***Appendix A Variables identified through literature review***

1. **Data Security –** IoT enables secure payment through Smartphones
2. **Faster Decision Making –** IoT enables decisions to be taken faster through analysis of the data
3. **Customer Insights –** IoT provides customer insights through predictive analytics
4. **Security Risks –** Customer data and security risks need to be addressed effectively for effective IoT implementation
5. **Customer Experience –** Refueling experience significantly increases at Retail Oil Outlets through IoT
6. **Connecting Customers' Mobile Phones to Petrol Pumps –** IoT provides information on the nearest oil outlet, shortest route to the outlet, track the chain of past transactions, payment modes and offers smart discount offers to customers
7. **Increased In-store Sales from Formerly Fuel-only Customers –** Personalized offers bring more customers to convenience stores which used to formerly only refuel at the pump
8. **Convenience –** Apart from cashless transaction, IoT can help a customer to identify closest parking spot, alerts the driver when the vehicle runs low on fuel and navigates the driver to the nearest Retail Service Station
9. **Customer Expectation –** IoT can provide value, flexibility, simplicity and options to customer
10. **Relations with Stakeholders –** IoT can help create more sustained value through moving from a one-time transaction focus to a continuous, relationship focus with customers, suppliers, workers and assets
11. **Brand Value –** The brand value significantly increases as a result of IoT adoption

12. **Workforce at Outlets –** IoT adoption significantly reduces the work force at Retail outlets
13. **Marketing –** Communicating the value of the IoT adoption to prospective customers will enhance sales
14. **Return on Investment –** IoT helps generate superior returns and increases the return on R&D investments
15. **Automation of Manual Processes –** Many of the manual processes could be automated through IoT thereby eliminating the need for repetitive human labor, improving ease of use and removing human error
16. **Cost Optimization** - IoT holds the key to cutting costs in Retail Oil Outlets
17. **Efficient New Method for Performing Existing Tasks –** IoT enables the existing tasks to be executed faster and provides new ways of delivering services
18. **Cashless transaction –** It involves scanning a QR code at the pump, selecting how much fuel to be refilled without having to pay through wallet
19. **Process Optimization –** IoT enables optimization of processes at Retail Oil Outlets
20. **Generation of New Revenue Stream –**IoT enables to sell new products and services at Retail Oil Outlets, thereby, enabling fuel retailers to gain new revenue streams Example: Usage based insurance policies
21. **Competitive Advantage –** IoT presents a new means for the business to build competitive advantage. Integrating IoT into the main business is necessary to remain competitive
22. **Application Service Provider –** Service providers need to be engaged with for interpretation and analysis of generated data
23. **Wearables –** Wearable watches increase collaboration with workers
24. **Sensors –** They collect information about physical assets to monitor status or behavior. They can monitor inventory on real time basis. IoT enabled

sensors can be used to monitor power use, tailor the operation of equipment to business hours, customer traffic and even weather conditions at the Retail Oil Outlets

25. **Asset Optimization -** With improved tracking of assets (machinery, equipment, tools, etc.) using sensors, businesses can benefit from real-time insights and visibility into their assets and supply chains. They could more easily locate assets and run preventive maintenance on critical pieces of infrastructure and machinery to improve throughput and utilization
26. **Business value –** Connected devices can unlock tremendous business value for Retail Oil Outlet business through higher speed networks, cloud storage, computing power and falling cost of sensors
27. **Sensor and hardware producers –** Tie-ups have to be set up with service providers for IoT adoption
28. **Mass Market –** Scalability of IoT adoption will address the broader mass market over a period of time
29. **Market Share –** IoT grows the market share for Indian Public Sector fuel retailers by adding more customers to the respective company / outlet

## *Appendix B Questionnaire – Semi structured interview for finalizing variables*

Thank you for taking time to answer a set of questions. Your exact identity will not be captured. The data collected will be used only for my Research work and will not be shared with any third party. It is likely to take about 10 minutes to complete this questionnaire.

