**Business Intelligence Design: Consideration of Convergence Challenges**

Completed Research Paper

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Abstract

There is a need to develop an effective BI solution to handle the complextity of information. One of the major applicant of BI solution is to facilitate the management team to derive better business decision. In the organization, management’s activities always involve Complex Cognitive Activities (CCA). CCA are important during decision making, analysis, forecasting, strategizing and sense making. These activities always take place in the collaboration settings especially between experts and decision makers from various fields and levels. While there is an effort to develop various BI solutions to facilitate these kind of activities, there is lack of understanding about the application of CCA in collaborative settings. This effort is still in its early stage and there is much to be understood in order to develop an effective BI solution to support CCA. One of the primitive and essential challenges for Collaborative-CCA is about suportive the convergence of ideas—or the convergence phase. In this paper, we focus on identifying the challenges within the convergence phase during the Collaborative-CCA process by using a qualitative approach based on a literature analysis and semi structured interviews in the real organization settings. The data collected from the focused study and emergent sampling strategies have been analysed using Deductive Qualitative Analysis (DQA). Our findings highlight two key issues: (i) the difficulties to clarify the main driver (goal); and (ii) the difficulties to see and draw the interconnectedness between various elements as the cause that impacts the understanding for the convergence during Collaborative-CCA process. From the research found the importance of BI solution to handle convergence by represent complexity in a way users can sense some awareness about the main driver and synthesizing multiple elements towards better value and quality of the Collaborative-CCA outcomes.

**Keywords:** Business Intelligence Solution, Design, Complex Cognitive Activities, Collaborative and Convergence,

1. **Introduction**

Organizations are facing information overloaded challenge and there is a huge effort to develop BI solution to facilitate the organization in handling the messy, massive, diverse and ever changing information. However, the research highlighted the lack of practicality and effectiveness of BI solution in facilitating the real organization settings. According to John et al (2012), 50-70% of technology initiatives fail to fulfil the business organization’s needs and 30% of BI application fails to meet business requirements. While the attention for BI is more on technological perspectives hence from organizational perspectives, they are less concern about how data is stored, processed or being taken care. Instead, the BI solution will become more valuable when they are able to grab the relevant information and used to facilitate them for better business value. We believe it is timely that we must revisit the way in developing the BI solution. Due to organizational differences, this research focus on the context of management in the organization. Trough design perspective, the research is not directly trying to develop BI solution, instead we intended to discover the real problem within this condition. By understand the real problem, we hope to rationalize and accomplish more effective design for BI solution. Even though the design perspectives seem to be going backward by revisiting the problem, it is crucial since the BI solution is in lack of it.

Due to this motivation, this research intend to develop further understanding about the convergence challenges for management in the organization domain. According to Sedig & Parsons (2013), the management’s activities in the organization always involve Complex Cognitive Activities (CCA). Complex Cognitive Activities (CCA) are processes that lie at the heart of decision making, forecasting, strategizing and sense making. For examples, in order to arrive at a decision, decision makers need to analyse information from multiple sources, strategize and do some forecasting. The complexity increases when multiple decision makers are involved simultaneously in a collaborative environment, where experts from different areas within an enterprise, with different levels of expertise, and are familiar with their own ways of data representation and analysis. Collaboration is an essential for increased productivity and innovation in organizations. It implies that a team has to perform a task jointly, thus requiring interactions and coordination of effort and thinking or cognition (Kolfschoten & Brazier, 2012). When CCA are carried out within a team, we refer to them as Collaborative-CCA.

