often World Heritage Site, and for this reason we, as Italian people, have to face a bigger challenge compared to the cities of other countries: here we have the need to make the cities as a whole (infrastructure, monuments, historical center, buildings) resilient, with the double meaning of hold out to external events both for the citizens and the history present in the cities.

Recent natural catastrophic events showed how little has been made until now to preserve the Italian artistic heritage.

As in many countries in the rest of the world, Italy have now to face natural events pretty rare until now: weather bomb, landslides, floods, fire, drought and earthquakes, have follow one another, so that Italy has become one the European country with the highest risk of catastrophic events. Despite this, our institutions doesn't take actions to preserve our "Belpaese" from this kind of events. Last in time order, the center Italy earthquake: the intensity of the earthquake has been so high that created importance damages both the buildings and the people. The differences between several historical centers has been in the fact that the areas where interventions has been made beforehand has had no damage, whereas where no interventions has been made, entire towns have been destroyed.

It's easy to understand which could be the solution: what we propose is a methodological approach focused more on the prevention that on the reconstruction post event. Is the concept of resilience himself that needs prevention, the city has to survive a catastrophic events of any type, weather events (flood, dryness, burning) geophysical events (avalanches, earthquakes and volcanoes), or industrial accidents.

METHODOLOGY OF INTERVENTION.

The procedures to follow could be identified according to a progression ladder.

First of all, we need a complete mapping of the national territory, that indicate the areas that could be more susceptible to catastrophic events: this first step, must be realized by a team of experts, that can detect the possible issues in the several areas, capable to explain what kind of risk is present.

The next step would be to check the categories of building to preserve.

The main five categories are:

1. Historical Monuments
2. Historical Town

3. Common Buildings in historical fabric and not
4. Infrastructures
5. Sensible buildings

For any of these categories there are different priorities, according to the historical or structural relevance, the economic resources, etc.

The last step is the more important: the type of intervention. What we propose, is to be able to indicate different interventions packet for any categories, with his economic plan, his professionals requirement, the technology needed both in the design (BIM and its evolutions) and in the intervention.

For example, often for the historical monuments the main problem that have to resist during a catastrophic event, is the state of abandonment. In a catastrophic event, a building have to resist not only in a structural way during the real event, but mostly have to remain in operation on its specific function on the territory, that could be infrastructural or social, but also cultural or historical.

In terms of their nature and their valorization, a first differentiation can be made:

1. Historical buildings/monuments that have "only" an historical function, that can be preserved just through a consolidation intervention.
2. Historical buildings/monuments that, besides having a historical and cultural interest, have a social function, that can be preserved through a consolidation and restoration intervention
3. Historical buildings/monuments in state on abandonment, that could be reused in several function, that through a consolidation and restoration intervention could have a new life.

The restoration just to block the deterioration should be just a phase. Mostly important is to reutilize it in a durable way, to avoid that the building return in a state of abandonment with a waste of money and time.

The points to approach the problem, related to the different cases above exposed, can be the following:

1. Inclusion of the historical building/monument in the list of priority intervention.
2. Historical and environmental analysis of the building/monument.
3. Choice of the type of intervention (consolidation, consolidation/restoration, consolidation/restoration/refunctionalization). Evaluation of the social an infrastructural context, and eventual development plan for the refunctionalization.
4. Plan for static consolidation and restoration work.
5. Maintenance plan.

These 5 phases represent the 5 different fields of the overall project. They depend on each other and are mutually interconnected, despite they have different features and peculiarities.

Thanks to geologist Roberto De Marco, who for years has been the director of the national seismic service of the Presidency of the Ministers Council, we have tried to understand the main problems of prevention and reconstruction, that will be explain in the paper.

CONCLUSIONS

The procedures outlined above remain useless if not well understood. We, young professionals, made an analysis of the past, trying to learn by the mistakes of our predecessors, and trying to find how assure the building prevention. Engineering Firms should begin to realize that their structure can no longer be composed solely by professionals, but it must contain new professionalism that can interfere with different utilities to increase awareness of these issues. Awareness of private citizens, institutions, private banks etc.

The concept behind this reflection lies in the fact that, apart from the universally acknowledged historical monuments, the maintenance of which is in the hands of public administration or private bodies, the greatest building consistency of historic centers and monumental villages belongs to private citizens. This

implies that they must be aware of the usefulness of the catastrophic pre-event maintenance intervention, understanding that the initial economic investment will only bring benefits. This awareness-raising work has to be accomplished capillary and above all by specialized personnel who know how to understand the true purpose of the interventions and the gains they obtain.

The engineering company will have to be able to make this work clear to all (according to the procedures described above) to make it concrete and real, trying to develop issues that are understandable to everyone in order to avoid getting ostracisms from the entities or lack of finding of funds.

From here emerges the urgent need to create and train new skills that have both technical (engineering and architectural) knowledge, as well as knowledge in sociology, rather than economics, in relation to investment banks or world bank. Only in this way will we be able to overcome the gap between professionals and citizens so as to understand the true needs of Italian real estate.

But the same approach will have to be applied to public administrations, helping them to find funds and investment opportunities, which could be re-privatization of property, private investor intervention, etc.

We, young professionals, who, in order to get started working, had to interfere with difficulties due to the financial crisis not yet fully completed, we understand the need to share experiences and information, and better than older generations, we are sensitive to the importance of training.

In order to be able to find space in the societies we work with, we have had to create networks of knowledge to better understand the specific competencies we were asked for: that is why we are able to cover these roles or otherwise specialize and create these figures, needed to create a solid development of engineering companies.

HUMANITARIAN ENGINEERING TO RESCUE

By Jomanah AlBtoush, Jordan & Wafaa Balla Beshir Ahmed, Sudan

About the Author

JOMANAH ALBTOUSH

FIDIC YPFSC Chair
Project Manager and Water & Wastewater Team Leader, Arabtech Jardaneh – Jordan.
Jomanah is an active Young Professional in FIDIC space since 2011, she is YPFSC chairperson since September 2016 and a member of FIDIC Risk & Quality Committee, in addition she is a task group/force member in Sustainable Development and Contracts Committees.
Jomanah holds MBA and B.Sc. in Civil Engineering. Also she is certified in (PMP Professional, GPM-b, Carbon Reduction & GHG Manager (CRM), Six Sigma Green Belt (CSSGB))
Jomanah has about 15 years of experience in consultancy services. She is an enthusiastic wet infrastructure engineer with significant experience in working in different aspects of consultancy services such as modelling, master planning, concept, schematics, detailed design and tender documents. She has been an integral part of many large infrastructure projects in Jordan, Yemen, Oman, Libya, KSA, Oman, etc. Also she has an extensive knowledge in project management, contracts, quality management, environmental and sustainability fields.

About the Author

WAFFA BALLA BESHIR AHMED

Projects Coordinator, TEKNO Consultancy - Sudan
Wafaa is an ordained young professional African engineer, she is a civil engineering graduate from the Khartoum University, Sudan. She has been awarded a Project Management Professional and the Risk Management Professional certificates from the project management institute (PMI), attended many professional, academic and professional training courses and workshops and she is a regular attendee for FIDIC International Infrastructure Conferences.
Wafaa is also a member at the FIDIC Young Professional Steering Committee and the Chairperson of the Newsletter and Social Media Subcommittees.
She is currently working in the project management office in TEKNO Consultancy, based in Sudan, she has also been involved in different community development initiatives, with special concentration on the role of the Engineers in community and life improvement.

Introduction

A humanitarian crisis/ disaster is defined as a singular event or a series of events that are threatening in terms of health, safety or well-being of a community or large group of people, usually occurs throughout a large land area. Therefore local, national and international responses and collaboration are necessary in such events. **Humanitarian engineering** aims to research, design and implement to directly improve the well-being of poor, marginalized, or under-served communities, which often lack the means to address pressing problems. Through go beyond traditional approaches to finding smart, sustainable, innovative and appropriate solutions that can heal communities and help meet future challenges for developing communities.

Goal

The main goal of this paper is to study the role of engineering industry in the humanitarian responses worldwide.

Methodology

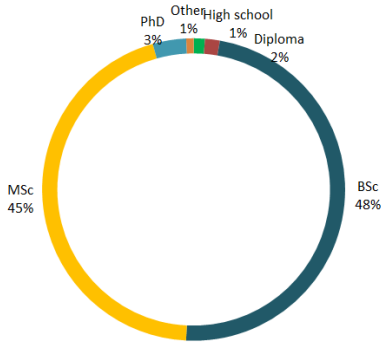
- Literature review for related papers and studies.
- Prepare a questionnaire as a tool for this study.
- Issue an online and focused survey worldwide to study the respondent's feedback.
- Analyse the survey responses to reach the survey findings/ results.

Objectives of this study are:

- Assess the awareness of humanitarian works.
- Study and recognize the unique skills for the engineering industry/ engineers to situations of humanitarian conflicts.
- Highlight the challenges and the opportunities.

Results Analysis

The collected responses is about **300** for the period from **July- September 2017**, the analysis and outcomes are as below:



About **50 Countries** from all over the world participated.

Gender: Male 66%, Female 33% and Prefer not to mention 1%.

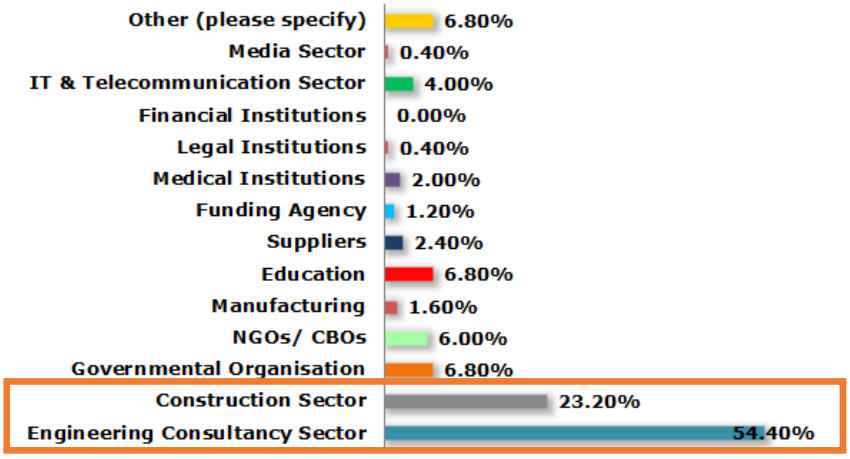
Age: 70% less than or equal 40 years old and 30% more than 40 years old.

Achieved Academic Qualification

Majority are bachelor and Master Degree holders.

Professionals Sectors

About 55% from consultancy Engineering Sector and 23% from Construction Sector.

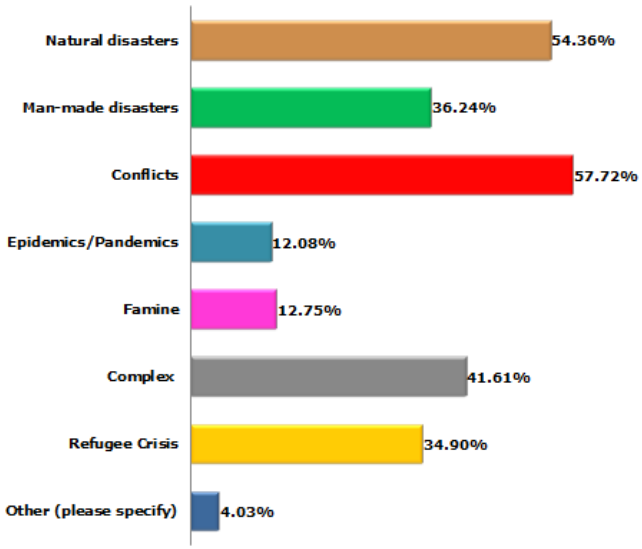


Awareness about Humanitarian Engineering

25% of the respondent heard about Humanitarian Engineering, in relation to NGOs, personal awareness due to crisis or working for International Organization.

Human crises types that considered the most influential based on the below types:

- **Natural disasters** (earthquakes, volcanic eruptions, floods, etc.),
- **Man-made disasters** (hazardous material spills, nuclear accidents, etc.),
- **Conflicts** (War, Terrorist, etc.),
- **Epidemics/Pandemics** (AIDS, bird flu, etc.),
- **Famine,**
- **Complex** (a combination)
- **Refugee Crisis**



Most of the respondent emphasized on the role of engineering in the Humanitarian Works in term of response and recovery phases through consider innovation/ smart solution, rehabilitation, use of local resources, sharing knowledge and experiences. Special focus was also given to the Refugee Crisis, where engineering can help in reduce the suffering by create innovative solutions to sheltering, water and sanitation services, and electricity and basic human needs.

Main sources of funds to help Humanitarian Engineering

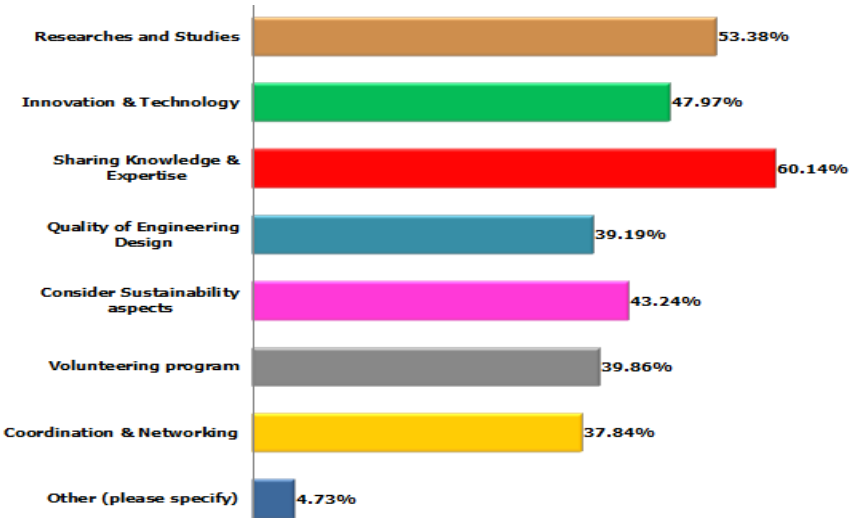
51% from international funds, 23% from private organizations, 20% from local funds and 6% other sources.

