Executive Summary

Our society is going through a rapid transformation from unconnected objects to connected 'Things[1]' that can generate data themselves. The data thus generated is examined to draw out rich information. Known as Internet of Things (IoT), this new disruptive technology is set to transform the daily activities of everyone through higher efficiency and richer experience (Intel, 2014). The IoT revolution is touching almost all areas of the Oil and Gas operations across Upstream, Midstream and Downstream. IoT enables objects to get connected to the internet and sends data from these which can be analyzed to evaluate their performance and well-being. IoT is an enabler for bringing about economic and business value to organizations across industries.

Currently more than 99% of physical entities are not joined to the internet and the opportunity to make them connected is huge. IoT ranks third in terms of the estimated potential economic impact of 12 technologies (Manyika, Chui, Bughin, Dobbs, Bisson, & Marrs, 2013). As per Cisco's report 'A New Reality for Oil and Gas', there is a 3.7% (Moriarty, O'Connell, Smit, Noronha, & Barbier, A New Reality for Oil and Gas, 2015) increase in consumer demand at Retail Oil Outlets due to adoption of IoT. Today, the Indian Public Sector Retail Oil Outlets are looking for a different value proposition that directly impacts business outcomes and helps them become faster and more agile. IoT can help plug the gap for these organizations. Literature Review has revealed that currently there is a

[1] *Thing is a natural or physical object which can be provided an IP address. It has the potential to move data through the network*

substantial financial opportunity loss of ₹1569 crores for 2014-15 without the adoption of IoT in the Indian Public Sector Retail Oil Outlets. The Indian Public Sector Retail Oil Outlets considered in the study are the Indian Oil Corporation Limited (IOCL), Hindustan Petroleum Corporation Limited (HPCL) and Bharat Petroleum Corporation (BPCL) as they together account for 94% of the total Retail Oil Outlets in India.

29 digital enabling variables were identified from the Literature Review which increased operational efficiency and employee productivity at Global Retail Oil outlets. Based on the outcome of the semi-structured interview of 15 (Guest, Bunce, & Johnson, 2006) respondents (till data saturation happened), three variables were omitted and the rest 26 variables were considered for the study. A seven point Likert[2] scale questionnaire was prepared and administered to a sample size of 402 respondents; the Cronbach's Alpha[3] came out to be 0.920. If the Cronbach's alpha is more than 0.70 then it is considered to be an allowable degree of internal consistency (Nunnally & Bernstein, 1994).

The sampling adequacy was checked using the Kaise-Meyer-Olkin (KMO)[4] test which came out to be 0.715. With the help of Prinicipal Component Analysis (PCA)[5], nine factors were determined whose cumulative percentage of total variance is explained by 68.7% of variance. The 26 identified variables under nine factors based on their co-relations were Customer focus, Increase in operating profit, Differentiation, Value to customer, Adoption of latest technology,

[2] *Likert scale is most widely used in research where questionnaires are administered to users.Rensis Likert (pronounced "lick-urt") had invented this scale. Users provide their respective degree of concurrence on a symmetric acceptable-non acceptable scale for a few questions.*
[3] *Cronbach's Alpha indicates scale reliability and the closeness of items as a group.*
[4] *KMO test is used for assessing the suitability of the data for Factor Analysis. It was named after Kaiser-Meyer-Olkin and is used to measure the adequacy of a sample. The KMO score of 0.50 or more is acceptable.*
[5] *Principal component analysis (PCA) is a method that establishes a fewer number of variables that are not correlated also known as principal components.*

Enabling IoT ecosystem, Connected Objects, Better usage of customer data and Partnership with IT service provider.

The Business Model Canvas[6] tool (Osterwalder & Pigneur, 2009) has been used to develop the IoT business model for Indian Public Sector Outlets as it is based on the results of multiple studies of business models. A semi structured interview having a few closed-ended questions along with a few open-ended questions was used for incorporating 26 significant variables under the nine building blocks in the Business Canvas tool. For each of the significant variable the mean score was computed and the relative importance of variables within each building block was computed through the mean score. In each building block, the means of all the variables were measured against the average of all the variables and significant differences were searched for. In each building block, variables that scored significantly higher than the average were marked 'Green', variables that received points lower than the average were marked 'Pink' while those variables that did not have any marked difference from the average were marked 'Yellow', this is depicted in Figure 4.2.

The semi-structured interviews for the open-ended questions were recorded, transcribed and coded with ATLAS.Ti software. The output of the ATLAS.Ti[7] software obtained through the Network Diagrams were analyzed to depict the interrelation of Processes with Data, People and Things as well as the interrelation of People, Processes, Data and Things. This formed the IoT Business Model for Indian Public Sector Retail Oil Outlets depicted in Figure 4.17. This IoT Business Model was validated by subjecting it to an in-depth interview with three Senior Management employees, one each from IOCL, HPCL and BPCL.

[6] *The Business Model Canvas is a tool used for developing new business models*
[7] *ATLAS.ti software is used for Qualitative data analysis*

The base theory for the current research is the 'Thing' Theory. The 'Thing Theory[8] however does not mention about the interrelation of processes with People, Data and Things within integrated IoT. The study shows the contribution to the 'Thing Theory' by depicting the interrelation of Processes with People, Data and Things through the IoT Business Model in Indian Public Sector Retail Oil Outlets. The IoT business model can be leveraged by the Indian Public Sector Downstream Oil Companies for implementation of IoT at their Retail Oil Outlets.

[8] *Thing Theory mentions about the interrelation between people, things and technologies and how they can be used in an IoT environment*