As Collaborative-CCA can represent significant processes for an organization to get valuable innovation and outcomes (Haque & Baer, 2014), we observe the understanding about this condition is still in its early stage and there is yet much to be understood about the challenges for the intersection between CCA and Collaboration (Isenberg et. al, 2011; Bresciani et al, 2008, Bresciani & Eppler, 2011). Overall investigation has found three main challenges within Collaborative-CCA process; i) lack of understanding the importance of convergence, ii) different mental model in achieving the shared goal and iii) the evolvement of emergent information. Due to the limited pages, this paper will focus on the primitive and essential challenge – convergence. Basically, the convergence challenges are about the lack of main driver and interconnection as the cause that impact the understanding to overall condition. As the most complex and difficult aspect in the collaborative-cognitive effort, convergence is crucial to synthesize and achieve the desired goal from various levels of the user’s mental model, cognitive processes and information. Without seeing the bigger picture, this cognitive process might end up with the quality of decision not improving the individual decision. Therefore, by exploring the convergence challenges, the research believes it can provide further understanding and rationales for designing more effective BI solution.

This paper is presented according to the following structure. Section 2 describes the working background of this research, where we present some discussion about literature analysis. In section 3, we discuss the methodology to verify the convergence challenges in the real organization setting. Section 4 is about findings and discussion and finally section 5 provides a summary and some future research directions.

1. **RElated BACKGROUND**

In order to develop an effective BI solution, this research emphasizes the credibility design towards the element of effectiveness due to its relevancy on the organizational business. From here, the research should understand how Collaborative-CCA takes place and why certain collaborative processes need to be supported. It helps to establish the design process credibility in which justify the values of the BI solution later. Since there is still a lack of consideration about Collaborative-CCA, it is still inadequate of the research to emphasize the significant problem that is able to justify the needs for a better design. Therefore, the research needed to identify the convergence challenges by embedding the methods of literature analysis and verification through semi structured interview in the real organization setting. The challenge identification through literature analysis will be described in the subsequent paragraph while the challenge verification through semi-structured interview will be explained in section 3.

In appreciating and utilising the prior knowledge, literature seeks researches from other areas to help us through the discovery from various fields and perspectives such as complex system, cognitive, collaboration and management. However, due to the wide range of collaborative issue and this research is tended to centralize the challenges from the perspective of activities, we are following De Vreede et al (2011) on collaborative design structure. Thus, we have identified three prominent and well documented collaborative processes worth exploring more deeply: The process of convergence in the collaborative processes (Kolfschoten & Brazier, 2012), a process model of knowledge communication (Eppler, 2012) and organization learning (Senge, 1990). The selection of these four collaborative processes are based on the context of collaboration that related to the management in organizational context. Even though some of them are not specifically mentioned in the collaboration, but the context and purpose are for collaborative benefit and show concern in CCA. **Error! Reference source not found.** summarizes these:

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| Phases | Kalfschoten & Brazier (2012)  | Eppler (2012)  | Senge (1990) |
| Problem identification | Identify problem | Expert Introduction | Personel mastery |
| Divergence | Divergence | Analysis | Mental model |
| Convergence | Convergence | Transfer of result | Build shared vision |

 **Table 1: The Summary of Process Related to Collaborative-CCA Context**

Based on the table above, we can see that when a group of people collaborate, they often perform CCA by going through roughly four phases: (i) Problem identification, (ii) Divergence, (iii) Convergence, and (iv) Making a decision. Problem identification is the first stage to explore current situation with all its parameters. It is an accurate assessment to identify the real problem and constraints and then decide what goal or aim to achieve. Then according to the goal, the group will diverge and converge so that finally they arrive to set of possible solutions to choose from. Wayne (2015) and Briggs et al (2009) emphasizes two core phases during the collaborative-CCA process which are divergence and convergence (please refer to Figure 1). Divergence is the ability to think outwards and bring up unique ideas to problem thinking. Meanwhile, convergence is the ability to bring facts together and then apply the knowledge and logic of it to the problem to find narrower solutions. Both are important and complement each other.



**Figure 1: The Concept of Divergence and Convergence (source: Wayne, 2012 [11])**

From literature review, the research found the convergence part as the most challenging during the Collaborative-CCA process. The degree of complexities has been increased due to the convergence phase and the lack of support let the users in difficult endeavour. We found the literature from the research below (refer Table 2) complement our understanding about convergence challenge during collaboration process from the CCA point of view.