How to integrate the efforts to achieve the global partnership between Engineering sectors & Humanitarian works?

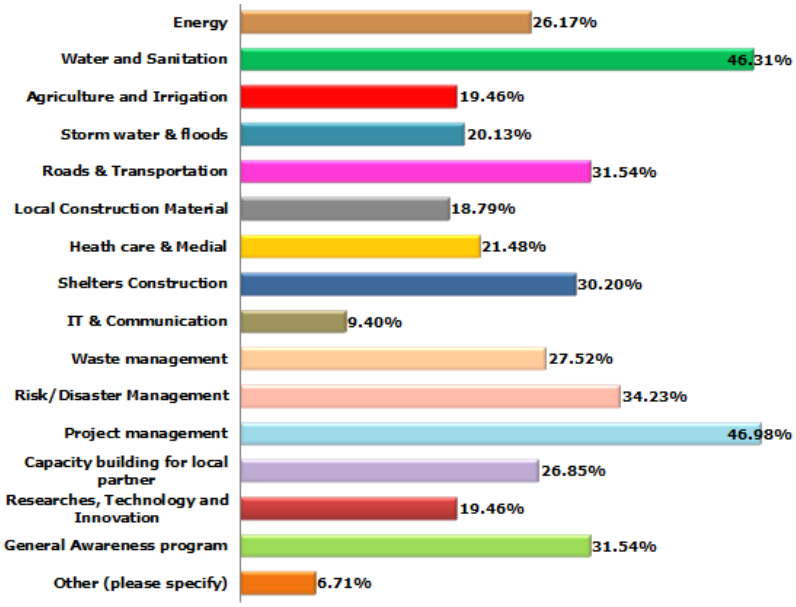
Considering that the funds are available. This can be achieved through Sharing knowledge & Experience and focus on Researches & Studies since these two points considered as the fastest way to accelerate the integration efforts.

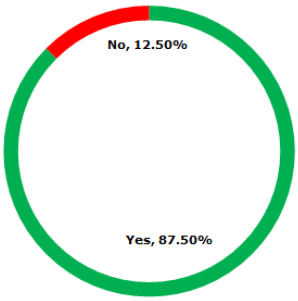
How to mitigate the integration gaps? Between Engineering sectors & Humanitarian works, this can be achieved through the below ideas:

- Sharing knowledge & experience
- Consider standardize contracts forms
- Enhances Coordination and integration
- Work on data base
- Study humanitarian works in university and training courses.
- Awareness, especially on social media to share vision and efforts



Sectors which are you able to contribute to help in the humanitarian crises

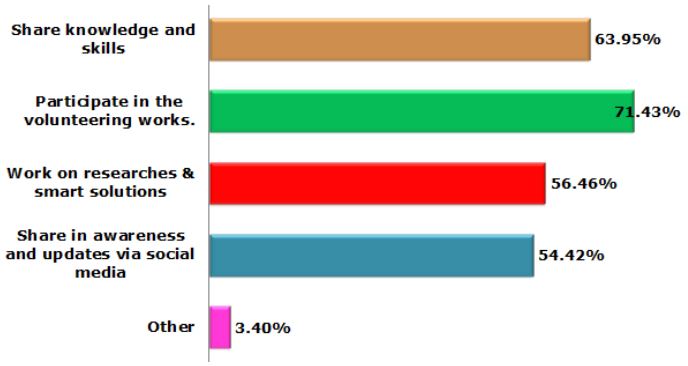




Do you think company Corporate Social Responsibility (CSR) program can be integrated with Humanitarian Works? Through sharing knowledge & experiences, provide time and technical advises, fund rising, provide efforts on ground where possible.

How Young professionals (YPs) can help in Humanitarian Engineering

YPs can lead the integration efforts worldwide and help through technology in sharing knowledge efficiently and through new means.



How do consulting engineering can be more involved and effective?

- Consider humanitarian works as a sector that need to be focused on
- Provide holistic approach that consider the opportunities and threats and different stakeholders needs
- Consider more flexible approaches based on the limitation in resources
- Create smart and efficient solutions
- take the lead….be the initiators for certain technical initiatives
- Be prepared, trained and involved prior to the crisis.
- Sharing knowledge and technologies.
- Highlight the pivotal role of engineering in social media

1. **Closing**

We hope that this study has highlight the essence and scope of Humanitarian Engineering, in order to help effectively in facing the challenges and improve skills and talent ahead.
We the workers in engineering sectors should be proud of our work, by improving the lives of others, through our daily endeavours for the development and disaster relief works.

Finally, this is a message of solidarity for all the people who suffer from different kind of disasters that we promise to continue our efforts to help everyone and everywhere.

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About the Author

ADAM BIALACHOWSKI

Managing Partner of Vintage Consulting-Poland
Previously worked for KPMG in the U.S. and as a Member of the Board at B-Act Sp. z o.o. in Poland. An expert in the field of business management, project management, contract and claim management, cash flow optimization in construction contracts. He has led successful business transactions with international construction and engineering firms on large infrastructural projects. He is a member of the FIDIC Young Professionals Steering Committee. An alumni of Saint Joseph's University (BBA'07) and a Master Degree in Management recipient from Harvard University (ALM'15) He also holds a MA degree in finance and accounting from Koźmiński University (MSc'13).
He also recently got elected as the Vice President of Harvard Club of Poland. This alumni chapter brings together more than 150 alumni who help young polish students reach top levels of education by organizing a "Path to Harvard" educational competition that brings thousands of applications every year.

FUTURE OF HOW ENGINEERS WORK KEY TO RESILIENT INFRASTRUCTURE AND IMPROVING LIFE

By Adam Bialachowski, Poland & Cosmin TobolCea, Romania

Our paper focuses on the importance of changes in how engineers work (especially YPs), on how information technology is changing the engineering consulting services market and how this will have an impact on resilient infrastructure and improving life.

Recent trends have shown that the construction sector efficiency has not increased in any measure in the last twenty-five years (McKinsey report). Even though new technologies have been introduced the way how we do business is only changing today.[1]

Urban society is highly reliant on the functioning of its linear infrastructure such as telecommunications, electricity, water and transportation networks. This dependence is highlighted when infrastructure systems fail in a time of crisis or disaster. To overcome this issue, and follow on complications, there is a need to have resilient infrastructure which can survive after a crisis.

Critical infrastructures are significantly interconnected and mutually dependent in complex ways. This interrelationship can be physical or through a host of information and communication technologies or both. Considering this characteristic, infrastructure can be defined as a system.

When it comes to achieving community resilience (the ability to withstand or bounce back quickly following major disruptions), ensuring that critical infrastructures have continuity of service—especially water, energy, transportation and communications lifelines; emergency services; and local governance— is crucial. Each of these systems is essential, yet they are also interdependent, so it is imperative to identify and address shared vulnerabilities.

Resilience is the ability of systems to prevent or adapt to changing conditions in order to maintain control over a system property…to ensure safety… and to avoid failure.

- Hollnagel, Woods, & Leveson

The answer might lay in what is known as Industry 4.0 and the great chance that engineering consultancies have by changing how they themselves conduct business and how their clients conduct business.[2]

[1] McKinsey „Construction Productivity Imperative" http://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/the-construction-productivity-imperative
[2] http://economictimes.indiatimes.com/news/economy/policy/services-need-to-gear-up-for-industrial-revolution-4-0-nirmala-sitharaman/articleshow/58224117.cms

About the Author

COSMIN TOBOLCEA

Executive Manager PRO TOBY - Romania
Cosmin has graduated his PhD. in Civil Engineering at Iasi Technical University from Romania and has over 13 years of experience in project implementation in Romania and abroad (Republic of Moldova, Hungary, Poland etc.). He was involved in many projects as an engineer-supervisor and consultant/advisor in the field of water and wastewater infrastructure. He published 17 papers in the last years at different technical international conferences from Romania, Italy, Spain, Japan, Morocco, Bulgaria, Poland etc. Also, he is a co-author of 10 technical books in the field of engineering and consulting for water & wastewater infrastructure.
Currently he is the Executive Manager of Pro Toby, one of the leading engineering and consulting companies in Romania providing services of planning, design, consulting and management of water and wastewater infrastructure, working on FIDIC contracts (Red&Yellow) for projects financed by European Union.
He is also a the Vice Chair of the FIDIC Young Professionals Steering Committee (YPFSC) and also a member of FIDC Sustainable Development Committee and a vice president of ARIC (Romanian FIDIC MA).

We see this revolution taking place in Eastern Europe, where key competencies are with individuals not with companies. It is the expert that actually has experience and has conducted the job that clients are looking for. Many high level specialists are creating their own consultancy's and companies that specialise in a very narrow speciality. Companies are becoming umbrellas that can produce specialised teams in an organised, cheap and quick fashion. Technology has become the solution for this new and emerging trend.

Globalisation of the small specialised consultancy engineering consultancies that are ready to compete against the established firms is the trend in Eastern Europe.

These firms are ready to collaborate on international projects together through the use on internet tools and software, an analogue trend to that which has happened in the early 2000s to software engineers this trend is hitting the engineering consultancy market now. Consortiums of many firms offering key personnel at lower rates with just as much experience as established firms are forming in Easter Europe and are competing today. Today we can design a sewage pumping station in Qatar using, for example, engineers from Poland, Romania the Ukraine. This is the new playing field.

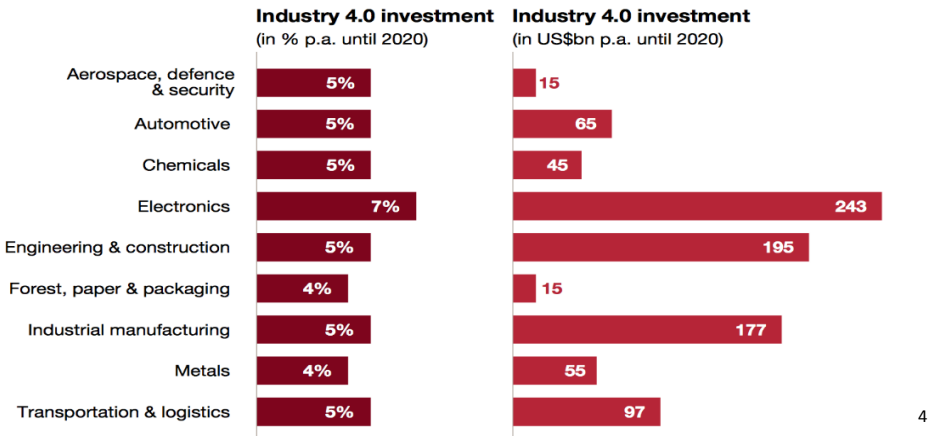
How does this improve life and resilient engineering? The transfer of knowledge is not limited to corporate memory any more. Teams are established at an ad hoc basis by combining people of many cultures with many empathies and specialities to deliver the best and optimal solution without the burden of using established corporate policies. These small companies are free to cooperate with whom they choose, they are not limited by corporate strategy of partnering with "old and tried partners".

Industry 4.0 and what follows the service industry 4.0 "Cyber-physical systems will allow online and physical services to be combined in order to meet the specific needs of individual consumers." "In the SMART SERVICE WORLD the traditional provider-customer relationship is replaced by an ecosystem of specialized partners. The new smart service architecture of cyber-physical systems, data services and service platforms creates new business relationships and models that transform existing value chains beyond recognition."[3]

Industry 4.0 building a digital enterprise report and survey results done by PWC show an interesting finding:

[3] http://industrie4.0.gtai.de/INDUSTRIE40/Navigation/EN/Topics/Smart-service-world/smart-services.html

***Figure 14:* Companies in every industry sector are planning substantial investments**

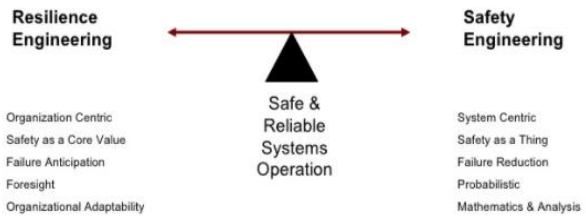


[4]

This is already happening in Eastern Europe and we are sure it is happening where you come from. How our industry reacts to this, and how we as Young Professionals react to this will be key in delivering resilient infrastructure.

Reducing the vulnerabilities of critical infrastructure and increasing their resilience is one of the major objectives of the EU. An adequate level of protection must be ensured and the detrimental effects of disruptions on the society and citizens must be limited as far as possible.

Planning more resilient infrastructure systems is significantly advanced by communities when they engage in continuous resilience planning, as capsulated below:



- ✓ Create a continuing planning and development process that will shift the way in which infrastructure services are designed and implemented, to consider more resilient protection for existing and future infrastructure systems
- ✓ Create a resilience program and recovery plan for post disaster implementation that considers the types of risks that threaten critical systems, assesses vulnerable infrastructure, and identifies priorities for improving resilience, based on an assessment of multi-compartment and life-cycle costs and project benefit.

Achieving infrastructure resilience is a continuous learning process. Reducing infrastructure risk requires ongoing initiative to refine and adjust mitigation actions to be increasingly effective and reliable, recognizing that hazards are variable and mitigation technologies are evolving.

When the emergence of new technologies for infrastructure systems is coupled with new developments in understanding the variability of climate change, a need emerges to create a continuous learning process.

[4] PwC report: „Industry 4.0 building the digital enterprise. https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf

We can best react by increasing our networkability, the trust we have in relationships with other professionals and our ability to conduct business online. This will both increase the quality of life for us and produce better results for our clients.

The new approach aims at building common technology tools and a common approach in the world to critical infrastructure protection and resilience, taking better account of interdependencies.

