A Framework for Developing Innovation Competencies

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Introduction:

Innovation has become the universal savior. In today's competitive scenario, 'making innovation work' has become a strategic imperative. The 'working of innovation' depends on processes, technology, and individuals. While ample work has been done on developing processes and technologies, little work has been done on developing individuals for 'making innovation work'. In 2002, an MIT Professor Clayton Christensen referred to innovation as "the new science of success" and predicted that innovation would become a new management discipline and profession [1]. Immelt, the GE CEO, emphasized that the only reason to invest in organizations is their ability to innovate [2]. The UN Secretary General Ban Ki-moon challenged the 2011 World Economic Forum at Davos to apply revolutionary thinking and innovation to the challenges of our time such as lifting people out of poverty while protecting the planet and ecosystems that support economic growth. [3]. Mohanty believes that for a nation to achieve pre-eminent position and superior status, it has to pioneer the culture of innovation [4]. Drucker notes that innovation has become a buzzword and predicts that the next decade will require even more innovation [5]. In short, "making innovation work" has become a matter of survival for every organization.

Almost all organizations have a huge potential to innovate but do not live up to it. Fortunately, many role model organizations such as Apple, Titan Edge, Dainik Bhaskar and individuals such as Steve Jobs, Varaprasad Reddy, Dr Govindappa Venkatswamy have been hugely successful innovators[6]. Their success needs to be emulated and proliferated. That will require individuals with innovation competency. Darsø [7] emphasizes that the employee is the most important factor in innovation. Waychal et al. [8] assert that it is no secret that the best-conceived innovation purposes and most thoroughly developed innovation processes cannot succeed without appropriate human resources to execute them.

Development of a framework

This background motivated us to construct a framework for developing innovation competency of individuals. Based on the profile and time availability of participants, the framework allows developing customized workshops that equip participants with the understanding of a full life cycle view of innovations starting from problem identification, idea generation to diffusion, and introduces techniques and methods for various phases. The framework relies on many insightful participative exercises, audio-visuals, and case studies to unravel the dynamics of innovation. Participants learn that identifying a right challenge is critical to trigger the innovation process and choose an appropriate challenge to pursue their journey of innovation. Darsø has discussed a theoretical framework to develop innovation competency at workplace [7] and another framework

from pedagogical perspective [9]. Stilgoe et al. [10] have proposed a framework for responsible innovation. They have defined responsible innovation as "taking care of the future through collective stewardship of science and innovation in the present" and have included four dimensions in the framework i.e. anticipation, reflexivity, inclusion and responsiveness. We are aware of some organizations and individuals conducting courses and workshops to develop innovation and creativity competencies. In the developing economies, many of them do not seem to use research-based strategies. In the developed economies, researchers such as Clayton Christensen have been delivering workshops that are rooted in research-based strategies.

Approach

Competencies can be seen as inclusion of skills, knowledge and attitudes including the patterns of personal competencies and the way they work together for achievement [11]. We adopted Richard Lyons' definition of innovation - fresh thinking that creates value for all the stakeholders[12] - for developing our framework. This includes two elements – fresh thinking or creativity and value delivery. Fresh thinking results in generating a number of quality ideas and choosing the best idea(s) and value delivery entails, developing solutions and deploying them to ensure benefit to the stakeholders. Our focus was more on creativity and less on value delivery for the workshop framework. We believe that workshops provide easy opportunities to develop creativity competency unlike value delivery which requires real-life scenarios or at least simulation tools and is time consuming.

Innovation is a complex phenomenon and requires competency in multiple areas such as visioning, ability to generate ideas, internal and external networking relationship, ownership, stretch mindset, focus on tasks and decision making [8]. Vloke [13] has proposed a competency profile for innovation leaders derived from research in a South African science-based research and innovation organization. It has four quadrants –strategist, capability builder, achiever and match maker with twenty competency clusters. We have developed our framework based on the competencies proposed by Waychal et al. [8], who have proposed a smaller reasonable subset of Vloke's cluster. That, we posit, is a good starting point.

We developed the framework with an axiom that the throughput of a learning process increases significantly with active participation, intense reflections, and collaborative working on case studies and real-life projects i.e. student-centered learning. We have synergistically combined the elements to ensure the targeted outcome of the workshop - the ability to explain creativity and innovation and their underlying dynamics, and the ability to apply the understanding to provide innovative solutions to real-life problems. We do not claim to cover all the sub-competencies of innovation. As discussed earlier, we have developed the framework / workshop based on the competencies proposed by Waychal et al. [8]. We have tabulated the sub-competencies and corresponding pedagogical techniques and contents in table 1 below.