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| Convergence difficulties | Sources |
| Increase of cognitive load during the convergence. | Kolfschoten & Brazier (2012), Briggs et al (2009)  |
| Identified ‘*big picture*’ challenges during the collaboration process for experts and decision makers in knowledge integration. | Eppler (2012), Mengis & Eppler (2006), Mengis & Eppler (2007), Mengis & Eppler (2008), Eppler (2011), Eppler & Bresciani, (2013) |
| The iteration between abstraction (converge) and details (divergence) for higher level of thinking. | Ziemkiwicz & Kosara (2009), Ziemkiwicz & Kosara (2010), Ziemkiwicz & Kosara (2009), Ziemkiwicz (2010). |
| The importance of user’s goal and context in complex condition.  | Albers (2010), Albers (2015), Albers (2008), Albers (2004). |

**Table 2: The Convergence Difficulties during Collaborative-CCA**

This research is intended to explore these challenges further by focusing more on the convergence phase in Collaborative-CCA. To this end, we want to further understand the convergence challenges from the real organization settings.

### The Methodology

Our research seeks to further understand the convergence challenges using semi structured interviews from real organization settings. This exploration is to expand our understanding of the context of use and activities, especially about how and why these challenges occur in the real Collaborative-CCA settings. By using description and task settings from the participants’ own job perspectives, we hope to enrich and expand the description for each of the challenges and how they impact their job and other activities. The unit of analysis for this study is the Collaborative-CCA Process based on the need to understand the activity and its sequential process. The research used the combination of 2 types of purposeful sampling strategy – the criterion and emergent samplings and there were 10 participants involved in the interview as mentioned in Table 3.

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| Type of Purposeful Sampling | PID (Participant’s Identification) |
| **Criterion Sampling Strategy** * Professional/Managers/Executives/Grade A level
* 10 years working experience
* Management level in the organization (involve in the Collaborative-CCA process)
 | PID 1 – 5 |
| **Emergent Sampling Strategy** * Secretariat for any Collaborative-CCA process
 | PID 6-10 |

**Table 3: Sampling Strategy**

The first criterion of sampling serves as the foundation to select a representative sample population that possess the characteristics of the whole population. As this research is designed to investigate activities that originate from the domain of organization, the first criterion deals with collaborative-CCA. Thus, we have chosen the participants that have experiences in performing Collaborative-CCA from the organization (Eppler, 2012; Mengis & Eppler, 2007; Mengis, 2007; Mengis, 2007b; Mengis & Eppler, 2008). Five (5) participants were interviewed from the public service and corporate agencies in Klang Valley, Malaysia, as they met the requirements of the criteria listed in the table 3. During the interviewing process, the research still found the lack of description about the Collaborative-CCA phenomenon. We found some prejudices and biased instances since the participants from criterion purposive sampling were involved in more operational and simpler tasks instead of complex activities. In the meantime, the early findings from 5 participants have showed the major roles of the secretariat to coordinate Collaborative-CCA. The participants mostly mentioned the importance of the secretariat’s role in managing the committee before, during and after the meetings. Thus, the research employs the emergent sampling strategy as the second type of strategy to further investigate from secretariats’ point of view. Through both sampling strategies, the research is able to get a richer, deeper understanding based on a more accurate data about the activities. The combination data from both sampling give more holistic view about the Collaborative-CCA process.

Before the interview, there was a session to introduce the objectives of the interview. This initial phase of the interview was to get a mutual understanding about the definition of the Convergence in the Collaborative-CCA. The participants described the meaning of the Convergence in Collaborative-CCA from their perspectives. From their explanation, the interviewer included and explained additional facts. By building mutual understanding, indirectly the respondents will better understand the concept of the Collaborative-CCA that the study seeks to investigate. Then participants were then asked to list out their scope of work. From the list, the interviewer picked the most regular or unique job scope for further investigation. From the particular job scope selected, the participants were asked to give a few examples of recurring problems. The interviewer then picked one of the problems related to convergence and then the participants describing that particular problem.