Name: _____

Email:_____

Mobile Number (Optional):_____

I. Do you believe the following digital enablers would increase employee productivity and operational efficiency in **Indian Public Sector Retail Oil Outlets**, please tick 'Yes' or 'No'.

- **Data Security –** IoT enables secure payment through Smartphones at Retail Oil Outlets

  Yes ☐ | No ☐

- **Faster Decision Making –** IoT enables decisions to be taken faster through predictive analysis of the sales data

  Yes ☐ | No ☐

- **Customer Insights –** IoT provides customer insights through predictive analytics

Yes ☐ | No ☐

- **Security Risks –** Security risks for customer data need to be addressed effectively for effective IoT implementation

  Yes ☐ | No ☐

- **Customer Experience –** Refueling experience increases at Retail Oil Outlets through IoT

  Yes ☐ | No ☐

- **Connecting Customers' mobile phones to petrol pumps –** IoT provides information on the nearest Oil Outlet, shortest route to the Outlet, track the chain of past transactions, payment modes and offers smart discount offers to customers

  Yes ☐ | No ☐

- **Increased In-store Sales from Formerly Fuel-only Customers –** Personalized offers bring more customers to Convenience stores who used to formerly only refuel at the pump

  Yes ☐ | No ☐

- **Convenience –** Apart from cashless transaction, IoT can help a customer identify the closest parking spot, alerts the driver when the vehicle runs low on fuel and navigates the driver to the nearest Retail Service Station

  Yes ☐ | No ☐

- **Customer Expectation –** IoT can provide value, flexibility, simplicity and convenience to customer

  Yes ☐ | No ☐

- **Relations with Stakeholders –** IoT can help create more sustained value through moving from a one-time transaction focus to a continuous, relationship focus with customers, suppliers, workers and assets

  Yes ☐ | No ☐

- **Brand Value –** The brand value significantly increases as a result of IoT adoption

  Yes ☐ | No ☐

- **Workforce at Outlets –** IoT adoption can significantly reduce the work force at Indian Public Sector Retail Oil outlets

  Yes ☐ | No ☐

- **Marketing –** Communicating the value of the IoT adoption to prospective customers will enhance sales for Public Sector Oil Marketing Companies

  Yes ☐ | No ☐

- **Return on Investment –** IoT helps generate superior returns and increases the return on R&D investments

  Yes ☐ | No ☐

- **Automation of Manual Processes –** Many of the manual processes could be automated through IoT thereby eliminating the need for repetitive human labor, improving ease of use and removing human error

  Yes ☐ | No ☐

- **Cost Optimization** - IoT holds the key to cutting costs in Retail Oil Outlets

  Yes ☐ | No ☐

- **Efficient New Method for Performing Existing Tasks** – IoT enables the existing tasks to be executed faster and provides new ways of delivering services

  Yes ☐ | No ☐

- **Cashless Transaction –** It involves scanning a QR code at the pump, selecting how much fuel to be refilled without having to pay through cash

  Yes ☐ | No ☐

- **Process Optimization –** IoT helps optimization of processes at Retail Oil Outlets

  Yes ☐ | No ☐

- **Generation of New Revenue Stream –**IoT enables to sell new products and services at Retail Oil Outlets thereby enabling fuel retailers to gain new revenue streams. Example: Usage based insurance policies

  Yes ☐ | No ☐

- **Competitive Advantage –** IoT presents a new means for the business to build competitive advantage. Integrating IoT into the main business is necessary to stay ahead of competition

  Yes ☐ | No ☐

- **Application Service Provider –** Service Providers need to be engaged with for IoT adoption, interpretation and analysis of generated data

  Yes ☐ | No ☐

- **Wearables –** Wearable watches increase collaboration with workers

  Yes ☐ | No ☐

- **Sensors –** They collect information about physical assets to monitor status or behavior. They can monitor inventory on real time basis. IoT enabled sensors can be used to monitor power use, tailor the operation of equipment to business hours, customer traffic and even weather conditions at the Retail Oil Outlets