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About the Author

ARASH EMAMBAKHSH

Project manager, Kahanroba- Iran
Graduated as a metallurgy engineer (BS) in 2000 and entrepreneurship (MS) in 2017.
Engaged in several industrial projects as a part of a consulting engineer body or an EPC contractor since June 2000; A project manager in Kahanroba, an Iranian know how developer in mineral processing, since 2009;
Vice President of FCIC (Federation of Consultants from the Islamic Countries) since July 2017
Familiar with FIDIC forms of Contract since 2004, when acting as the deputy of the project director of a large scale EPC project in mineral processing followed by several FIDIC contract training courses.
Trained in FIDIC YPMTP (2010-2011), made him more familiar with FIDIC, resulted in membership in the steering committee of FIDIC YPF since 2013.
Leading a team for establishment of YPF in FIDIC ASPAC region in 2013 and chairing the steering committee to 2016.
Co-trainer of FIDIC International Training Courses held in Iranian Society of Consulting Engineer (ISCE) since 2014 also benefitting from FIDIC/UNEP Train the Trainers course;
Member of Task Group 12 of FIDIC Contract Committee since 2014.
Member of Capacity Building Committee of FIDIC since 2015.
Member of several committees of ISCE since 2011.
Member of Iran Project Management Association, Iran Metallurgy Engineers Society and Iran Corrosion Association.

FIDIC AND YPS

by Arash Emambakhsh, Iran

Pre-word

Merriam-Webster defines "YOUNG" as "being in the first or on early stage of life, growth or development" while United Nation describes it as "the period of transition from the dependence of childhood adulthood's independence. Based on the document titled "Definition of Youth" issued by UN, several ranges are considered in this definition as follows:

Entity/Instrument/ Organization	Age	Reference
UN Secretariat/UNESCO/ILO	Youth: 15-24	UN Instruments, Statistics
UN Habitat (Youth Fund)	Youth 15-32	Agenda 21
UNICEF/WHO/UNFPA	Adolescent: 10-19, Young People: 10-24, Youth: 15-24	UNFPA
UNICEF /The Convention on Rights of the Child	Child until 18	UNICEF
The African Youth Charter	Youth: 15-35	African Union, 2006

FIDIC usually uses this adjective for "Professional" which is defined by Merriam-Webster as "characterized by or conforming to the technical or ethical standards of a profession", "exhibiting a courteous, conscientious, and generally business-like manner in the workplace" or "having a particular profession as a permanent career".

While the definition of a young professional can vary, generally they are characterized as highly entrepreneurial, civic-minded people between the ages of 21 and 40 with a college degree.

In FIDIC, It shall mean that a YP is an employee of an consulting engineer as a young person who is known as a profession in his career.

How does world deal with a YP?

If we consider 40 as the top range for the age of a YP, we may recall that world generally does not separate YPs from the senior / top managers / leaders.

Not only a large number of CEOs of the large leading companies is now a days under 40, but also several political leaders can be found in this range.

How does FIDIC deal with a YP?

Early in this century, when one of the main requirements and the criteria of both businesses and the governors was age minimum limits for the selections of their senior managers, which could assure them of a minimum level of experience, FIDIC started to count on the leading role of its young fellows.

So, in 2004, FIDIC started a forum of its young professionals, YPF, with the intention of providing them the opportunity to participate actively in FIDIC with their peers and to develop the next generation of consulting engineering industry leaders.

The forum is led by a steering committee which started with 5 members in 2004 developed to 31 members in 2017.

Since FIDIC believed in the essence of the capacity building among its YPs, at the same year, 2004, a training program for developing the management skills was launched as YPMTP, Young Professional Management Training Program.

These two wings empowers YPs to fly.

The program trained about 600 YPs from 80 countries, while despite the other mentioned businesses and the governors, neither FIDIC nor its Member Associations / companies are enjoying the leadership of YPs as a member of their leading team, i.e. a member of the EC (executive committee) or a chairman of a committee in FIDIC, a president or managing director of one of the MAs or a president or a CEO of one of the leading companies of the industry.

What is the missing point?

It seems that FIDIC has tried the best to realize the relevant ground for the leadership of its YPs, while the end goal is still in progress.

We believe that realizing the goal is viable if:

- the organizations, with high level of leadership, believe in:
    - succession plan;
    - meritocracy;
    - readiness for assignment;
    - provide YPs the real exposure to the all levels of tasks and responsibilities
- and the YPs:
    - hesitate overestimating themselves;
    - increase the level of the required technical and leadership skills;
    - believe in the organization core values;
    - try their best to act as trustee and reliable successors;
    - educate themselves through receiving the knowledge of their seniors.

About the Author

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he is currently the senior manager of the engineering analysis department at Bangkok Expressway and Metro Public Limited Company (BEM), the largest private transportation service provider in Thailand, and is a member of Young Professional Forum Thailand. Tanaphat was born in Bangkok, Thailand in the early 80s. He graduaded from the School of Civil Engineering, Chulalongkorn University (Bangkok, Thailand) in 2004. He earned a master's degree in construction management (MS.CE.) and a doctoral degree (Ph.D.) from Purdue University (West Lafayette, Indiana) in 2011 and 2014, respectively. His research expertise is in the areas of public-private partnerships (PPP) for infrastructure procurement, investment viability evaluation for infrastructure projects, and transportation network analysis. At BEM, he is responsible for macroscopic and microscopic traffic analysis of existing and prospective highway infrastructure systems, highway road safety and standards and PPP concession administration for infrastructure facilities.

A SYSTEM DYNAMICS MAP FOR PPP CONCESSION EVALUATION OF HIGHWAY FACILITIES

By Tanaphat Jeerangsuwan, Thailand

INTRODUCTION

Researchers have proposed qualitative and quantitative frameworks for evaluating the feasibility and viability of the utilization of a PPP concession for large-scale highway development and improvement projects. However, the available frameworks are not capable of evaluating the viability of a concession from a lifecycle perspective in which key concession parameters have impacts on financial and economic performances of the concession throughout implementation phases: design, finance and negotiation, construction, operation, maintenance, and rehabilitation phases.

During the negotiation period between a granting authority and a private concessionaire, a set of key concession design parameters such as a concession capital structure, highway capacity, toll rates, and a concession period are negotiated based on the partnerships' mutual interest. Understanding the impact of selecting key concession parameters on the concession's financial and economic performances over its lifecycle would definitely improve concession viability evaluation practices. This research presents a concession analysis framework or "**a concession map**" for better quantitative evaluation of the financial and economic performances of a PPP concession from a lifecycle perspective.

METHODOLOGY

The concept of system dynamics is employed to help map the cause and effect relationships between the key concession parameters and capture the feedbacks these parameters have on the concession performances. The research formulation follows the system dynamics approach for modeling a complex system which entails problem analysis and development of causal loop diagrams (CLDs) for identification of cause and effect relationships.

FORMULATION OF PPP CONCESSION EVALUATION PLATFORM

Major challenges in evaluating financial and economic viability of a concession originate from problematic features (or "complexity") of implementing the PPP concession which are: (1) conflicting objectives of the concession participants over a number of key concession parameters, (2) cause and effect relationships among these parameters, and (3) impacts of these relationships that are distant in time throughout its lifecycle. In order to systematically address the complexity issues in evaluating the concession viability, the problems are conceptualized through the development of a dynamic hypothesis which focuses particularly on the cause and effect relationships between the system variables and their feedbacks to the system [1]. In this research, the dynamic hypothesis of the complexity problems in evaluating the concession viability is defined by (1) the model boundary containing key concession parameters and other influential variables of

the highway system; and (2) the causal loop diagrams depicting the cause and effect relationships between these parameters and variables.

Model Boundary

The model boundary provides a summary of the key variables in the systems and labels them under endogenous, exogenous, and ignored variables. Endogenous variables are a group of variables, the changes and interactions of which cause the dynamics of the system. In this research, the key concession parameters such as equity level, loan terms, construction period, and concession period are considered the endogenous variables directly responsible for the dynamics on the concession's financial and economic performances. Exogenous variables such as economic, social, regulatory, and legal factors influence the dynamics of the system, but their behaviors are beyond controls of the concession participants and not impacted by the systems. Ignored variables such as political stability and natural disasters are simply outside of the model consideration and therefore are assumed to have no significant impacts on the changes of the concession parameters and other system variables.

Causal Loop Diagram for Concession Phases

Causal loop diagrams (CLDs) are visual representations of interactions and feedback loops of system variables which help theorize causes of system complexity. The causal loop diagrams basically depict how each variable can affect model outcome directly or through other intermediate variables. They show clearly the direction and kinds of causality among different variables in the system [2]. To explore the complexity in the concession implementation and capture the cause and effect relationships among the key concession variables, four causal loop diagrams are proposed to emphasize cause and effect relationships among the key concession parameters and other variables and therefore form "**a concession map**".

Causal Loop Diagram for Finance and Negotiation Phase

A finance phase refers to a negotiation period during which a capital structure of a concession is to be finalized after a public authority prepares needed legislative and regulatory supports as well as all issues regarding planning and impact mitigation. A concession capital structure describes critical aspects of the project finance including: (1) types of financial instruments that form the concession portfolio; (2) proportion of each financial instrument; (3) sources of the financial instruments; and (4) obligations on these financial instruments (e.g., grace period, maturity, interest) [3]. Therefore, a group of concession parameters that cause the dynamics in the concession implementation are selected to describe the finance of the concession. These concession parameters are: (1) equity level; loan terms including loan interest, and debt maturity; and (3) concession period. Figure 1 presents the cause and effect relationships between concession parameters and the other dependent variables which describe the lifecycle structure of the concession. The dynamics caused by the negotiation over the key concession parameters are captured by a reinforcing loop called "**Max Return Min Equity**" representing the concessionaire objectives and balancing loops called "**Financial Risk**" and "**Public Interest**" representing financier and public party objectives, respectively. "**Debt Maturity**" represents how interest cost and maturity interact. These feedback loops emphasize the bargaining forces exerted by the concession participants over the key concession parameters.

Figure 1 – Finance and Negotiation Phase CLD

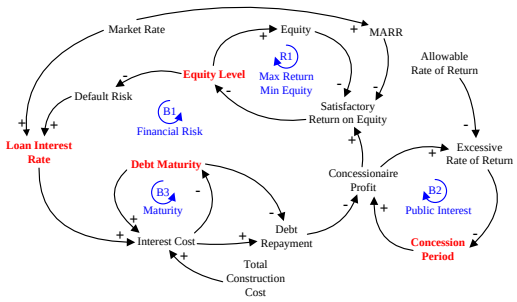
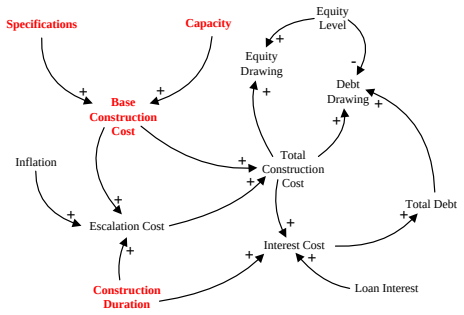


Figure 2 –Construction Phase CLD



Causal Loop Diagram for Construction Phase

There are two main parameters which are considered to have tremendous impacts on total construction cost and used in this framework to specify a range of the total construction cost: (1) facility's capacity (lane-km); and (2) specifications (pavement types, etc.). The cause and effect relationships of the construction cost elements can now be mapped as presented in Figure 2. Note that there are no feedback loops for the construction phase since the key concession parameters in this phase are a result of what is agreed in the finance and negotiation phase. Nevertheless, the causal relationships between the variables are necessary to be depicted as a transition of the financial acquisition in the finance and negotiation phase to operation and maintenance phases.

Causal Loop Diagram for Operation Phase

An operation phase of a concession spans the longest period in the lifecycle of a PPP project. It is also the most crucial period in which most concession activities (e.g. revenue generation, operation, maintenance) take place and yield the operating results vital to the viability of the concession implementation. In the operation phase, the key concession parameters related to revenue and expenditure are selected in mapping the causal relationships between the concession variables.

These key concession parameters include: (1) toll rates; (2) traffic volume; and (3) debt repayment scheme indicating the status of outstanding debt, current interest rates, principal, and interest (4) revenue risk mitigation measures such as government subsidies, revenue repayment measures, and toll adjustments. A government subsidy clause is triggered when actual revenue from facility operation falls short below a pre-specified level guaranteed. In the other extreme where actual revenue exceeds a certain point beyond which the public interest and welfare might be compromised, a revenue cap will be enforced to protect the public partner from private profiteering and returns the excessive revenue for the public use. The causal loop diagram for the operation period of the concession is presented in Figure 3.

Figure 3 –Operation Phase CLD

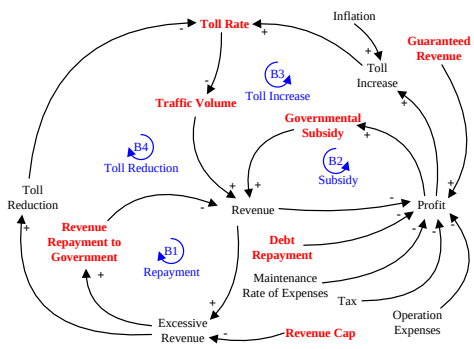
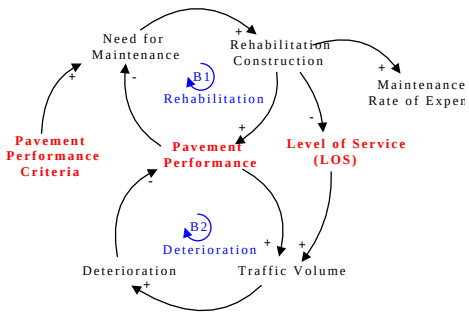


Figure 4 –Maintenance Phase CLD



Causal Loop Diagram for Maintenance Phase

From literature review, the viability evaluation of a PPP concession rarely considered maintenance aspects even though traffic flow patterns are physically derived from serviceability of a highway system and a large portion of concession cash outflow comes from the maintenance expenditure. For this reason, key concession parameters that are significant to the maintenance aspects of PPP highway facilities and have impacts on the viability of the concession implementation are considered. These key parameters include (1) facility performance criteria for maintaining standard levels of facility serviceability, and (2) rehabilitation maintenance plans. The causal loop diagram conceptualizing the cause and effect relationships among these parameters are presented in Figure 4.