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Sub-competency	Pedagogical techniques and contents
Visioning	We present global and/or organizational challenges and ask participants to choose a challenge and develop a vision statement to tackle the challenge
Ability to generate ideas	We explain and practice various creativity techniques to generate ideas in exercises including the challenge exercise. Case studies also help with the ability to generate ideas.
Decision making	Participants have to make many decisions throughout the workshop such as identifying key learnings from case studies, choosing a challenge and key solutions to scale the challenge.
Internal and external networking relationship	We form random / diverse teams and ask them to work collaboratively on exercises, case studies, and challenges. This has a smaller element of external networking.
Ownership	The 3H model and value delivery covers this to some extent. We seek commitment from participants to work on the problems. We do not track this in all the workshop instances though.
Stretch mindset	The value delivery covers this to some extent. We conduct many of the workshops on a holiday with only a lunch break. This, of course, may not suffice to develop a stretch mindset.
Focus on tasks	The 3H model and value delivery covers this to some extent. All the activities are time bound and schedules are strictly adhered.

Table 1: The sub-competencies and corresponding pedagogical techniques and contents

Principles

The framework is based on the following four principles: (a) Creativity and Innovation can be taught; (b) Student-centered learning such as, team- and project-based learning, active learning and case-study-based learning are the best methods for developing innovative competencies; (c) Diversity enhances innovation throughput; and (d) Innovators succeed while working on challenges emanating from their passions.

(a) We can teach Creativity and Innovation

Many thought leaders, researchers and teachers such as Robinson[14], Altshuller[15] and Belski [16] believe that creativity and innovation can be taught. Robinson[14] asserts that pedagogy can be designed to encourage other people to think creatively. He adds that one can encourage participants to experiment and to innovate without giving them all the answers but giving only the tools they need to find out what the answers might be or to explore new avenues. Smith [15] points that idea generation was never perceived to follow a scientific method till Altshuller's proposed the TRIZ process. It is the antithesis of unreliable, trial and error, psychological means of lateral thinking and contains scientific, repeatable, procedural, and algorithmic processes.

Grounded in the huge database of two million patents but stripped of the technical subject matter, Altshuller found that only a small number of engineering analogies and abstractions were necessary to explain the vast majority of inventions. Belski[16] designed and taught a separate thinking and problem-solving course, based on the Theory of Inventive Problem Solving (TRIZ) and observed that students' perception of their abilities in problem-solving changed vastly as a consequence of the course. Chang [17] believes that by consistently emphasizing both the creative process and the thinking strategies outlined in the ENGAGE models, individuals and companies could become inventive and innovative much sooner than otherwise. Thus, creativity and innovation are not inherent traits but can be taught and developed by using different process frameworks and appropriate pedagogies.

(b) Student-centered learning helps developing innovative competencies

Student-centered learning such as, team- and project-based learning, active-learning and case-study-based learning are the best methods for developing innovative competencies. Robinson observed that when you get people to think visually—to draw pictures or move rather than sit and write bullet points—something different happens. Breaking them up so they aren't sitting at the same desk and getting them to work with people they wouldn't normally sit with creates a different type of dynamic and results in innovation [14]. Waychal [18] and Brown [19] have shown that student-centered learning can help develop creativity. The two aspects of innovation –fresh thinking and value delivery – require student-centered learning. It is important that individuals be immersed in real-life situations to understand problems and generate various ideas. Value delivery requires implementation of those ideas to solve the problems. We can achieve the two elements by active participation of students in classroom sessions and by executing full life-cycle real-life projects.