As we followed qualitative methods using semi-structured interviews, the data must be captured and be relevant to convergence challenges. In order to do that, the research analysed the data from the audio recordings during the interview – that have been transcribed from the interviews (Yin, 2011a). Furthermore, the analysis was be conducted based on the deductive qualitative analysis - DQA (Gilgun, 2011; Carbone, 2010). DQA is a thematic analysis process based on open coding. The analysis codes for a theme have been assigned based on the unit of data analysis. According to Yin (2011b) and Yin (2010), the unit of analysis selection is critical to understand how the evaluation might relate to any broader body of knowledge. The unit of analysis for this validation is concentrated on the processes of how the users handle the challenges during the Collaborative-CCA.

### THE FINDINGS

Generally, findings from the interviews have justified the challenges from the LR in the real organization settings. It described the problem in more details - the situation, condition, output and impact of the convergence to the participants’ job. Table 4 summarizes the corresponding key ideas in supporting each of the themes.

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| Main Challenges | Theme | Subtheme (from DQA) |
| The lack of understanding of the importance of convergence | (a) The difficulties to clarify the main driver  | i) The main driver is too detailed (too constrained) or abstract (not well-defined) |
| ii) Difficulties to appreciate the value of main driver |
| iii) Difficulties to sustain the main driver direction |
| (b) Difficulties to see and draw the interconnection between various elements.  | i) Various sources of information. |
| ii) The users are in the determination approach |
| iii) No guidelines to raise to higher level thinking  |
| iv) Mental Overload |

**Table 4: Themes and corresponding subtheme for the Convergence Challenges**

From the analysis, there seems to be a lack of understanding and implementation of convergence during the Collaborative-CCA due to (a) the difficulties to digest the main driver; and (b) difficulties to see and draw the interconnection between various elements. It is difficult to clarify the main driver because of the: i) instructive (too tight) or abstractive (too loose) of the main drivers to centralized and externalized the guidelines, ii) difficulties to appreciate the value of the main driver and iii) difficulties to sustain the main drivers’ direction. Furthermore, the analysis found the difficulties to see and draw the interconnection between various elements because: i) various sources of information, ii) the users are in the determination approach, iii). No guidelines to raise to higher level thinking, iv). Mental overload and v) seeking and searching from various tools usage (sources). Each challenge will be discuss in the next paragraph.

## 4.1. The Difficulties to clarify the main driver

The research found the clustering of key items as shown in Table 5 to develop the 3 subthemes about the difficulties to clarify the main driver. In general, from the analysis, all the participants have clearly answered and highlighted the importance of the main driver which they termed as purpose, aim, objective and agenda during the interviews. The job only can be done after they identify the specific issue or problem that needed to be solved. As an example, PID2 mentioned that she needed to know what the purpose is or issues are before identifying the related elements. One more example is mentioned by PID3, *“The agenda must be outline… early in the meeting. They must clarify the aim. Then get some feedback from the other departments (means the users). Only you must very clear on what you want”.* Therefore, it is clear that the participants need to clearly understand the main drivers before Collaborative-CCA take place.