SUMMARY

Public-private partnerships (PPP) procurement for delivering a highway infrastructure facility is a complex procurement procedure. The implementation of a PPP concession exhibits several key characteristics of a complex system due to the interactions between the concession participants; and the complex design and negotiation procedure by the concession participants over the key concession parameters. This research utilizes the concepts of system dynamics and presents a concession map which helps the evaluation of financial and economic viability of a PPP concession for financing a highway infrastructure project. The map considers the complexity from the PPP implementation and the lifecycle cause and effect relationships among key concession parameters in each of the critical implementation phases including finance and negotiation, construction, operation, and maintenance. Causal loop diagrams are used as a modeling tool to explicitly emphasize the cause and effect relationships between the key concession parameters. A collection of key concession parameters and their causal relationships which have significant impacts on the viability of PPP concession implementation from a lifecycle perspective are modeled. The identification of such parameters would ease the mapping of the cause and effect relationships and help capture complexity in PPP concession implementation during lifecycle. The concession map has considered the complexity in the PPP project development and allows the quantification of the dynamic changes in key concession parameters which are extremely crucial to evaluation of PPP concession viability.

FUTURE WORK

From a quantitative research aspect, stock and flow diagrams and can be created based on the causal relationships and their polarities mapped in the causal loop diagrams to quantify the actual flow of monetary values needed for the evaluation of the financial and economic concession viability. A sensitivity analysis can also be performed to demonstrate the concession map's capability to investigate the impacts from changes in the key concession parameters on the lifecycle financial and economic viability of the concession implementation.

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About the Author

TAKASHI MATSUO

VOICE OF YPS IN ASPAC REGION FOR RESILIENT FUTURE

By Takashi Matsuo, Japan

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Is a senior chief engineer with over 16-years, wide range of experience in preliminary planning, detailed design, computer analysis, construction planning and construction supervision on bridge projects. His field of the work is expanded to all over the world, such as Vietnam, Cambodia, Myanmar, Sri Lanka, Papua New Guinea, Egypt, Tanzania, Rwanda, Mozambique, etc.
From April 2001 to the present, as specialized bridge engineer for CHODAI CO., LTD., which remains as one of premier bridge designing firms with an impressive record of completed long-span bridges throughout Japan as well as worldwide. He provides clients with professional consulting services regarding new and existing bridges on many projects.

What is ASPAC YPF?

ASPAC Young Professionals Forum (YPF) was initiated in 2008 in order to promote activities of Young Professionals (YP) of Asia-Pacific region and carry the functions of research, networking, research and education that are interrelated each other. The Forum had experienced several tough times in its operation, but have been getting on the track for these years.

The Steering Committee (SC) of ASPAC YPF, which consist of 15 representatives from 9 countries (China, India, Indonesia, Iran, Japan, Korea, Malaysia, Philippines, and Thailand) is aware that we should be a community-based organization with a high regard for an interactive dialogue with YPF in each country because we believe that increased activities of the each YPF will be conducive to further development of the region as a whole.

Currently we are building up mutual understanding on challenges of each YPF and in preparation for sharing good practices thrived in one country with others.

Recognition of current situation of YPs

ASPAC is responsible for about 33% of the world's GDP and covers 50% of the world population. While people may easily understand the influence of this region in terms of economy worldwide and the importance in the growth potential, YPs in this region should clearly recognize their responsibility in sustainable development of the world.

Let's turning an attention to major concerns of some countries.

- **JAPAN and KOREA:**
  A rapid aging of society with a falling birthrate that world have never experienced is in progress and a serious decrement in number of working population are undoubted. Companies are needed to dealing with the shortage of workforce by means of an improvement of productivity. However, the anxiety for future that young generation is feeling have not yet cleared.

- **INDIA:**
  The number of young professionals increase with population growth in contradiction to afore mentioned two countries. YPs are feeling other type of anxious, namely a concentration of YPs in big cities causes a rabid competition for a well-paid employment.

- **IRAN:**
  The allocation of national budget for infrastructure investment has been restricted due to a protracted recession in Iran, thus the inflows of private capital, such as PPP/PFI project, have been promoted in

conjunction with a development of legal systems. A management of such new project type is challenge of consulting engineers.

As above, it was realized that the circumstances surrounding YPs were full of variety depending on situations of each country. However, it was confirmed that YPs' desire for learning in order to overcome the tough situations was strong whereas training opportunities were limited.

How can we deal with the issue?

It is thought that an orientation fulfilling such a strong desire of YP is to open courses near at hand with budget price. FIDIC has been creating capacity building opportunities for a long time, and recently they have started online training courses. However, the concerns are its tuition and narrower variety of courses from view point of YPs.

Possibility of collaboration

A hint of a solution was found when we learnt activities running by Consulting Engineers Association of India (CEAI). Thanks to generosity of CEAI YPF, they invited ASPAC YPFSC to their webinar in May 2017. Two months later, the webinar became worldwide because they advertised the webinar via Facebook and made all YPs enterable.

There is no doubt in my mind that some other MAs or Member Firms have already been operating a webinar, and they will welcomes participants of the world.

All that we have to do is a creation of a website where the information of enterable webinars are updated.

Table. Webinar performed by Consulting Engineers Association of India

Seminar Theme	Date	Enterable	Course Fee
Sustainable Facades	04/Mar/2016	Indian YPs	Free
Power Plant Control Monitoring And Metering Through Soft Communication	01/Apr/2016	Indian YPs	Free
Rehabilitation And Strengthening Of Major Structures - Important Issues For Engineers	26/Apr/2016	Indian YPs	Free
Earthquake Resistant Design Of Bridges In India - Current Practice And Future Scenario	31/Mar/2016	Indian YPs	Free
Clean Coal Technology Based Power Generation - India's Deep-Dive Approach	05/Sep/2016	Indian YPs	Free
Earthquake Resistant Design Of Bridges In India - Current Practice And Future Scenario	15/May/2017	**ASPAC YPs**	Free
Structures For Spectacular Sports Arenas	29/Jul/2017	**ALL YPs**	Free

Our Proposal to FIDIC Society

ASPAC YPF proposes a plan for improving the circumstances surrounding YPs to FIDIC, Member Associations and Member Firms. Outline of the proposal is described hereafter.

1 Proposal Title: Collection and publication of educational materials for YP by FIDIC

2 Issues to be solved:

2.1.1 To increase opportunities of training for YPs
2.1.2 To provide such training opportunity with a budget price (or free of charge).
2.1.3 To maintain certain quality of the educational materials.
2.1.4 To accumulate educational materials inexpensive way.

3 Task of Each Party:

3.1.1 **FIDIC** requests Member Associations (MA) and Member Firms (MF) for the contribution of educational material (vide, webinar, others) and shall carry out data administration.

3.1.2 **MA and MF** offer educational materials to the extent possible (such materials maybe the one used in an in-house training)

3.1.3 **ASPAC YPFSC** conducts marketing survey for YPs' interests and reports it to FIDIC.

4 Expected status in future:

4.1.1 YPs can take seminar without cost.

4.1.2 YPs can select a training from a broad range of training theme.

4.1.3 FIDIC carries out its responsibility of capacity development of YPs.

4.1.4 Member Associations and Member Firms carry out those responsibility of the contribution to society, and enhance the corporate image.

4.1.5 FIDIC website become one of the most famous portal site of education.

5 Practical consideration

5.1.1 Review of this proposal by FIDIC Capacity Building Committee

5.1.2 Study of a coping strategy on the quality management of educational material.

5.1.3 Study on an incentive system in order to keep MA and MF motivation high.

NOTE 1: FIDIC ASPAC consist of twenty-one countries as of August 2017.

NOTE 2: a seminar or other presentation that takes place on the Internet, allowing participants in different locations to see and hear the presenter, ask questions, and sometimes answer polls.

About the Author

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She is from Johannesburg South Africa and works as a Civil Engineer in the Rest of Africa Department at Aurecon's Pretoria office. She has worked on civil/structural projects and has a career spanning 11 years with experience in design, construction and construction supervision. She holds a Bachelor of Science (Hons.) Applied Science Degree in Structural Engineering from the University of Pretoria and has completed her coursework and research (which is currently under examination) toward a Master of Engineering degree in Civil Infrastructure Management and Maintenance from the University of Cape Town. The research focused on trying to ascertain the value of using Structural Health Monitoring systems as a way of mitigating risk borne by a lack of maintenance on South Africa's bridges.

Keamogetswe has been involved in the Consulting Engineer's South Africa's Young Professionals Forum (CESA YPF) where she held the positions of Branch Chair of Gauteng South as well as Vice National Chair and National Chair of CESA YPF. She has also served on the Group of African Members Association (GAMA) Young Professionals Steering Committee (YPSC) through which she, together with Jeshika Ramchund, presented a paper at the 2016 FIDIC conference which was held in Marrakech, Morocco. Keamogetswe has also presented at other conferences and is passionate about the mentoring of youth and development of young professionals. This is exemplified through programs such as Bokamoso Cross Mentorship and CESA's Job shadow initiative which seek respectively to open scholars to various career opportunities and afford learners an opportunity to experience a day in the life of a consulting engineer.

HOW DESIGN LED THINKING BY YPS CAN CONTRIBUTE TO RESILIENT INFRASTRUCTURE IN AFRICA

by Keomogetswe MMekwa & Jose Miranda, South Africa

Abstract: Civil infrastructure around the world is deteriorating at a rapid pace. Over and above uncertain economic growth, exchange rate volatility, social instability, unemployment and geopolitical uncertainty (PWC, 2017), investment in African economies is still heavily reliant on the development and performance of a country's infrastructure. In Africa, the World Bank estimates that about $93 billion is required annually to be able to fund the continent's infrastructure for the next 10 years. With PWC (2017) reporting a decline in growth in the sub-Saharan Africa region from 3% in 2000 to 1.5% in 2016, it seems unlikely that this targeted investment requirement will be met. This creates a backlog and consequently infrastructure that deteriorates to a level where it can no longer be maintained and thus needs to be replaced. Lee (2012) writes that infrastructure designs should anticipate the long-term environment as well as the needs and constraints under which it will function. Given the slow growth rates in Africa, an argument can be made for infrastructure that not only anticipates long-term environmental factors, but is also resilient to the current economic climate in which maintenance is neglected; infrastructure that is necessary and responds to user needs. Young Professionals need to be at the forefront of developing solutions that are Africa specific by using design led thinking tools such as innovation, future-ready design methods and technology in order to build resilient infrastructure.

1. Introduction

The World Bank estimates that Africa currently represents 15% of the world's population and 3% of the world's GDP (PWC, 2017). The lack of functionality of infrastructure is often a deterrent for investment into the continent, with unreliable power and water supply being cited as major contributors of stagnant growth patterns. The continent still holds world reserves of a variety of minerals which are exported, thus when infrastructure is unreliable, exports are reduced. Accordingly, depending on the reliance of commodity exports for GDP income, this can affect economic growth. For infrastructure to be deemed functional, it needs to be able to deliver a certain Level of Service (LOS) to its users. Chasey, et al. (1997) suggest that LOS

for infrastructure systems should be defined in terms of both capacity (Level of Availability) and maintenance (Level of Operation), thus when infrastructure can no longer meet its capacity or is left unmaintained, it does not meet its required LOS.

The term "**resilient**" refers to the ability of such **infrastructure** systems (including their interconnected ecosystems and social systems) to absorb disturbance and still retain their basic function and structural capacity (http://cee.illinois.edu, 2017). In Africa the basic function of infrastructure needs to be built to withstand low economic growth periods, social instability, unrest, socio-economic conditions, overloading and rapid urbanisation in order to meet its user service needs. When designing in Africa, engineers need to think more systemically in a way that takes into account other elements beyond design specifications. This method of thinking considers the unique political, social and cultural challenges in Africa. Design thinking is one of the systems thinking tools that has proven to be successful in addressing complex or wicked problems. In an era where engineering quality is being compromised by low priced bids (a factor of fast paced delivery), factors that contribute to creating sustainable and resilient infrastructure are sacrificed for quick delivery. The purpose of this paper is to explore how design led thinking in the hands of YPs on the African continent can contribute in building resilience into infrastructure.

2. Design led thinking

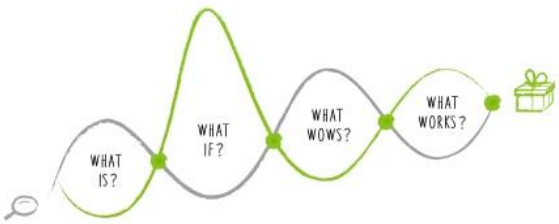
Design thinking as an approach to problem solving, has been slowly evolving since the 1960s (Szczepariska, 2017). It is only up until recently that engineering companies have started adopting this method of thinking to deliver projects. IDEO CEO and President Tim Brown defines design led thinking as a system that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business can convert into consumer value and market opportunity. The approach involves understanding the actual problem and looking for the problem that the client overlooks, it encourages the use of technology, the incorporation of redundancy, flexibility and durability into designs and the use of suitable structural systems. This builds an understanding that everything is interlinked. Through this current phase of disruption (change) that the engineering industry is experiencing, Chan Kim and Mauborgue (2004) suggest that the companies that are going to survive are those that adopt blue ocean strategies. These are "all the industries not in existence today – the unknown market space, untainted by competition" (Kim and Mauborgue, 2004). They highlight that adopting the blue ocean strategy helps companies maintain their competitive edge.

Adopting the blue ocean strategy can be accomplished using design led thinking tools guided by 4 questions (Liedtka et al., 2015) in the execution of their projects, they are:

- **What is?** entails understanding the status quo looking at today.
- **What if?** process explores and experiments on what might be possible tomorrow
- **What wows?** Tests assumptions, refines ideas, tests again and identifies the best solution.
- **What works?** Is a process of improving the solution and delivering the final product. Ultimately this creates a new, more meaningful value.