(c) Diversity enhances innovation throughput

Robinson says that we have to promote and teach—collaborating and benefiting from diversity rather than promoting homogeneity [14]. Kurtzberg & Amabile [20] point out that diversity can enhance creativity owing to heterogeneous sets of perspectives and also warn that it can hinder group process. Hoever [21] comments that properly integrated diverse teams can lead to creative synergy. Hargadon [22] cites past innovations and demonstrates that many are the result of synthesizing or bridging ideas from different fields. Innovation, he argues, is the result of simultaneous thinking in multiple boxes and not of the oft-prescribed "thinking outside of the box." Dyer [23] says that networking is one of the important skills for an individual to be innovative. Johansson [24] asserts that continuously expanding value network aides innovation. Lafley [25] asserts that anyone can innovate, but practically no one can innovate alone. Hansen and Birkinshaw [26] point out that the key metric to keep in mind is diversity of contacts, and not the mere number of contacts. Bessant et al. [27] suggest that individuals should not limit their search to fields they are already familiar with, but instead look at the edge of their radar screens and sometimes a bit beyond. Innovation requires thinking beyond the obvious. That thinking is

stimulated by exposing to varied situations and interacting with experts from different fields, thereby embracing diversity.

(d) Innovation benefits from working on challenges emanating from your passion

Robinson points out that if you combine a personal aptitude with a passion for that same thing, you go into a different place [14]. Munshi [6] believes that innovators require a 'create history' kind of attitude to accept impossible challenges that engage the heart rather than appeal to reason. If innovation starts with an idea, it may end with a failure of that idea. On the other hand, if one starts with a challenge - about which one feels passionate - failure of an idea would propel one to think of new ideas. It is highly likely that one will go on until he overcomes the challenge.

Workshop framework Architecture

The central trunk in figure 1 provides the core contents of our workshops. The branches are optional and all the timings (given in diamonds) are indicative. The workshop faculty modifies contents and timings based on time availability and group profile. The introductory session elicits expectations from participants, tries to assess if we can meet the expectations and informs participants accordingly. We also form diverse groups in the session. The group size is typically 4 to 7 depending on the total number of participants. We ask the groups to announce their names, unique methods of salutation, unique tunes and introduce their peer members on a dais. This helps in developing networking and presentation skills.

We then cover the 3H model as a requirement for any developmental activity i.e. "head" to think, "heart" to relate and "hands" to execute. We illustrate each 'H' aspect with various exercises, some of them are drawn from Covey's seven habits of highly effective people [28]. The 3H model is also used by many researchers [29][30][31]. The 3 H model helps develop creativity, relationship, and execution (focus on tasks, ownership, and stretch mindset). We then cover basics of innovation - what it is, why it is important and how it can be practiced. Some creativity techniques such as 5-whys, questioning, associations, and brainstorming are covered. We optionally cover advanced techniques such as TRIZ. The pranayama and meditation techniques are also optional. Meditation is associated with "sustained, disciplined introspection" [32] and can help in development of all the sub-competencies listed in Table 1. Of course, we only introduce meditation techniques and participants will need to practice that at regular intervals to reap the benefits. We hypothesize that the framework should be able to cater to participants from different countries or cultures, since we have not come across any reports of students benefitting differently from pedagogies or contents.
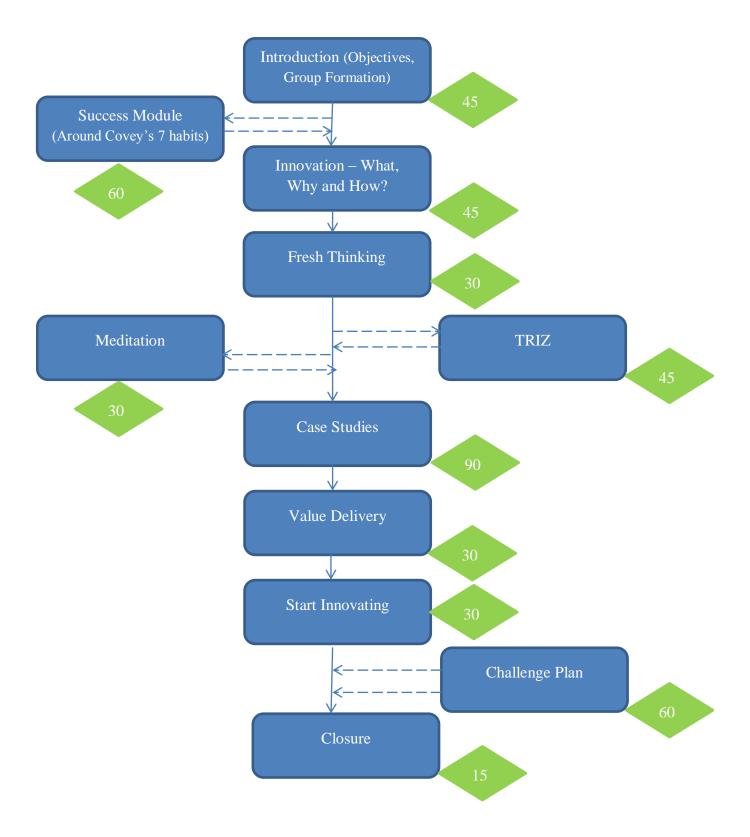
Figure 1: Workshop framework Architecture - The central trunk provides the core contents of workshops. The branches are optional and all the timings (given in diamonds) are indicative.