  Yes ☐ | No ☐

- **Asset Optimization -** With improved tracking of assets (machinery, equipment, tools, etc.) using sensors, businesses can benefit from real-time insights and visibility into their assets utilization. They could more easily locate assets and run preventive maintenance on critical pieces of infrastructure and machinery to improve throughput and utilization

  Yes ☐ | No ☐

- **Business Value –** Connected devices can unlock tremendous business value for Retail Oil Outlet business through higher speed networks, cloud storage, computing power and falling cost of sensors

  Yes ☐ | No ☐

II. If you feel that any of the above digital enablers should be modified then please mention the same below:

III. Do you feel that there could be additional digital enablers that would increase employee productivity and operational efficiency in Indian Public Sector Retail Oil Outlets? If so, please mention them in one/two sentences:

## *Appendix C Questionnaire for Research Objective 1 (RO1)*

Thank you for taking time to answer a set of questions. Your exact identity will not be captured. So please feel free to respond to the best of your belief and conviction. The data collected will be used only for my Research work and will not be shared with any third party. It is likely to take about 10 minutes to complete this questionnaire.

You are:

a. An employee of BPCL (Bharat Petroleum Corporation Limited)

b. An employee of HPCL (Hindustan Petroleum Corporation Limited)

c. An employee of IOCL (Indian Oil Corporation Limited)

d. Others_____

For the questions below, please choose (on the 7 point scale) your response based on **whether the variable proposed would increase employee productivity and operational efficiency in INDIAN PUBLIC SECTOR RETAIL OIL OUTLETS**. Please 'tick' or 'circle' your response on the choice. For example: Agree

1. *'Data Security'* is key to effective IoT implementation

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

2. IoT enables *'decisions to be taken faster'* through predictive analysis of the sales data

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

3. Adoption of IoT can provide *'significant insights on customers'* such as spending pattern

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

4. 'Security risks' for customer data need to be addressed effectively for effective IoT implementation

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

5. IoT can enhance the *'refueling experience'* to customers

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

6. IoT can enable the connection of *'Customers' mobile phones to petrol pumps'* and provide Smart discount offers

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

7. IoT can increase the *'in-store sales'* from formerly fuel-only customers

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

8. Implementation of IoT will bring about *'convenience'* to customers by helping them identify the closest parking spot, alerting the driver when the vehicle runs low on fuel and navigating the driver to the nearest Retail Service Station

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

9. Adoption of IoT helps meet *'customer expectations'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

10. Implementation of IoT will build *'relationship with customers, suppliers, workers and assets'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

11. IoT adoption will enhance the 'brand value'

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

12. IoT can significantly reduce the 'w*orkforce*'

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

13. Communicating the value of the IoT adoption to prospective customers through *'Marketing'* will enhance sales

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

14. Implementation of IoT can bring about significant *'return on investment'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

15. IoT would enable *'Automation of manual processes'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

16. Implementation of IoT can help 'reduce costs'

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

17. IoT can enable *'existing tasks to be performed with new efficient methods'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

18. IoT can bring about *'cashless transactions'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

19. IoT adoption will enable '*Optimization of processes'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

20. IoT can enable to sell new products and services thereby enabling PSU fuel retailers to gain new revenue streams

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

21. IoT presents a new means for the business to build *'competitive advantage'*

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

22. Partnerships need to be set up with *'Application Service Providers'* for IoT adoption, interpretation and analysis of generated data

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

23. *'Wearable devices'* will increase collaboration with workers

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

24. *'IoT enabled sensors'* can be used to monitor power use, tailor the operation of equipment to business hours, customer traffic and even weather conditions

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

25. IoT would enable *'optimization of assets'* through improved tracking of assets

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

26. IoT devices can unlock tremendous *'business value'* through higher speed networks, cloud storage and computing power

Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree

## *Appendix D Closed-ended Questionnaire for Research Objective 2 (RO2)*

Thank you for taking time to answer a set of questions. Your exact identity will not be captured. So please feel free to respond to the best of your belief and conviction. The data collected will be used only for my Research work and will not be shared with any third party. It is likely to take about 10 minutes to complete this questionnaire.