These questions are illustrated in the design wave in Figure 1 below:

Figure 1: Design wave (Liedtka et al., 2015)



The design wave is a methodology that is designed to build understanding, challenge, explore and experiment, validate and guide; and ultimately to deliver new, more meaningful and transformational value (Liedtka et al., 2015). This enables companies to be future ready. The design to innovate approach is a robust approach used to unlock creativity and innovation. When companies operate in red oceans (known market spaces where the competitive rules are well understood), the aim is to try to outperform each other. The design led thinking approach in the engineering industry, is a way of responding to the red ocean phenomenon, i.e. commoditisation, differentiation and investing, through innovation and creativity, by following a client and user centric approach. The process demands from designers and innovators the ability to, not only notice the everyday things, but to go one step further and fix them. Companies like Apple, Uber, Airbnb have revolutionised their respective industries by coming up with state-of-the-art ideas that put the end user's needs first. In the engineering industry companies like Aurecon undertake a co-creative approach that identifies the 'right' problems often hidden in complexity. This assists in directing them towards opportunities that were always there, but were perhaps hidden.

3. Resilient Infrastructure

Existing design codes are constructed on tested methods and historical conditions. The codes are only updated following years of research and incidents of failure and after going through a rigorous process of experimentation and vetting before new versions are released. In the interim however, infrastructure may lose its capacity and resilience to adverse conditions.

The response to 3 concerns affecting the ability of infrastructure in Africa to maintain its resilience, can be:

a) **For low economic growth periods**: To use technology to detect when maintenance is absolutely necessary, this can be modelled to reflect the costs of repair at various stages of the age of the infrastructure. This information can be used by asset owners to make decisions.
b) **Unrest:** Designers could look at designing robust infrastructure that is not easily destroyed. This could include the use of durable materials e.g. the use of high strength concrete, or fire retardants in mixtures or by increasing the cover to reinforcement on reinforced concrete structures.
c) **Rapid urbanisation:** This may include strengthening infrastructure assets, increasing the capacity of existing infrastructure or controlling urban movements by, for example limiting permits for developments until there is enough supply of resources. Alternatively, making developers pay for new water and electricity needs.

Infrastructure in Africa plays a critical role in connecting people across the continent and for ensuring that local and continental trade is rapidly ramped up. The approach to designing resilient infrastructure using the design thinking approach requires that the client be informed in all steps of the design process and to give the client the best possible available knowledge based on the codes of practice at the time of the design.

Not only that, but also to advise the client of the possibility of abnormal occurrences and the impact that this will have.

4. Contribution by Young Professionals

Most vernacular or traditional languages on the African continent spell Afrika with a "K" (Nantambu, 2002). Embracing the term 'Afrika' signifies embracing an identity with an inward looking-out perspective of the continent as opposed to an external looking-in type Western world view. Having diverse teams is fundamental to design thinking, coupled with that, examining the realities and aspirations that are specific to Afrika. This diversity should straddle age, gender, race and culture. Youth therefore have an important part to play in shaping the development of the Afrikan continent. The current crop of YPs (those under 35) also fall within the millennial generation (A generational cohort born roughly between 1980-2000). They are the first generation in history that have grown up totally immersed in a world of digital technology (Okere, 2016), very technologically savvy and are also the most educated generation in Western history. The explorative and creative nature of millennial YPs are part of the reasons why they should be at the forefront of design-led thinking and creating infrastructure that will aid in the development of Africa's economies. The disadvantage however, of putting this process in millennial hands lies in their lack of experience. Technology cannot be used as a substitute for experience, rather the two need to work hand in hand. If the design to innovate process is aimed at an approach to problem finding in conditions of high uncertainty and complexity rather than solution driven, it stands to say that experience gained is imperative.

5. Conclusion

The future of designing infrastructure lies in differentiation and identifying problems that clients and end users do not know they have. Resilient cities in Africa are those that will successfully respond to the needs of their people. Young professionals need to involve themselves in the design to innovate process, while gaining experience and identifying the solution needs to be a collaborative effort. If the process is to be successful it needs YPs with a strong technical background, solid experience and a creative mind-set as well as empathy for the people that the infrastructure is designed for.

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About the Author

PHAM NGOC HUNG

Hydrological & Environmental Specialist, Power Engineering & Consulting Js Company 3- Vietnam
he received his Bachelor of Engineering on Hydrological and Environmental Engineering since 2009 and have worked for Power Engineering Consulting JS Company 3 (PECC3) for 8 years (2009-present). Working in the PECC3's Department of Environmental Engineering, he studies important environmental issues in the investment and construction of hydropower projects: (i) Modeling and assessing the effects of annual flood discharge from reservoirs to downstream area; (ii) Estimating flooded areas, afected land, human and property damage, animals and entire ecosystems. He has contributed to many power projects to bringing in add values to both the Client and the society, and one of his major contributions is calculation and prepare flood prevention plan for downstream area for hydropower dams in many projects in the Central Highland – Vietnam since 2012 with successful records. Looking forward, Hung.P.N continue to envision himself being deeply involved in the environmental domain as it has a positive impact on sustainable development.
Special skills:

- *Simulate hydraulic mode in the natural river*
- *Building flood maps*
- *Environmental Management Plan (EMP)*
- *Emergency Preparedness Planning (EPP)*

EVALUATION THE EFFECT OF CHANGES IN NATURAL RIVER FLOW FOR DOWNSTREAM AREAS AFTER CONSTRUCTION OF HYDROPOWER PLANTS IN THE CENTRAL HIGHLAND VIETNAM

By Pham Ngoc Hung, Vietnam

Hydropower plants in the Central Highland – Vietnam and Environmental impacts to downstream area

Vietnam is one of the 14 countries in the world with high hydropower potential capacity, with more than 2,371 large rivers and streams longer than 10km. At present, more than 80% of Vietnam's hydropower potential is exploited. In particular, from 2012 to the present Central Highland has always been the largest hydroelectric center in Vietnam.

However, besides the positive contribution of energy resources and the economic growth of the area, some hydropower projects in the Central Highland have also had negative impacts on the environment. They alter the natural flow and discharge the flood annually causing damages to the downstream.

According to records, there are many people have swept away by floodwaters in the region, many areas flooded for a long period caused food and medicine shortage, causing great economic losses: Recent typical damages such as large floods in Song Hinh hydropower reservoir (Binh Dinh province) and Ba Ha river (Phu Yen province) in December 2016 caused 425 houses submerged, more than 1,400 hectares of rice and crops damaged, 24,000 pupils and students at all grades missed school; Large flood discharge of Ba Ha hydroelectric reservoir in May 2017 left 4 people washed away, etc.

Current Situations of the Development of Flood Prevention Measures for the Downstream of Hydropower Dams in the Central Highlands of Vietnam

In Vietnam, the requirements for flood control for downstream areas of hydropower reservoirs have been considered for a long time and have been mandatory since 2007. However, implementation and methodology of many projects are limited so there are still negative environmental and social impacts over the years. Meanwhile, hydropower dams are still under construction, resulting in the lives and property of the downstream population in many of the projects under threat.

Through surveys of hydropower projects in the Central Highlands that have encountered environmental incidents or have had a negative impact on the downstream environment, we note some of the following:

1. The investigation of the socio-economic situation and past flood situation in the downstream areas have not been properly prepared, and even ignored. Much of the downstream areas of the dams have no record of major floods before and after the construction of hydropower projects.
2. Estimation of downstream flood damage: The geographic information system (GIS) of the downstream areas is not synchronized, so it is difficult to establish, list and classify affected objects: people, works on the river, affected land, flora and fauna, etc.
3. A permanent problem that has an impact on the environment and society is the annual flood discharge reservoir in large frequency (P=80%; 90%, ect) or discharge the flood annually. However, this is not included in the current calculation rules so the project approval is not thorough. On the other hand, there are many dam owners who claim that they do not discharge floods but still cause severe damage due to flooding downstream. The reason is that rainfall flows in a large basin creating local flow.

   Application of current regulations on dam safety management, including flood control plans for downstream areas. Due to the particularity of each hydroelectric project in terms of scale, level of construction, geographic location, operating mode, the research approach will be very different. Typical example: Da Nhim dam (Lam Dong province) discharges floods on the Da Nhim river but releases water to generate electricity through the Krông Pha river basin; Downstream areas have many population and navigation works on the river. Therefore, the level of detail is high, requiring documentation of works and people living there. On the other hand, many hydropower dams have flood discharge design differ from current regulations and need to be consulted by PPC prior to implementation. Some designers do not understand the peculiarity of the works so poor record quality and time-consuming implementation.

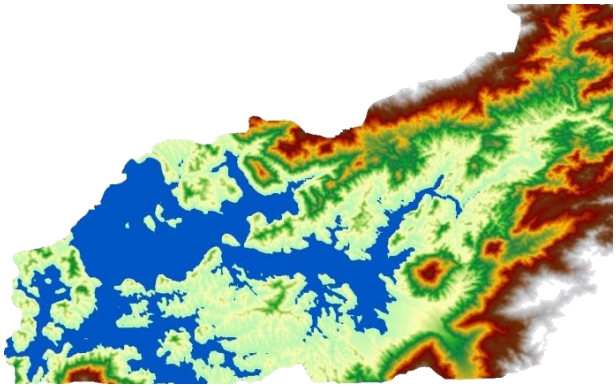


Figure 1: Simulation of downstream flood in the hydroelectric dam

Some experiences of PECC3 in approaching and developing effective flood control plans for downstream dams

Power Engineering & Consulting JS Company No. 3 (PECC3) is the leading engineering firm in Vietnam helping the project developers and local authorities in the downstream to successfully build flood control plans for many hydropower dams. In particular: Dam'Bri (75MW); Da Nhim (160MW), Ham Thuan - Da Mi (175MW), Dai Ninh (300MW), Se San 3A... In addition, We also deeply explore the downstream affected areas to improve the quality of consultancy records, meeting the needs of customers.

As mandatory requirement, the flood control plans for downstream of the dam will be prepared under the guidance of the Ministry of Industry and Trade and the Ministry of Agriculture and Rural Development. However, implementation of these guidelines does not apply to all hydro-electric reservoirs. This is due to differences in

(i) Downstream areas with or without population;
(ii) Regional and regional cultural differences. Accordingly, the downstream can be composed of many ethnic groups living, different cultural lifestyle in language and writing, ect.
(iii) In addition, the disaster prevention and rescue and search work in each locality as well different.

Below, we would like to share some experiences on the flood control plan applied to many hydropower reservoirs in the Central Highland - Vietnam which have brought about good results.

1. Develop a flood map corresponding to the annual flood discharge levels of the reservoir according to the administrative profile of the affected villages; at the same time, demarcate the floodplains with the annual discharge levels. Currently, we are carrying out many projects in the Central Highland, such as Da Nhim hydropower plant.
2. Improving selection of method of flood mapping: an appropriate tool shall be selected for flood mapping, depending on the characteristics of the downstream area of each project:
   - Only cross-shore overflow over residential areas
   - Calculations for mountain rivers, the river has a lagre slope and steady cross-sections
   - Calculation for delta river region, cross-sections are very complicated.
3. Develop and experiment with a new methodology which can predict and estimate damage to residential areas with high precision results (Figure 2).

Figure 2: Simulation flooding residential areas

4. Correct/Calibrate the flood simulation software with the results of the combined local interview survey along the river: the literature documenting the impact and damage locally reflects the appropriateness of the methodology and calculation;
5. Ensure cross-cutting information from authorities, dam owners and downstream people. Transparent information includes communication systems and regional cultural factors;
6. Recommend Owner and Local Authority to Install flood relief columns along the river; At the same time, construction of evacuation road signs in the event of large floods at densely populated areas;

Figure 3: Install flood relief columns and construction of evacuation road signs

7. Recommend Owner and Local Authority to organize annual maneuvers before the flood season so that people can actively respond when floods occur;

8. Frequently collect and update feedbacks from clients and residents in downstream areas of the dams: from PECC3's perspective, submission the final study reports to the dam owners is not the end of the studies, we frequently study information on the annual flood discharge of reservoirs; Record local flooding status and getting feedbacks from local authorities and local residents to correct and recalculate for the purpose of improving the reliability and quality of the consultancy product.

Conclusions

This paper has shared PECC3's experiences about negative environmental and social impacts associated with changes in natural river flow and the discharge of floods to downstream areas after construction of hydropower plants in the Central Highland – Vietnam, and our experiences in in preparation of flood control plans to counter such impacts during operation phase. We believe that if these measures are added and applied in the early stages of the project (planning & design) will eliminate negative environmental and social impacts to the downstream area.

About the Author

EIJI SAWAMOTO

PROPOSAL FOR RESILIENT INFRASTRUCTURE MAINTENANCE FROM JAPANESE YPS THROUGH THE EXPERIENCE OF "THE GREAT EAST JAPAN EARTHQUAKE"

By Eiji sawamoto, Japan

Assistant Manager/ Sewage Works Division, Nihon Suido Consultants Co., Ltd- Japan
Education: Master of Civil and Environmental Engineering in Nagaoka University of Technology
Experience:

- *Mar.2011*
  East Japan great earthquake occurs.
  Graduated from University.
- *Apr.2011*
  Join company（Nihon Suido Consultants Co., Ltd）.
- *May.2011*
  Enter the disaster area of the Great East Japan Earthquake and conduct a field survey.
- *2011-2014*
  Engage in East Japan great earthquake disaster recovery and reconstruction project.
  In charge of restoration design of sewage treatment plant and pump station damaged by earthquake and tsunami.
- *2014-present*
  Mainly in charge of renewal and construction design of sewage treatment plant and pump station
- *2015-*
  ECFAJ YPF member

Objective

Japan is particularly prone to natural disasters such as earthquakes and floods, and establishing resilient infrastructure is extremely important in Japan. A role of YPs, who are responsible for the future of CE industry, is quite important for the realization of resilient infrastructure. This presentation will be held by Japanese YP who engaged in the rehabilitation project of a city which suffered from serious damage by The Great East Japan Earthquake occurred in 2011. In the presentation, the YP will introduce the recovery and reconstruction process of sewerage treatment facilities at Kesennuma City of Miyagi prefecture, and what the YP felt and learned through the project will also be covered.