We then move on to case studies that are mainly drawn from Munshi's 'Making breakthrough innovation happen' [6]. The groups choose cases to analyze and present. We then emphasize the importance of value delivery in innovation. The case studies help in generating ideas and, along with value delivery, provide understanding of the criticality of stretch mindset, ownership, and focus on task. Patton and Applebaum [33] have cognized the use of case studies for general educational purposes. Gerald and Alfred [34] have argued that a trans-disciplinary case study can help develop creativity and social competencies. The next important step is seeking organizational (micro) challenges from the participants and having the faculty present global or national (macro) challenges. The participants form groups around challenges. Depending on the time availability, the participants generate ideas and projects. The challenges help develop all the sub-competencies listed in Table 1.

We must point out that the framework has evolved over time and we are presenting the current version of the framework.

We have delivered twenty-two different iterations of the workshop based on the framework, over the last seven years in multiple countries, serving more than 750 individuals of varied backgrounds such as industry professionals, research scientists, government officials, college faculty, and undergraduate and post-graduate students. All workshops except for those delivered to researchers and a BPO industry received overwhelmingly positive feedback. The two groups wanted customized and canned inputs and provided feedback just above 3 on the Likert scale of 5. All the other groups' feedback was around 4.5 on the Likert scale of 5.

Result

We are presenting analysis of the feedback of some sample or representative workshops. We decided not to integrate feedback from all workshops as each workshop and its participants were different.

Industry Workshop-1

We conducted the workshop for 22 senior managers at an organization where the author was heading the corporate innovation function. We titled the workshop simply as 'Innovation Workshop' and scheduled it for 6 hours. We explained the need of innovation with the help of competency data of the organization. We did not cover the success, the 3H model, pranayama and meditation. We covered TRIZ in detail, explained the organizational framework for innovation, identified challenges, but did not spend time on finding solutions for them. The overall rating was 4.77 on the 5-point Likert scale and various strengths and improvements were as follows;

Strengths: Thirteen participants liked the workshop plan, which included an innovative structure, thought-provoking nature, exercises, and presentations by diverse teams and videos. Ten

participants valued the learning, the interactive nature of the workshop and the case studies used. Eight liked the workshop faculty. We have plotted the feedback in figure 2.a.

Improvement Areas: Nine participants had suggestions about the workshop plan. That included discussing the next steps of the organization-wide initiative, including more activities and reducing abstractness, avoiding time-consuming exercises and giving more stress on importance of innovation, having an innovation exercise to solve real-life problems, and providing case studies in advance. Five participants suggested using organizational and domain challenges / case studies, five suggested improvement in resources such as more descriptive / interesting slides, providing relevant resources on ongoing basis and handouts. Three of them felt that the workshop duration should have been longer – especially to cover TRIZ in detail. Three of them suggested conducting workshops at other locations and for other cadres. We have plotted the feedback in figure 2.b.

Overall, the workshop seems to have gone well with the main improvement point of using organizational or domain case studies and planning a separate TRIZ workshop.
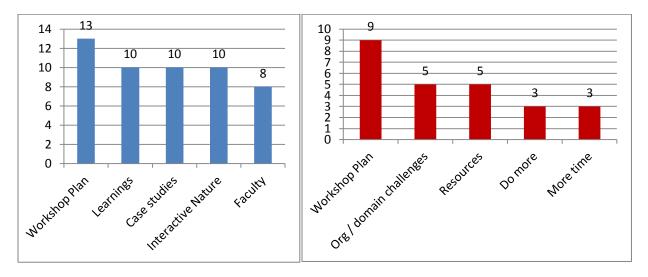

Figure 2a: Strengths of industry workshop-1; 2b: Improvement areas of industry workshop-1(Y-axis has the number of participants who provided the respective strength or improvement area)