You are:

a. An employee of BPCL (Bharat Petroleum Corporation Limited)

b. An employee of HPCL (Hindustan Petroleum Corporation Limited)

c. An employee of IOCL (Indian Oil Corporation Limited)

d. Others_____

The 'Osterwalder's Business Model Canvas tool (Osterwalder & Pigneur, 2009) would be used to develop the IoT business model. It divides a business model into nine different building blocks. These are:

1. **Customer Segments**: the different customer groups for which the product adds value
2. **Value Proposition**: the value the product delivered to satisfy the customer needs
3. **Channels**: how your company reaches its customer segments to deliver the value

4. **Customer Relations**: the types of relationships your company maintains with the customer segments
5. **Revenue Streams**: the ways how a company generates revenue from offering value to each customer segment
6. **Key Resources**: resources which allow a company to create and offer a value proposition
7. **Key Activities**: actions a company undertakes in order to create and offer value
8. **Key Partners**: partnerships a company makes in order to create and offer value
9. **Cost Structure**: the different costs a company makes in order to create and offer value and the main cost structure.

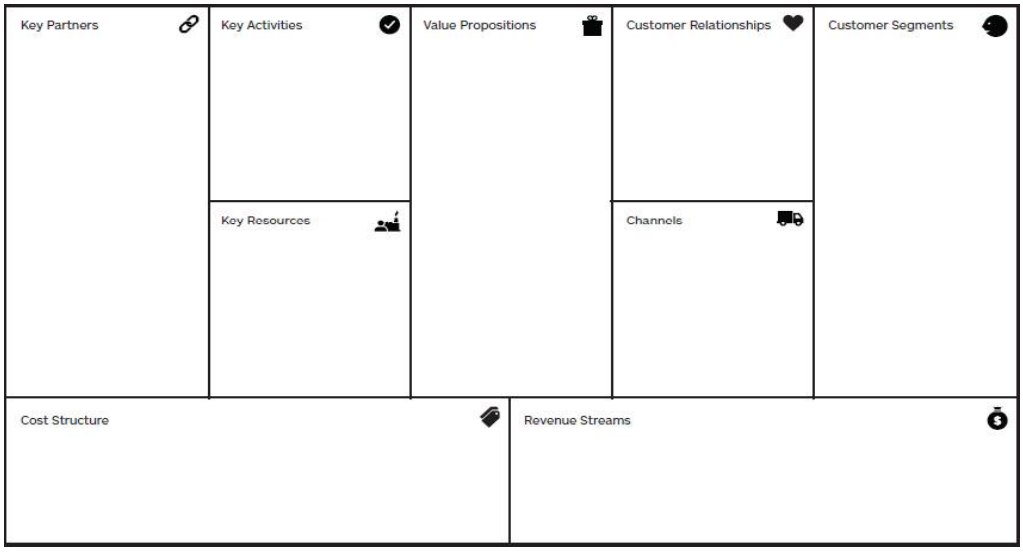


*Figure D.1: Osterwalder's Business Model Canvast tool (Osterwalder & Pigneur, 2009)*

For the questions below, please choose an option. Please 'tick' or 'circle' your response on the choice.

1. The variable **"Data Security –**IoT enables secure payment through Smartphones at Retail Oil Outlets" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

2. The variable **"Faster Decision Making –** IoT enables decisions to be taken faster through predictive analysis of the sales data" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

3. The variable **"Customer Insights –** IoT provides customer insights through predictive analytics" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

4. The variable **"Security Risks –** Security risks for customer data need to be addressed effectively for effective IoT implementation" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

5. The variable **"Customer Experience –** Refueling experience increases at Retail Oil Outlets through IoT" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