1. Overview of the Great East Japan Earthquake

- Date of the event：2011/3/11（Fri）14：46
- Magnitude of the earthquake: Moment magnitude Mw9.0 Depth24km Originated in Sanriku shore at the Pacific Ocean
- 15,893 people killed,：2,553 people lost
- Affected population: over 0.4 million people.

2. Summary of damage of Kesennuma City

Kesennuma City, located in Sanriku area, was one of the most affected cities by the earthquake. For the city's principal industry has been fishery, a lot of fisherman boat was lifted to the land by Tsunami, which made the rehabilitation process even more difficult. Tsunami reached to 10m from the ground level at maximum, affecting most part of the city.

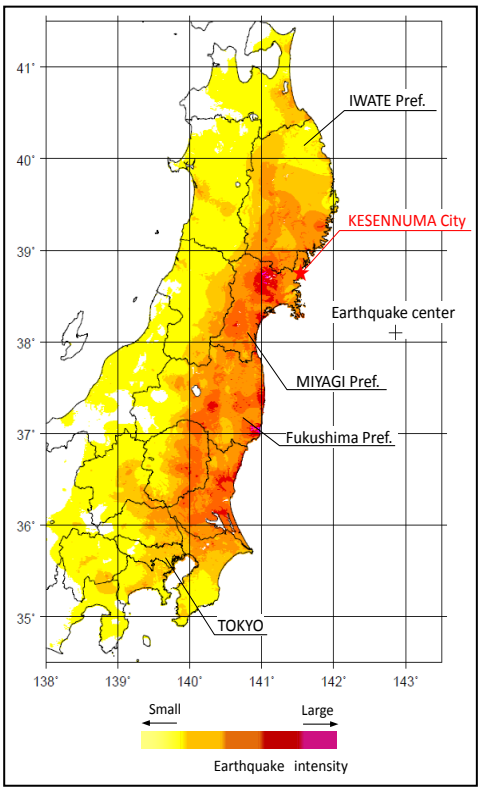


Figure 1: Earthquake intensity

3. Result of survey for damage of sewerage facilities

Most of the sewerage facilities were located at coastal area.

Tsunami caused the inundation of the major part of the facilities. In particular, operation of the facilities was shut down due to the damage to electrical facilities by inundation. This situation caused overflow of wastewater from manholes around the city, worsening the hygienic conditions of the area. The civil and architectural structures of the facilities were seriously damaged by the pressure of the Tsunami or collision of the things carried away by the Tsunami.

Figure 2: Comparison of before and after the event (Kesennuma city)

Figure 3:Photos taken at site (Left ： Wall broken by Tsunami at sludge treatment facility

Right: Damage caused by inundation at control room）

4. Rehabilitation process5.1 Methodology

It was estimated that it would take more than two years for the whole rehabilitation process. However, there was an urgent need for realization of minimum-level treatment of wastewater as soon as possible, considering hygienic and environmental conditions. This was accomplished by constructing temporal treatment facilities in the city. The rehabilitation itself was carried out step-by-step, taking into account the importance and priority of each facility (e.g. ①Pumping, settling and disinfection facilities ②Biological treatment facilities ③Sludge treatment facilities).

5.2 Basic concept of rehabilitation design to achieve resilience

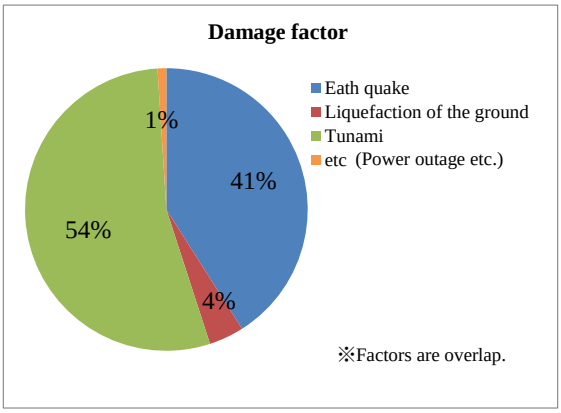
In the rehabilitation design, actual damage condition was taken into account to overcome certain vulnerability. Particularly, influence of Tsunami event had not been paid much attention to in the former design process. Since it was observed that the vulnerability of electric facilities was the major factor which caused the shutdown of the facilities and the delay of rehabilitation process. Considering this, new electrical facilities were designed so that they were protected enough and have capability to maintain the operation even in the event of Tsunami at similar magnitude.

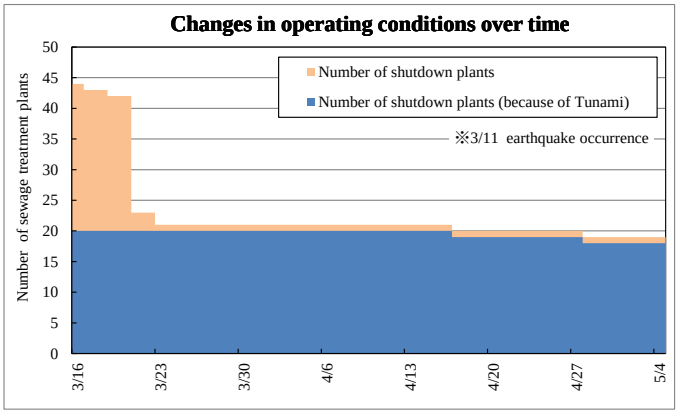
In particular;

- Four-story buildings with outside stairways were built for electrical facilities in order to keep Tsunami from reaching, at the same time making their rooftops (at 20m high from the ground level) serve as evacuation site for local people in the neighborhood.
- Pressure of Tsunami wave had not been considered in the former structural design. In Kesennuma's case, there were some base piles broken by pressure of the Tsunami. New facilities were designed so that the structure could have enough strength against the pressure of Tsunami.

These design concepts were standardized as "Tsunami-resilient design" in addition to "earthquake resilient design", integrated in the Guideline for Sewerage Facilities Design.

Table 1: Factor analysis of damage





5. Conditions of rehabilitation

Sewerage facilities in Kesennuma City were completely rehabilitated in 2015 and started operation.

Figure 4: After rehabilitation (Left: New electrical building, Right: Water-proof door to protect important facilities)

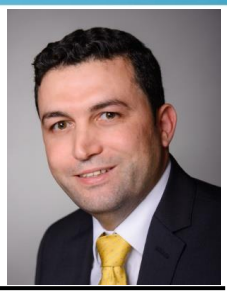
6. Lessons learned and way forward

- To establish "resilient infrastructure," appropriate approach for risk assessment and corresponding countermeasures are crucial
- Working on a series of the process ranging from initial survey to construction has been an irreplaceable opportunity for YP's experience and capacity building
- These experience will be of use for future development of "resilient infrastructure" in Japan, where a similar magnitude of earthquake event is expected

It is important to understand that countermeasures based on tangible aspect (e.g. constructing strong building/structures) have limitation. Countermeasure on intangible aspect (e.g. elaboration of BCP, raising awareness to the risks) should also be considered when working on establishing "resilient infrastructure".

About the Author

AHMED STIFI



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Dr. Ahmed Stifi is a Senior Consultant and Project Manager by Codema International GmbH, an engineering consulting company and a part of the Rauscher Group, a leading engineering consulting group in Germany.
Ahmed holds a degree of MSc. in Civil Engineering from the Technical University of Darmstadt in Germany in 2007. After 5 years of international work experience for CDM Smith at large-scale construction projects like "Metro Duesseldorf in Germany", "The World Island & Palm Deira in UAE", "5000 Unit Housing and Infrastructure Project in Libya" and "extension of King Abdul Aziz International Airport project in Saudi Arabia" he attended the research team of Karlsruhe Institute of Technology (KIT) in 2012 as a senior research associate and lecturer at the Institute of Technology and Management in Construction. In 2017 he received his PhD degree in construction management with highest honors (summa cum laude) from the Karlsruhe Institute of Technology (KIT).
Dr. Stifi is an active member of many engineering and international organizations, he is a member of the Association of German Engineers, member of the German Nuclear Society, member of the German Lean Construction Institute, member of the FIDIC Young Professionals Forum Steering Committee and member of the FIDIC Integrity Management Committee (IMC).

THE JOURNEY TO GREEN FIELDTHE ROLE OF CONSULTING ENGINEERING IN THE DECOMMISSIONING OF NUCLEAR FACILITIES

By Ahmed Stifi, Germany

Our presentation introduces a new generation of projects which need accurate attention and preparation from consulting engineering to be implemented in a sustainable way. We introduce here the "Decommissioning of Nuclear Facility".

The story of nuclear energy started in the 1950s with the first nuclear power plant in the USA. The American Atomic Energy Act determines the operation life for nuclear power plants with a maximum of 40 years; however, an extension by an additional 20 years is possible. Based on this, it is obvious that in the next couple of years numerous power plants will reach their end-of-life time. Worldwide, more than 163 reactors are currently out of service (446 reactors are currently in operation) and they are ready for decommissioning. Therefore, the role of consulting engineering in decommissioning projects needs to be defined more clearly. Another important factor to be considered is the shortage of experienced engineers in this field. Young professionals (YPs) of consulting engineers are provided both with the opportunity and the challenge to develop sustainable decommissioning projects. In Europe alone, the European Commission estimates that more than 10,000 experts will be involved in decommissioning activities.

The International Atomic Energy Agency defines the decommissioning of nuclear facilities as the final lifecycle phase after site selection, design, construction, commissioning and operation. The decommissioning process is a complex one involving planning and operation of the decontamination and dismantling of facilities, and the demolition of building and structures to achieve site remediation. This also includes the management of the resulting radioactive wastes which must be safely stored. Additionally, the decommissioning process takes into account the aspects of health and safety of the operating staff and public as well as the protection of the environment. Therefore, consulting engineers and their YPs are required to go beyond the traditional project delivery framework of cost, time and quality.

Our presentation shows the challenging tasks for consulting engineers in this field as to (1) planning decontamination and decommissioning processes without producing additional secondary wastes and with the focus on the reuse of decontaminated materials and lands for future projects. (2) Overcoming time and cost overruns. This is nowadays a significant feature of decommissioning projects since the average cost of decommissioning of nuclear power plants is more than 1 billion US dollars and takes approximately 15 years. (3) Above all, building capacity and preparing YPs for these specific projects.

In order to deliver a sustainable decommissioning project we suggest the "elimination of waste" as a key concept. In this respect, the term "waste" is not limited to the physical waste resulting from the decontamination process itself but to include waste as defined by Ohno, the father of the "Toyota Way of Production", to include the waste of overproduction, time, transport, and movement. In general and as introduced by Lean Management principles, all forms of non-added-value activities constitute waste. Here, another important waste form is to ignore the knowledge, skills, and competences of YPs.

The philosophy of creating value without waste should be the basis to untangle the complexity of decommissioning projects. Thus, consulting engineering professionals need to develop a deep understanding of legal requirements, approval processes, executing work of decommissioning and related supervisions. Of course, the use of innovative contract forms developed specifically for decommissioning projects will further add value to delivering a successful project. In this context, the ball is in the FIDIC's court.

Figure 1 below shows a framework for sustainable decommissioning. The model includes the major factors that influence the decommissioning process with the concept of increasing value and eliminating waste as the core of the model.

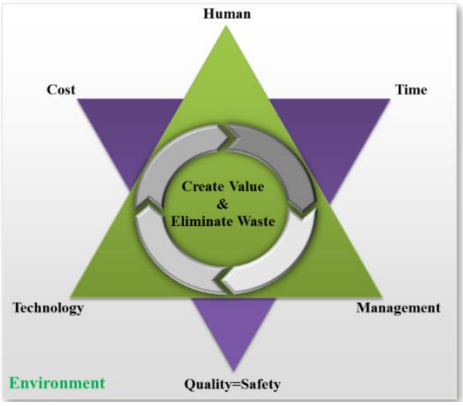

Figure 1: Framework of Sustainable Decommissioning

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Do Bao Vu is currently Civil Engineer in Geotechnics at the Power Engineering Consulting Joint Company 3, in Ho Chi Minh City, Viet Nam. He graduated from Ho Chi Minh City University of Technology in 2013 and completed a MSc at Ho Chi Minh in 2016 under the supervision of Vo Phan. His main research interest is piled raft foundations. His journal articles is published the Southern Institute of Water Resources Research Conference, provide novel solutions to practical problems. Although his research has embraced actual model testing, numerical analysis, his primary focus has always been on developing simplified models of analysis that are suitable for application. These have included various pieces of software for analysis and design of piles, pile groups, piled raft foundation.
Now, he proceeds to work consulting services in Thermal Power Plant Project. He provides some solutions to applied Turbine Generator foundation and Boiler foundation.

ANALYSIS OF EFFECT OF LOAD AND THICKNESS RAFT TO INTERNAL FORCE DISTRIBUTION IN PILED RAFT FOUNDATION

By Do Bao Vu, Vietnam

ABSTRACT

Piled raft foundations have been more and more widely applied, especially for high buildings. In piled raft foundations, piles are not only designed to take the full load but also to reduce the settlement to an allowable level. This method can be used in combination with FEM method for a conceptual design of a piled raft foundation, with a desired settlement. The foundation is currently designed as a conventional piled foundation. Piled raft foundation is considered as an alternative option. Plaxis 3D analysis is performed to verify the settlement and the load analysis for piles raft foundation.

INTRODUCTION

According to some point of view about the Piled raft foundations'design today, the bearing capacity resistance of the raft foundation is not considered, but according to the view of piles raft foundation (PRF), the load is both distributed to the raft and to the pile. Therefore, piled raft foundations have become the most effective solution for high buildings in the world because of the ability to bearing capacity, the settlement and better capacity of pilies in comparison to common pile foundation. The economic efficiency of piled raft foundation was mostly presented by Randolph (1994). It is said that these rafts and piles joining together will done the bearing capacity, decreased the settlement, reduced input materials.