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| Theme | Subthemes | Key Items |
| (a)The difficulties to clarify the main driver | i) The main driver is too detailed (too constrained) or abstract (not well-defined) | * Highlight the importance of main driver to guide the collaboration.
* The needs for determined and instructive pattern of main drivers (too tight) let the process of CCA being too strict.
* Objective as main driver is too general, the users don’t have the guidelines to centralize and externalize their shared mental model (too loose).
 |
| ii) Difficulties to appreciate the value of main drivers | * Value for CCA process is more on finishing the task instead of solving the CCA
* Care about the value and benefit of outcome due to their self-interest.
 |
| iii) Difficulties to sustain the main driver direction | * Deviation during more increasing complexities.
* Blurriness (being clueless) when others talk about their field of expertise (too detailed, too deep).
* At a lost when the chairperson is unable to control the discussion or incapable to summarize the content of discussion.
 |

***Table 5: Subtheme and corresponding key items in supporting the difficulties to clarify the main driver***

Most of the time, for new and complex matters, the objective as the main driver is abstract and too general and this makes the collaboration process to be too loose, leading to unrelated discussions. When the main driver is too loose, the users do not feel like they have the guidelines to centralize and externalize their shared mental models. In contrast, the results also seem to indicate the need to direct and determine main drivers during the collaborative CCA. As example, the participants have mentioned that:

“You must be clear of what you intend to achieve towards the end of the meeting. Don’t let this meeting lead to another meeting.”

“A good meeting is a meeting already designed to get the decision in favour to your needs.”

The instructive main driver has the potential to handle CCA being like an operational- determined task. In the operational-determined tasks, being open for convergence may delay the task and job execution. However, without understanding the real value of the main driver, the users tend to aim to ‘*finish the job*’ instead of solving the issues. The research identified the reactive mode of the users that insist to finish the tasks like a simple activities without reflecting on the CCA values. As an example, the PID4 said *“let’s say the tender meeting has 4 papers. Does this paper fail or pass? Does this paper fail or pass? Then, case closed”*. Here, the users mostly want to have a clear and instructive objective and finish the job. When asking about the elements to consider for approval, they based it on going through a checklist, budget constraints and technical specifications. When asked, *“Is there anything else to consider?”* they simply answered that it is out of their scope of their work. By insisting on an instructive and directive main driver, there might be a possibility for the mismatch on ‘how to conduct knowledge’, leading the complex activities to be tackled by using purposive and determined approaches. However, to understand the real value of Collaborative-CCA is not an easy task. PID8 told that as the ICT Department Director, she had trouble identifying the decision makers need from ICT department. After understanding the real needs from the business perspective, she is more guided on what to do, where to go and why the ICT Department needs to do the job. The research only found four out of ten participants who are capable of appreciating and connecting the value of interconnecting issues and information. As an example, the response from the PIDs in table 6 below highlighted the differences values according to the main drivers’ consideration

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| Without understanding the value of main drivers | With understanding the value of main drivers |
| Choose the best tenderer on the tender evaluation based on the criteria given.Example:*Let’s say the tender meeting has 4 papers. Does this paper fail or pass? Does this paper fail or pass? Then, case closed”. (PID4)* The outcomes for tender decision is straightforward andrelying more on determined consequences like a policy, criteria of technical and financial. | Instead of choosing the best tenderer on tender evaluation, they mix and match the tenderer expertise in forming one project. Thus, most of the tenderers will sustain throughout the economy recession. Example: *The agency divided 27 boats tender to the 3 companies. Then, by having 9 boats project, each of the company is able to survive at least for one year during this economic struggles. It also benefit back to the agency... because each of the company is performing well when they feel competitive with each other. They make sure to deliver the boats on time and achieve the speed and be the best for technical specification (PID1).* The outcomes for tender decision have been more valuable since it reflects the value of the tender approval tasks to the vendors, agencies, economy cycle and the nation as well.  |
| An isolated strategy plan from different agencies in one ministry for another 5 years planning.*Example: Each of the ministry agencies must come out with different strategy plan (PID5)*The outcomes for strategy plan is dependent on each of the agencies towards the ministry, without sitting together, collaborating and considering how their strategy can reflect the stakeholders better and eliminate redundancies between the agencies.  | An integrated strategy plan for different agencies in one ministry to provide better value for the stakeholders.*Example: The strategy planning for one ministry being executed from different agencies – Thus, all the agencies must complement each other to form a comprehensive and sustainability of house development and living (PID5).*The outcome for strategy plan is integrative from ministry level to each of the agencies. This master plan will help each of the agencies to hold the responsibility with the connection with each other and able to contribute better for the stakeholders.  |