Industry Workshop-2

This workshop was for 15 mid-level leaders of a BPO organization and was part of a larger training program that included multiple areas such as team management and financial accounting. We scheduled it for 4 hours and titled it 'Making Innovation Work'. We covered neither the success model nor pranayama-meditation. We covered TRIZ in detail, identified challenges, but did not spend time on finding solutions for them. The overall rating was 3.2 on the 5-point Likert scale and various strengths and improvement areas were as follows;

Strengths: Three participants liked the exercises and two each liked the interactive nature of the workshop and the faculty. One each enjoyed the learning and the case studies. We have plotted the feedback in figure 3.a.

Improvement Areas: Five of the participants felt that the workshop was more theoretical, three wanted more coverage of creativity techniques, and two opined that they did not have any leanings. We have plotted this feedback in figure 3.b. Later, we learnt that the other training sessions in the program were fully hands-on without any theory sessions and the participants were expecting a similar experience.

Overall, the workshop did not go very well with improvement points of using more activities and covering more creativity techniques.
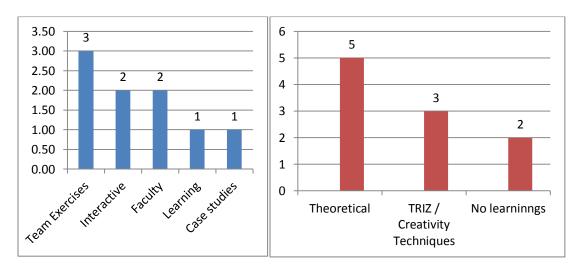

Figure 3a: Strengths of industry workshop-2; 3b: Improvement areas of industry workshop-2 (Y-axis has the number of participants who provided the respective strength or improvement area)

Student workshop-1

This workshop was for 33 final year (senior) engineering students. We titled the workshop 'Innovating Success' and scheduled it for full eight hours and covered all the optional branches. The overall rating was 4.6 on the 5-point Likert scale and the various strengths and improvement were as follows;

Strong Areas: Twenty-two participants liked the workshop plans and eighteen liked the team exercises. Fourteen participants liked the meditation. Twelve specifically mentioned the interactive nature of the workshop and eleven mentioned the videos. We have plotted the feedback in figure 4.a.

Improvement Areas: Eighteen felt that they would have liked the workshop to continue for longer. Six did not like the workshop plan. They specifically mentioned that some of the questionnaires were too long, the group discussion did not go very well, no inventors were

covered, and that there could have been more activities. Three of them wanted to minimize the use of paper to save the environment. We have plotted their feedback in figure 4.b.
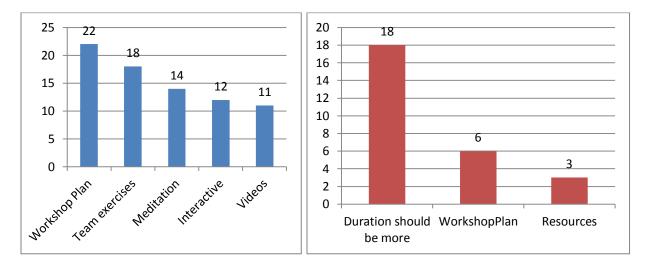
Figure 4a: Strengths of student workshop-1; 4b: Improvement areas of student workshop-1 (Y-axis has the number of participants who provided the respective strength or improvement areas)
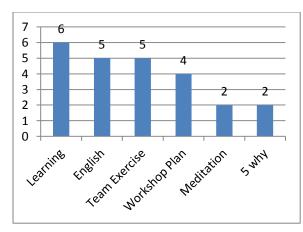
Student workshop-2

This workshop was for 11 Japanese students who were participating in an Indo-Japanese program to work on collaborative projects and scheduled to visit India. The students belonged to various technical and non-technical programs. We conducted the workshop in Japan and took help of an interpreter. We titled the workshop 'Innovating Success' and ran it for 6 hours. We covered the 3H model in detail and creativity techniques such as '5 Whys', questioning, observation, networking, experimentation and TRIZ. We did not cover case studies due to the unavailability of Japanese translation of our case studies. We covered meditation but not challenges. The overall rating was 4.36 on the 5-point Likert scale and suggestions related to strengths and improvements were as follows:

Strong Areas: Six of the students enjoyed learning from the workshop. Five each liked the chance to learn English and the team exercises. Four participants liked the workshop plan and two each liked meditation and '5 why' technique. We have plotted these suggestions in figure 5.a.