6. The variable **"Connecting Customers' Mobile Phones to Petrol Pumps –** IoT provides information on the nearest Oil Outlet, shortest route to the Outlet, track the chain of past transactions, payment modes and offers smart discount offers to customers" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

7. The variable **"Increased In-store Sales from Formerly Fuel-only Customers –** Personalized offers bring more customers to Convenience stores who used to formerly only refuel at the pump" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

8. The variable **"Convenience –** Apart from cashless transaction, IoT can help a customer identify the closest parking spot, alerts the driver when the vehicle runs low on fuel and navigates the driver to the nearest Retail Service Station" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

9. The variable **"Customer Expectation –** IoT can provide value, flexibility, simplicity and convenience to customer" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

10. The variable **"Relations with Stakeholders –** IoT can help create more sustained value through moving from a one-time transaction focus to a continuous, relationship focus with customers, suppliers, workers and assets" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

11. The variable **"Brand Value –** The brand value significantly increases as a result of IoT adoption" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

12. The variable **"Workforce at Outlets –** IoT adoption can significantly reduce the work force at Indian Public Sector Retail Oil outlets" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

13. The variable **"Marketing –** Communicating the value of the IoT adoption to prospective customers will enhance sales for Public Sector Oil Marketing Companies" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

14. The variable **"Return on Investment –** IoT helps generate superior returns and increases the return on R&D investments" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4)*

*Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

15. The variable **"Automation of Manual Processes –** Many of the manual processes could be automated through IoT thereby eliminating the need for repetitive human labor, improving ease of use and removing human error" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

16. The variable **"Cost Optimization** - IoT holds the key to cutting costs in Retail Oil Outlets" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

17. The variable **"Efficient New Method for Performing Existing Tasks –** IoT enables the existing tasks to be executed faster and provides new ways of delivering services" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

18. The variable **"Cashless Transaction –** It involves scanning a QR code at the pump, selecting how much fuel to be refilled without having to pay through cash" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

19. The variable **"Process Optimization –** IoT helps optimization of processes at Retail Oil Outlets" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

20. The variable **"Generation of New Revenue Stream –**IoT enables to sell new products and services at Retail Oil Outlets thereby enabling fuel retailers to gain new revenue streams. Example: Usage based insurance policies" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

21. The variable **"Competitive Advantage –** IoT presents a new means for the business to build competitive advantage. Integrating IoT into the main business is necessary to stay ahead of competition" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

22. The variable **"Application Service Provider –** Service Providers need to be engaged with for IoT adoption, interpretation and analysis of generated data" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

23. The variable **"Wearables –** Wearable watches increase collaboration with workers" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

24. The variable **"Sensors –** IoT enabled sensors can be used to monitor power use, tailor the operation of equipment to business hours, customer traffic and even weather conditions at the Retail Oil Outlets" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

25. **"Asset Optimization** - With improved tracking of assets (machinery, equipment, tools, etc.) using sensors, businesses can benefit from real-time insights and visibility into their assets utilization" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

26. **"Business Value –** Connected devices can unlock tremendous business value for Retail Oil Outlet business through higher speed networks, cloud storage, computing power and falling cost of sensors" would fall under the building block *1) Key Partners 2) Key Activities 3) Value Proposition 4) Customer Relationship 5) Customer Segments 6) Key Resources 7) Channels 8) Cost Structure 9) Revenue Segments*

## *Appendix E Open-ended Questionnaire for Research Objective2 (RO2)*

Thank you for taking time to answer a set of questions. The topic for my Research is *'Developing an IoT Business Model for increasing operational efficiency and employee productivity in Indian Public Sector Retail Oil Outlets'*. The data collected will be used only for my research work and will not be shared with any third party. It is likely to take about 15-20 minutes time to answer the questions.