**Table 6: The differences values according to the main driver’s consideration**

iii). Based on the analysis, the difficulty to sustain the main driver’s direction is when the discussion becomes more profound, deeper and related to various levels of depth, especially when they are discussing about a certain expertise that is unfamiliar to all participants. Thus, the users are unable to relate the specific discussion to the main point of the discussion, leading to some being clueless and deviations from the actual main drivers. The deviations will become worse when the chairperson is unable to control the discussions and incapable of summarizing what is discussed.

#### *4.2. The difficulties to see and draw the interconnectedness*

Table 7 show all the sub-theme and related key items in supporting the interconnectedness theme. There were 4 related sub-theme to justify the difficulties to see and draw the interconnectedness during Collaborative-CCA process. The subsequent paragraph will explain each of the subtheme accordingly.

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| Theme | Subtheme | Key Items |
| (b) The difficulties to see and draw the interconnectedness of information. | i) Various and sources of information. | * Information come from various and multisource.
* Different experts, units, departments hold different ownership of information.
* More concerned about their self-interest (e.g. their individual, representing unit, department or agencies) compared to the shared vision,
* Being open to consider different perspective might jeopardize their self-interest.
 |
| ii) The users are in the determination approach | * The users aim for job completion instead of value in handling the CCA.
* Open for convergence may delay the task and job execution.
 |
| iii) No guidelines to raise to higher level thinking(convergence) | * Need an explicit reminder and reference throughout the process (e.g, memorandum, tentative and agenda)
* No supporting tools while doing the higher level thinking
* The higher level thinking happens in the user’s head / in silo.
* Less of constructive arguments and reasoning – why and how for each of the consideration
 |
| iv) Mental Overload(convergence) | * Too much information and it is difficult to be written (they don’t know what to write)
* Unsure which information to drop.
* Too complex, so the users tend to focus on what they are able to understand and ignore the rest.
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**Table 7: Subtheme and Corresponding Key Items in supporting**

**the interconnectedness theme**

Our research also found that the participants had difficulties to understand the interconnection between various elements at different level of abstraction and details because the sources of information came from multiple sources. Each department will have different kinds of information. Since the users were used to job-oriented thinking and information from others departments was not under their control, it was difficult to see and understand the interconnection of the information they were analyzing. Furthermore, the users were concerned about their self-interest (e.g. their individual, representing unit, department or agencies) compared to the shared vision. In other words, being open for convergence might jeopardize their self-interest—especially in cases where they do not see and care for others’ interests.

It was quite common for the researcher to get puzzled faces and long waited answers when the researcher was asking about the interconnection of elements. Some participants could not understand why they need to have an integrative solution and some worried about the impact of the integrative solution because it was not the focus of their agencies. As an example, the PID4 looked puzzled when answering about the integrative solution and said *“… the solution from multiple agencies? It will turn out to be…. messed up.* Further than that, the participants also worry that consideration from various perspectives might delay their task or jeopardize their own interest. As an example, PID6 said, *“Normally, what do you want to achieve? If you want a solution, then you go for the round table, asking people for solution, you will get it… if there are ten people, then ten solutions. It seems like the objective of the meeting is not clear…”* and PID8 said, *“If there is a problem, you ask five people in the group… don’t be open to everybody, you must have a stand and instruct - you do this”*. In this case, the participant still insisted on a clear and instructive objective. From here, it shows that the point of consideration has been focused only on certain elements which lead to the lessening of interconnection and holism during the convergence.