Improvement Areas: A student felt that he was missing subtle points in translation and another one was hoping to use / refine his English skills in the workshop. One participant did not like the interpreter arrangement and another wanted the workshop for longer duration. We have plotted this feedback in figure 5.b.

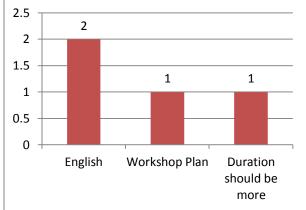Overall, the workshop went well with no specific feedback for improvement.

Figure 5a: Strengths of student workshop-2; 5b: Improvement areas of student workshop-2 (Y-axis has the number of participants who provided the respective strength or improvement area)

Workshop for senior government civil engineers

This workshop was for 40 senior and very senior government civil engineers from the state irrigation and public works departments. The workshop title was 'Meeting Minds –Scaling Summits' as it was a part of the annual get-together of the departments. We covered the 3H model in detail and limited creativity techniques only to brainstorming. The case studies were from the department and presented by the selected participants. We covered meditation but did not spend time on developing solution for the challenges chosen by the participants. The workshop went on for around four hours and received overall rating of 4.4 on the 5-point Likert scale. Various strengths and improvements were as follows:

Strong Areas: Seventeen participants liked the interactive nature of the workshop and fourteen liked the faculty. Thirteen participants enjoyed the experiential nature, five participants adored meditation and two liked the case studies. We have plotted the feedback in figure 6.a

Improvement Areas: There were a very few improvement areas. Four participants wanted the workshop for a longer duration and two participants did not like the case study presentation made by their colleagues. We have plotted the feedback in figure 6.b.

Overall workshop went very well with an improvement area of choosing right speakers for the case study presentations.
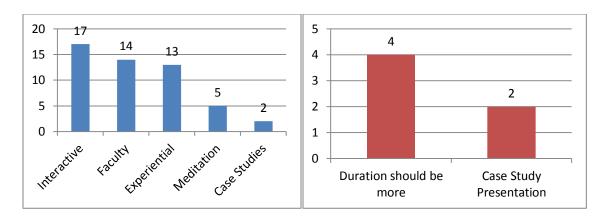
Figure 6a: Strengths of senior government civil engineers workshop; 6b: Improvement areas of senior government civil engineers workshop (Y-axis has the number of participants who provided the respective strength or improvement area)

Conclusion

We are living in a different world today. The spectacular scientific and technological progress has provided solutions to the yesteryear's problems but also has created a newer and more complex set of problems. The only recourse to overcome them is innovation. It can happen primarily through competent individuals. Therefore, we have developed a framework to design workshops for catalyzing development of the innovation competency. We have delivered twenty-two different iterations of the workshop over the last few years in multiple countries, serving more than 750 individuals of varied backgrounds such as industry professionals, research scientists, government officials, college faculty, and undergraduate and post-graduate students. Almost all the workshops received overwhelmingly positive feedback. We realized that the working professionals require case studies that are a part of their domains or organizations. Our assumption that they can learn other domains to trigger diverse ideas and apply them to their situations proved invalid. We also noticed that the participants liked non-traditional activities such as meditation and wanted more time for the workshops. The framework can help fellow educators to develop workshops and nurture more creative and innovative individuals around them.

We hypothesized that development of innovation competency does not depend on the culture of the group. We found that to be valid at least in the academic setting where the feedback from India and Japanese students was on the same lines except Japanese students were expecting to learn English through the workshop. We could not check the hypothesis in case of professionals.

A major limitation of the work is, we are assessing the workshops based on the participants' feedback and not the workshop outcomes. Going forward, we have to change that. We have to track progress of participants in innovatively solving their customers' problems. Right now, we make participants aware of the problems in value delivery but do not take specific steps to

overcome them. We require using simulation exercises towards that. We also have to develop an extended workshop or a semester long course that can cater to better development of the competency. We have analyzed a number of isolated workshops that are anecdotal. We require conducting and analyzing more number of workshops for different segments of audiences and elicit robust learning from them. That will help fellow educators to apply the framework more effectively.

Acknowledgement

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