Given below is the definition of variables which have been identified through literature survey:

- **Data Security –** IoT enables secure payment through Smartphones
- **Faster Decision Making –** IoT enables decisions to be taken faster through analysis of the data
- **Customer Insights –** IoT provides customer insights through predictive analytics
- **Security Risks –** Customer data and security risks need to be addressed effectively for effective IoT implementation
- **Customer Experience –** Refueling experience significantly increases at Retail Oil Outlets through IoT
- **Connecting Customers' Mobile Phones to Petrol Pumps –** IoT provides information on the nearest oil outlet, shortest route to the outlet, track the chain of past transactions, payment modes and offers smart discount offers to customers
- **Increased In-store Sales from Formerly Fuel-only Customers –** Personalized offers bring more customers to convenience stores who used to formerly only refuel at the pump

- **Convenience –** Apart from cashless transaction, IoT can help a customer can identify closest parking spot, alerts the driver when the vehicle runs low on fuel and navigates the driver to the nearest Retail Service Station
- **Customer Expectation –** IoT can provide value, flexibility, simplicity and options to customer
- **Relations with Stakeholders –** IoT can help create more sustained value through moving from a one-time transaction focus to a continuous, relationship focus with customers, suppliers, workers and assets
- **Brand Value –** The brand value significantly increases as a result of IoT adoption
- **Workforce at Outlets –** IoT adoption significantly reduces the work force at Retail outlets
- **Marketing –** Communicating the value of the IoT adoption to prospective customers will enhance sales
- **Return on Investment –** IoT helps generate superior returns and increases the return on R&D investments
- **Automation of Manual Processes –** Many of the manual processes could be automated through IoT thereby eliminating the need for repetitive human labor, improving ease of use and removing human error
- **Cost Optimization** - IoT holds the key to cutting costs in Retail Oil Outlets
- **Efficient New Method for Performing Existing Tasks –** IoT enables the existing tasks to be executed faster and provides new ways of delivering services
- **Cashless Transaction –** It involves scanning a QR code at the pump, selecting how much fuel to be refilled without having to pay through wallet
- **Process Optimization –** IoT enables optimization of processes at Retail Oil Outlets

- **Generation of New Revenue Stream –**IoT enables to sell new products and services at Retail Oil Outlets thereby enabling fuel retailers to gain new revenue streams Example: Usage based insurance policies
- **Competitive Advantage –** IoT presents a new means for the business to build competitive advantage. Integrating IoT into the main business is necessary to remain competitive
- **Application Service Provider –** Service Providers need to be engaged with for interpretation and analysis of generated data
- **Wearables –** Wearable watches increase collaboration with workers
- **Sensors –** They collect information about physical assets to monitor status or behavior. They can monitor inventory on real time basis. IoT enabled sensors can be used to monitor power use, tailor the operation of equipment to business hours, customer traffic and even weather conditions at the Retail Oil Outlets
- **Asset Optimization -** With improved tracking of assets (machinery, equipment, tools, etc.) using sensors, businesses can benefit from real-time insights and visibility into their assets and supply chains. They could more easily locate assets and run preventive maintenance on critical pieces of infrastructure and machinery to improve throughput and utilization
- **Business Value –** Connected devices can unlock tremendous business value for Retail Oil Outlet business through higher speed networks, cloud storage, computing power and falling cost of sensors

The 'Osterwalder's Business Model Canvas tool (Osterwalder & Pigneur, 2009) has been used to develop the IoT business model for Indian Public Sector Retail Oil Outlets. It divides a business model into 9 different building blocks which are given below:

- **Customer Segments**: the different customer groups for which the product adds value

- **Value Proposition**: the value the product delivered to satisfy the customer needs
- **Channels**: how your company reaches its customer segments to deliver the value
- **Customer Relations**: the types of relationships your company maintains with the customer segments
- **Revenue Streams**: the ways how a company generates revenue from offering value to each customer segment
- **Key Resources**: resources which allow a company to create and offer a value proposition
- **Key Activities**: actions a company undertakes in order to create and offer value
- **Key Partners**: partnerships a company makes in order to create and offer value
- **Cost Structure**: the different costs a company makes in order to create and offer value and the main cost structure.