ANALYSIS METHODS

Poulos - Davis – Randolph method (PDR)

The relationship between load and settlement of piled raft foundation was calculated based on Poulos and Davis method (1980). In 1994, Randolph developed this method to calculate the load which was both distributed to the raft and to the pile.

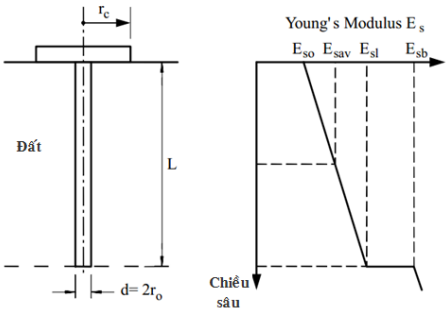

Figure 1: Describe unit of pile raft foundation

According to Randolph, the load ratio supported by the bearing capacity of raft foundation which is named α_{PR} and is calculated based on the equation:

$$\frac{P_r}{P_t} = \frac{K_r(1-\alpha_{cp})}{K_p + K_r(1-\alpha_{cp})} = \alpha_{PR} \quad (1)$$

Where :

- P_r: The load is supported by raft foundation
- P_t: The full load is supported by piled raft foundation
- K_p: The hardness of pile foundation.
- K_r: The hardness of raft foundation.
- α_{cp}: Coefficient of interaction between raft and pile

Finite Element Method (FEM)

Finite element method is one of the strongest methods for analyzing piled raft foundation. In this method, both pile and raft foundation are discretized. And then the number of equation balances will be very large which can be calculated based on the computer.

ANALYSIS OF FACTORS EFFECTED OF PILED RAFT FOUNDATION

Research models

VIETCOMBANK TOWER, No. 5, Me Linh Square, District 1, HCMC. Ho Chi Minh. The high project is 144 m, including 35 floors, 4 basements built on an area of about 3,200 m2. The thickness raft foundation is 3 m, the bottom of the raft is placed in the fourth layer with the elevation of -15.6 m. This models applied of Finite Element Method (FEM) with Plaxis 3D analysis is performed to verify the settlement and the load analysis for piled raft foundation. Summary of soil parameters under raft foundation as follows:

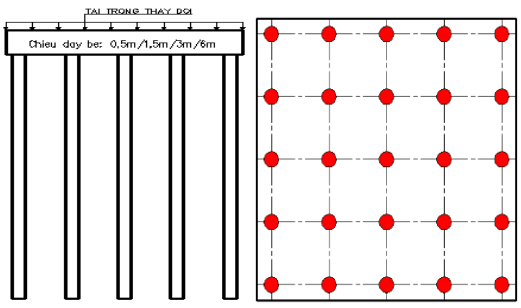

Figure 2: Models of pile raft foundation

Table 1: Summary investigation geologic at Vietcombank Tower

Parameters	Sign	Layer (1+2+3)	Layer (4)	Layer (5)	Unit
Thickness	Z	11.0	26.6	14.0	m
Density unsat	γ_{unsat}	16.5	17.5	17.0	kN/m^3
Cohension	C	16.5	12.4	100	kN/m^2
Friction	Φ	24.16	29.78	15.2	^{o}
Expansion	Ψ	0	0	0	^{o}
Young Module	E	8030	20270	23000	kN/m^2
Poisson's ratio	v	0.28	0.28	0.35	-
Ratio interface	R_{inter}	0.9	0.9	0.9	-

RESULT CALCULATION

Effected by loading

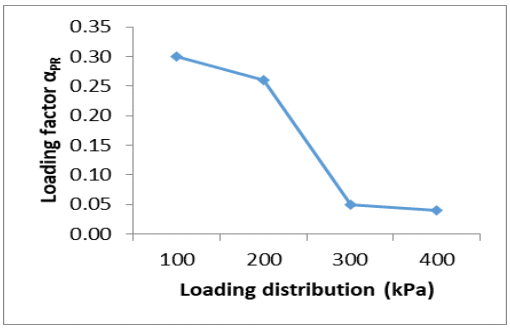

Figure 3: Relationship between loading distribution and load distribution coefficient α_{PR}

Table 2: Summary between loading distribution with settlement and load distribution coefficient α_{PR}

Loading distribution (kPa)	100	200	300	400
Settlement (mm)	19	33	59	74
Load distribution coefficient α_{PR} (%)	30	26	5	4

Effected by thickness raft

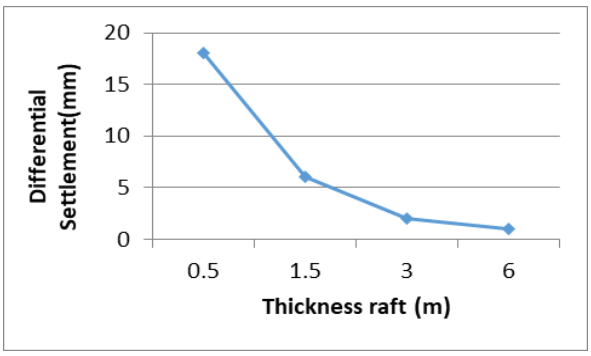

Figure 4: Relationship between thickness raft and differential settlement

Conclusion:

A) According to some recent point of view about piled raft foundations, they haven't considered about the working of bearing capacity of the raft, but only consider the working of bearing capacity of pile. However, according to the point of piled raft foundation, the load of project is both distributed to the raft and to the pile, based on table 2 we see that when the pressure due to external load increased from 100kP ÷ 400kPa, the load of the raft foundation bear a decreased force from 30% to 4%

B) The thickness of the raft does not affect much on the average settlement. However, the thickness of large rafts can be reduced by differential settlement. Based on Figure 4, we see that when thickness of raft increase from 0.5m ÷ 6m, the differential settlement decreases from 18mm ÷ 1mm. In this study, the differential settlement was not significant when the thickness was 3 m.

About the Author

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Committee Member FIDIC GAMA YPFSC
Council Member of Association of Consulting Engineers of Zambia
MEMBER ASSOCIATION
Association of Consulting Engineers of Zambia (ACEZ)
Civil engineering is an exciting profession because at the end of the day you can see the results of your work, whether this is a completed bridge, a high-rise building, a subway station, or a hydroelectric dam etc.

UN-TAPPING OUR BUSINESS POTENTIAL, WHY SO FEW ENGINEERS ARE ENTREPRENEURS?

by Harold Chibwe, Zambia

Introduction

The field of engineering is filled with people who are trained to solve problems. Being trained as an Engineer provides one with the greatest opportunities that one can ever have. One Such opportunity is being an entrepreneur. Engineers possess particular qualities that make them become good entrepreneurs. Engineering education should therefore, cement such qualities in order for engineers to find their place in society and take the leading role in innovation and technology so as to improve the "quality of life". The world today demands more of engineers to solve the many problems that society has. Problem solving alone however, will not bring about the changes that society requires. This entails that the mindset of Engineers should change from being traditional Engineers to entrepreneurial engineers.

Objective

This paper explains why so few engineers are Entrepreneurs. It further explores the qualities that engineers have to untap their potential to become great entrepreneurs. The paper also acknowledges the limitations of assessing a broad range of engineers who indeed have managed to untap their entrepreneurial skills.

Research Methodology

1. Literature review

In conducting literature review, international publications such as construction and dispute resolution books, journals, and any other relevant publications such as newspapers and magazines were some of the sources of literature that were reviewed. The internet was another source of foreign data.

2. Interviews

Business consultants were interviewed using unstructured questions. The interviews were preliminary, consultative and provided a good opportunity to obtain important statements, experiences of the stakeholders.

3. Questionnaire surveys

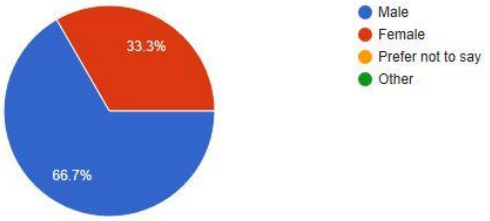
The main method of primary data collection was through questionnaire surveys. The information obtained provided understanding on why so few engineers are entrepreneurs.

In order to achieve the objectives of the research, a random questionnaire survey was undertaken and results presented below.

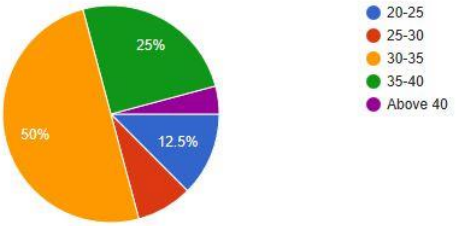
Results:

Findings from Respondents

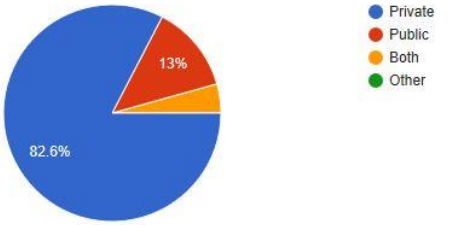
Gender



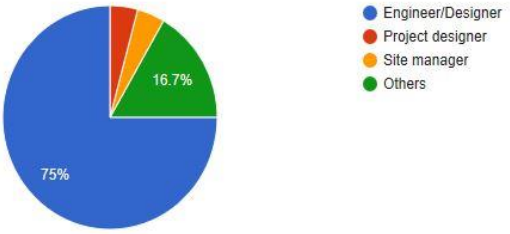
Age Group



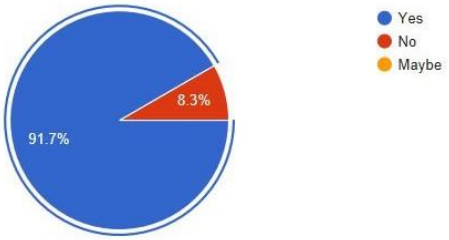
Organization Type



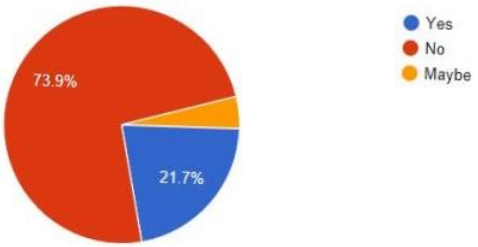
Disciplines



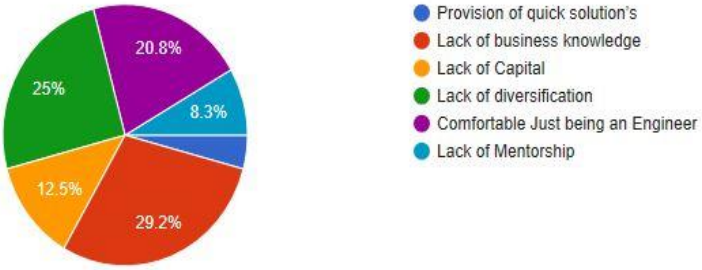
Have you ever thought about becoming an Entrepreneur as an Engineer?



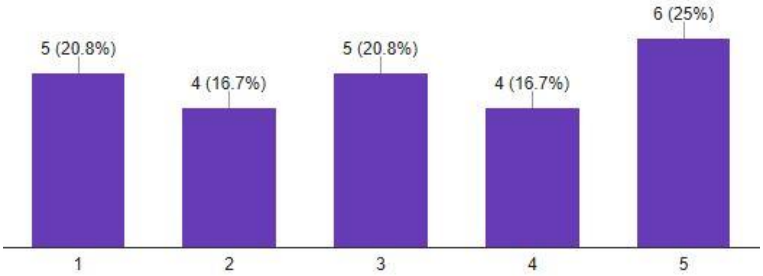
Has College or Varsity education influenced you in any way to being an Entrepreneur?



Why are so few Engineers Entrepreneurs?



How does the quality of Engineering Entrepreneurship compare with other professionals?



Analysis & Discussion

From the results, the following was deduced as some of the reasons why so few engineers are entrepreneurs;

- **Lack of business knowledge and/or an entrepreneurial mind**
  - Engineering education must teach engineers how to be entrepreneurially minded.
  - The educational paradigm must include: instruction in the technical fundamentals of engineering & business knowledge which needs to be integrated into curricular.
- **Lack of Capital**
  - Engineers are trained to interpret exact science and taught to design within restricted parameters. Simply put Engineers are not taught to take risks.
  - A good Entrepreneur on the other embraces risk as an opportunity. The result is that engineer driven solutions often are too late if they ever get, in today's fast-moving markets.
- **Comfortable in the comfort Zone**

Engineers are extremely brilliant and passionate about engineering. This results in engineers being comfortable in that daily norm of their lives. It further blinds them to step out of the comfort zone as employees and become entrepreneurs or employers.

- **Lack of Capital**
  Access to capital in starting up an enterprise is another reason why so few engineers are entrepreneurs.
  Reasons are many but not all have been discussed in this article.

What makes Engineers Great Entrepreneurs?

1. Engineers Solve Problems

New businesses erupt when there is a need to bring something into the market that is missing. Filling a void is perfect for someone who is capable of defining a problem.

Engineers are trained to think logically and to follow a methodology to uncover useful solutions. ***This is the basis of a successful business.***

2. Engineers Are Optimistic

The world can be a very pessimistic place, especially when the economy is biting.

Engineering courses teach people to persist in the face of difficulty, persevere & always entertain positive thoughts.

3. Engineers Can Build Trust

An engineer will tell the truth in a blunt manner. This candor establishes trust with consumers. Trust is a quality that is not easy to establish, but an engineer should have little problem.

4. Engineers A Yearning for Knowledge

When a person is not afraid to learn and gain more knowledge, growth will occur. Growing is a key factor involved with developing a solid business. Being an entrepreneur means constantly striving to uncover the most amount of knowledge possible.