When the participants have being asked *“Don’t you consider that 10 ideas should be converged to become one comprehensive solution? At that time, maybe some ideas need to be rejected and some ideas may have points to be considered”*. This kind of question lead the participants usually refer to the capability of the chairperson or secretariat to come up with an integrative, innovative and comprehensive solution. As an example, PID7 agreed with the point but she said *“It is difficult to merge a few options to get the best result… not many people are capable to do that. It is the problem”.* There was a participant who answered about the naturally talented and experienced leader who is able to come up with the interconnection and various points of consideration to conclude the solution and this kind of leader mostly holds a higher level of position. Moreover, during the higher level meetings, there is a massive amount of CCA issues to consider and each of it is messy, which an experienced leader doesn’t have an ample time to look for each of it. It turns out the responsibility to handle the CCA has been given to the secretariat in the middle management. Since some of the secretariats in middle management are still following orders, they lack the experience to consider the situation from various perspectives. These situations turn the convergence as instructive main driver that reduce the interactivity and discussion among the users. Moreover, during the instructive process, the point of consideration has been focused only on certain elements which lead to a less holistic view of the issues at hand, an important aspect of bringing convergence.

Lastly, there are no guidelines for proper discussion and sharing of ideas that can lead them to converge. This is because the convergence process is always take place in the higher level thinking skills and various type of information that lead to cognitive overload. PID4 said that “Sometimes when it is too complex, “*I am sketching my own mind map to clear things and get more understanding. The key points and the details that are relevant to the current task are jotted down and then linked if there is a relationship among each other.*” It shows that when it’s too complex, the users need the tools to facilitate their thinking. Moreover, it also shows that the users usually refer to their own mental model without any centralized and externalized guidelines to facilitate them during the convergence phase. Normally, the users are able to propose ideas during the divergence or brainstorming phase and then identify which ideas can complement the main drivers well.

### 5. CONCLUSION AND FUTURE WORKS

While this paper focus to understand the Collaborative-CCA challenges in more details, we then aim to apply these outcomes as the rationales to develop an effective BI solution design for facilitating Collaborative-CCA process. Through the investigation, the convergence within Collaborative-CCA has been described in more details and a deeper perspective. These lets the research gained more understanding about how the process of Collaborative-CCA has been doing, the people and roles involved and found some cues on how the solution must work to better facilitate the Collaborative-CCA process.

The findings from semi structured interviewed make us realized that it was not only the lack of supporting, but the users don‘t understand and see the importance of the convergence process itself. The research found the unconsciousness of the convergence is because complexity arises when the users are dealing with the information that is usually made up of elements that are connected at many levels and phases. This has been our main concern since we can see the different values and qualities between the outcomes of the Collaborative-CCA with and without convergence consideration. The verification also can see the process of Collaborative-CCA occurring even without the users realizing the importance to consider the convergence during the Collaborative-CCA. The norm of gaining instructive main drivers, executing tasks and determining the outcomes lead to the decreasing value of Collaborative-CCA outcomes. Therefore, the BI solution must be able to facilitate the convergence process, moreover the design need to emphasize the convergence components and lets the users aware the importance of convergence towards more valuable business decision.

Based from these findings, the research found the necessity of BI solution in facilitating Collaborative-CCA must be able to represent complexity in a way users can sense some awareness about convergence element. At least, the users are able to aware of the various elements to consider and relate in order to achieve the valuable main driver as Collaborative-CCA outcomes. Therefore, we propose the systemic approach for BI interface solution. By extending the technical function of an overview through visual structure, the users are able to view each information elements as part of the whole and giving them preparation to handle any emergence of information. Through this, it can act as the guidelines to bring awareness among the users about the importance of interconnectedness elements during the Collaborative-CCA process.

Finally, these lengthy and details description about the convergence challenges encourage the BI community to understand and grab some rationales for BI solution effectiveness. Due to the creativity, theorizing and practicality of design for BI solution, this research also welcomes an enrichment for the identified challenge. The BI community might have other perspectives for the set of challenges, a different way of design solution or evaluation enhancement due to facilitate Collaborative-CCA. Thus, the BI community might consider to use or enhance these convergence challenges.

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