References

Articles by Joshua Turner & Mark Crawfold

About the Author

FRANCIS KOFI YANKEY

Senior Engineer, ABP Consult Ltd.-Ghana
He is 39 years old and comes from Ghana.
He holds a Bachelor of Science degree in Geodetic Engineering and a Master of Science degree in Road and Transportation Engineering from the Kwame Nkrumah University of Science Technology (KNUST), Kumasi, Ghana.
He is an Engineer by Profession and a Corporate Member of the Ghana Institution of Surveyors and the Ghana Institution of Engineers.
He is presently a Senior Engineer employed at ABP Consult Limited, a Consulting Engineering firm in Ghana. He has been involved in engineering projects and contributed to making key decisions at the planning, design, construction, monitoring, evaluation and management levels.
He is the immediate past Chair of FIDIC-GAMA (Group of African Member Associations) Young Professionals Forum Steering Committee (YPFSC) and also a member of the FIDIC YPFSC. He has previously occupied the position of FIDIC-GAMA YPFSC, Vice Chair, for the period, 2013-2015.
He attended the FIDIC Young Professional Management Training Program (FIDIC YPMTP) in Barcelona, Spain in 2013. He has also attended a number of FIDIC-GAMA International Conferences.
He is an immediate past member of GAMA Executive Committee, the first Young Professional to serve in that capacity. At the maiden edition of the FIDIC 2016 YP Award held in Marrakesh, he received the FIDIC 2016 Special Recognition Award.
He is currently a member of the FIDIC taskforce on Sustainable Development and has recently been selected by the FIDIC Conference Advisory Committee to be a member of the Local Organising Committee (LOC) for the upcoming FIDIC International Conference in Berlin, Germany, in 2018.

IMPROVING THE WORK ENVIRONMENT, FOR SUSTAINABILITY

By Francis Kofi Yankey, Ghana

Study Objectives

1. To know the different type of work environment
2. The impact of the work environment on productivity and retention
3. How to improve the work environment for sustainability

Justification

This study is justified by the fact that the work environment plays a very important role in productivity. It cannot therefore be downplayed if we want to increase productivity at the workplace. A healthy work environment can also help retain young professionals which will invariably leads to the sustainability of the engineering industry.

Methodology

This study reviewed literatures on work environment and its impact on the level of productivity and how it can be used as a catalyst to retain young professionals for the sustainability of the engineering industry.

1.0 Background

We generally assume that it is the increment of salaries of employees by employers that improves productivity. This may not necessarily be true especially if the right work environment is not created. Studies abound which shows a strong correlation between work environment and the level of productivity.

The work environment is a term used to describe the surrounding conditions in which an employee operates. A positive or healthy work environment makes employees feel good about coming to work, and this provides the motivation to sustain them throughout the day.

This study reviewed literatures on work environment and its impact on the level of productivity and how it can be used as a catalyst to retain young professionals for the sustainability of the engineering industry.

2.0 Literature Review

2.1 The Work Environment

Scholar definitions exist for the term, work environment. Micheal Poh, a freelance blogger publication on the characteristics of a positive work environment, defines work environment as the surrounding conditions in which an employee operates. He went further to say that work environment is everything that forms part of the employees' involvement with the work, such as the relationship with co-workers and supervisors, organizational culture, room for personal development, etc. Oludeyi (2015) also defines work environment as the sum of the interrelationship among employees, employers and the environment in which the employees work. Tahir (2015), in his study on the impact of working environment on employees productivity defines work environment as the environment where people work together to achieve organizational objectives. Addai (2015) in his study on the effects of work environment on employee's productivity in government organizations defines work environment as the social and professional environment in which a person is supposed to interact with a number of people. Hay Group (2007) also contends that work environment includes a friendly, well-designed, safe physical space, good equipment and effective communication. Opperman (2002) (as cited in Oludeyi, 2015) defines work environment as the processes, systems, structures, tools or conditions in the workplace that impact favourably or unfavourably on individual performance. He went further to categorize work environment into three sub-environments: the technical environment, the human environment and the organizational environment. Technical environment refers to tools, equipment, technological infrastructure and other physical or technical elements. The human environment refers to peers, others with whom the employees relates, team and work groups, interactional issues, the leadership and management. Organizational environment involves systems, procedures, practices, values and philosophies. Kohun (1992), defines working environment as the totality of forces, actions and other influential factors that are currently and, or potentially, contending to the employees activities and performance. He added that working environment is the sum of the interrelationship that exists within the employees and the environment in which the employees work.

It is evident from the foregoing definitions that employees and the work environment are dependent variables. The impact, whether positive or negative, directly affect the other.

2.2 Types of Work Environment

Kochan (1980) and Molokwu (1993), put work environment into two main categories. The internal and external work environments. Both agreed that the internal work environment consist of the buildings, furniture's, layout, as well as the physical conditions under which employees operate. The external work environment however consist of factors such as custom and laws of the community within which the business operate, weather condition, policies etc. outside the work environment. However, many scholars or authors put work environment into two main categories: the conducive and toxic work environments (Akinyele, 2010; Chaddha, Ravi and Noida, 2011; Yusuf and Metiboba, 2012; Assaf and Alswalha, 2013) (as cited in Oludeyi, 2015).

Conducive work environments give pleasurable experiences to the employees and help them actualize in the dimensions of personality profile while toxic work environment give painful experiences and de-actualize employee's behaviour.

Kyko (2005) (as cited in Oludeyi, 2015) in his study on employee personality profile at the work place concluded that employee personality profile is not static. Kyko believes that irresponsible or uncommitted employees can change to be responsible and be more committed to job in conducive work environment because such environments reinforce the self-actualizing traits in them. The reverse is the case for the toxic work environment.

Chandrasekar (2011) (as cited in Oludeyi, 2015) in his study on employee's engagement with their working environments identifies twelve factors in the work environment which either lead to engagement or disengagement of workers. These factors include: goal-setting, performance feedback, role congruity, defined processes, workplace incentives, supervisor support, mentoring or coaching, opportunity to apply new skills, job aids, environmental factors and physical factors. Kyko (2005) based on the foregoing factors refined and identified six factors that have determinants effects on whether workplace environment will be conductive or toxic. These factors are:

a) Opaque management

This factor consists of such issues as unclear vision, mission, goals, or objectives, badly defined systems, policies, regulations or rules, ambiguous roles, violated management principles, idle and inefficiently used of resources, disruption of unity command, when people get away cheating or not performing their duty.

b) Boss

Boss who plays favoritism showing preference for one set of subordinates over others on their functions, boss who says one thing and does another; boss who is not decisive - subsequently employee does not have a sense of direction; boss who plays "God" with the performance appraisal; boss who delegates responsibility without the authority to act - curtailing the employee's self-esteem.

c) Company policies

Win-lose policies, centralization of power, creating privileged groups in the organization, closed door policy, poor fringe benefits, too much red tape.

d) Working Conditions

Hot and noisy working environment, unsafe work conditions, dirty work environment, insufficient resources, old technology, old machinery.

e) Interpersonal relationships

Unhealthy politicking, lack of cooperation among workers, back stabbing, empire building, rumour mongering, alienation, mistrust, sabotage.

f) Pay

Pay below the market rate.

The aforementioned studies on the type of work environment shows that there are multifaceted factors or elements that constitute the definition of work environment and each factor play very key role in the actualisation of either a conducive or toxic work environment within an organization.

2.3 Work Environment and Productivity

A lot of studies and research work have drawn strong correlation between the work environment and the level of productivity. Tahir (2015), on his studies on the impact of work environment on employee's productivity in the Banks and Insurance Companies in Pakistan concluded that the work environment has a positive impact on employee's level of productivity through factors like supervisor support, relation with co-workers, training and development, attractive and fast incentives and recognition plans and adequate workload at the work place.

Oswald (2012) study on the effect of working environment on employer's performance concluded that the work environment has a strong correlation on employer's level of performance.

Manu (2015), on his study on the effects of work environment on employee's productivity on government organization concluded by saying that for employees level of productivity to be enhanced, the psychological environment and health environment must as well be improved.

The American Society of Interior Designers found that physical workplace design is one of the top three factors that affects an employee's performance and job satisfaction.

3.0 Conclusion

The aforementioned studies no doubt show a strong evidences regarding employee's level of productivity and the work environment. Though there are multitude of factors inherit in the work environment which must be considered and improve within an organization, it must take a conscious and deliberate effort and policies on the part of employers especially to create a positive or conductive work environment, which will invariably lead to the improvement in the level of productivity.

Employers in the consulting engineering industry must therefore improve on the work environment to help retain young professionals for the sustainability of the industry.

Fédération Internationale des Ingénieurs-Conseils
International Federation of Consulting Engineers
Internationale Vereinigung Beratender Ingenieure
Federación Internacional de Ingenieros Consultores

2018 FIDIC Management Training Programme for Young Professionals and Potential Managers

February to October

An eight-month on-line course followed by final sessions at the FIDIC conference.

The Young Professionals' Way to Management Skills

The Young Professional Management Training Programme is a virtual training program based on real-life management issues, supported by the FIDIC document: Guide to Practice.

About 600 Young Professionals (YPs) from more than 55 countries have participated over the years.

About YPMTP

The basic textbook is the FIDIC Guide to Practice (GtP). In connection with the course, you will receive an electronic copy of the book.

The YPMTP is tailored to consulting engineers or professionals with similar technical background wishing to improve their general management skills. Your experience will be tested and honed in dialogue with other YPs, you will learn from team members with different backgrounds and experience and from the YPMTP Mentors.

Up to 30 nationalities are represented every year resulting in international networking opportunities for all.

The topics are:

- **Organization and Human Resources**
  - Starting a company
  - Growing the company
  - Ownership structures
  - Attracting staff
  - Merger and acquisition
- **Marketing and business development**
  - Marketing
  - Financial management
  - Quality management
  - Risk management
- **Business consolidation**
  - Client relationship and communication
  - Sustainable development
  - Business integrity management

All case work is based on virtual discussions on the Podio platform between team members. For each study period, two editors will be summarizing the discussion for presentation at the following classroom session.

The active case work is supported by references to the FIDIC Guide to Practice and dedicated lectures by the Mentors uploaded as recordings. Additional lectures focus on FIDIC's White Book - Client Consultant Model Services Agreement, Sub-consultancy Agreement, Joint-Venture Agreement and Representative Agreement.

The Conference Sessions

The final 5 days session at the FIDIC Conference involve further lectures and discussions with Mentors and among the students. There will be intercultural exchanges among some 30 nationalities getting together and representing a variety of approaches to the management issues discussed. An important element is the networking opportunity which can serve as the basis for future international cooperation as consultants.

The final assignment is a presentation for the whole FIDIC Conference of the teams' perception of their challenges as future leaders in the consulting industry: the Future Leaders Workshop.

International networking:

More than 55 countries have participated in the course, linking up in the FIDIC Young Professionals Forum.

Optional Exam

YPMTP offers an optional exam based on a multiple choice test. Passing the exam will give you a Certificate enabling you to claim educational points in relation to any required professional accreditation.

About your course input

Your participation in case work and attending classroom sessions requires some 100 hours of active input in addition to one week of final in-person sessions and the FIDIC Conference.

The program requires internet access.

The virtual platform is provided by Podio and the classroom by Adobe Connect. Your access will be established by FIDIC, no further registration is required.

The training programme runs from February to October with 8 virtual classroom sessions and a final 5 days session at the annual FIDIC Conference.

www.fidic.org/ypmtp2018

Fédération Internationale des Ingénieurs-Conseils
International Federation of Consulting Engineers
Internationale Vereinigung Beratender Ingenieure
Federación Internacional de Ingenieros Consultores

2018 FIDIC Management Training Programme for Young Professionals and Potential Managers

Fee

Euro 2750.- including on-line training, access to the relevant FIDIC documents, final sessions and full participation in the FIDIC 2018 International Infrastructure Conference.

(Excl. air travel and accommodation)

Organisation

FIDIC YPMTP, coordinated by FIDIC, is facilitated by Mr. Steen Fredericksen (SF Consult, Denmark) and assisted by the YPMTP Mentor Board which is comprised of experienced FIDIC affiliated consultants.

Participation

The FIDIC YPMTP participants, generally with an age range of 30 to 40 years, are professionals from the consulting engineering industry who possess professional experience in project management.

The programme requires participants to attend a 1 -2 hour monthly classroom session on the internet and participation by answering case-related questions in writing.

The average time input of the programme is approximately 100 hours.

All participants are required to possess fluency in written and spoken English as well as reliable internet access.

Certificate

In order to obtain a Certificate of Successful Completion, the participant must have attended at least 5 classroom sessions and responded in writing on Podio to all questions asked prior to the sessions.

A Certificate of Participation requires having participated in 50 % of all activities.

The YPMTP 2018 offers an optional exam based on the course and the FIDIC Guide to Practice. The exam will take place in connection with the participation in the training sessions prior to the FIDIC Conference.

The resulting Certificate will enable students to demonstrate their achievements in relation to obtaining Professional Development Units (PDUs) and maintaining certificates and credentials based on their participation in the YPMTP.

Programme content and course details

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Silvia Fossati, Training Manager, FIDIC

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Mail: sfossati@fidic.org

Date

The YPMTP 2018 will start in February 2018.

Online registration

Register and pay by credit card or by bank transfer at **www.fidic.org/ypmtp2018**

Terms and Conditions

Payment receipts: all registered participants will receive an acknowledgement of registration, an invoice and confirmation of payment.

Refunds: cancellations must be received and confirmed two weeks before the closing date for registrations. Refunds will normally not be made after this date. Refunds will be in full, less any handling or bank charges.

Cancellation: the organisers reserve the right to cancel the programme if it is undersubscribed or for any other reason. In the event of cancellation FIDIC will endeavor to give participants two weeks' notice and the registration fee will be refunded in full.

Substitutions: substitutions may be accepted provided they are announced two weeks before the programme starts.

FIDIC 2018 Conference: participants will be registered as full participants for the FIDIC 2018 International Infrastructure Conference. Hotel accommodation, travel fees, and reservations for optional events are made separately by the participant.

FIDIC, the International Federation of Consulting Engineers, based in Geneva, Switzerland, promotes globally the business interests of suppliers of technology-based intellectual services for the built and natural environment on behalf of some 100 national Member Associations representing over one million professionals working in 66,000 firms worldwide.

www.fidic.org/ypmtp2018