Using the Osterwalder's Business Model tool (Osterwalder & Pigneur, 2009) and the responses received from the stakeholders, the IoT Business model for Indian Public Sector Retail Oil Outlets is depicted below. The Relative importance of variables within each building block was computed through the mean score, the variables that scored significantly higher than the average were marked 'Green', variables that scored significantly lower than the average were marked 'pink' and variables that did not show significant deviation from the average were marked 'yellow'.

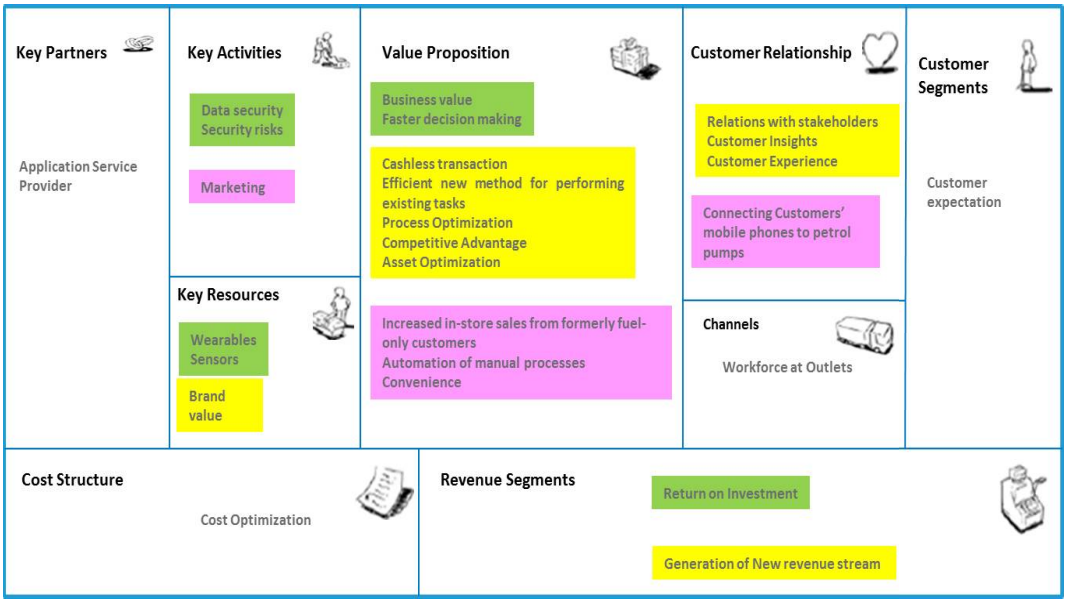


*Figure E.1: IoT Business Model for Indian Public Sector Retail Oil Outlets*

**Questions**

Q1) What is the interrelation of the following variables with the rest of the other variables, please elaborate the following?

- Automation of manual processes
- Cashless transaction
- Efficient new method for performing existing tasks
- Process optimization

Q2) In the above IoT business model, which are the variables that you view as most important and why? What is the interrelation of these important variable(s) with other variables?

Q3) Is there any other significant variable, which is not mentioned above, that needs to be incorporated, please elaborate? If yes, then please mention its significance and connection with the rest of the other variables?

## *Appendix F* Open-ended Questionnaire for Validation

Thank you for taking time to answer a set of questions. The topic for my Research is 'Developing *an IoT Business Model for increasing operational efficiency and employee productivity in Indian Public Sector Retail Oil Outlets'*. The data collected will be used only for my Research work and will not be shared with any third party. This interview is being conducted to validate the IoT business model developed for Indian Public Sector Retail Oil Outlets. It is likely to take about 45 minutes time to answer the questions. Given below is the definition of variables which have been identified through literature survey:

- **Data Security –** IoT enables secure payment through Smartphones
- **Faster Decision Making –** IoT enables decisions to be taken faster through analysis of the data
- **Customer Insights –** IoT provides customer insights through predictive analytics
- **Security Risks –** Customer data and security risks need to be addressed effectively for effective IoT implementation
- **Customer Experience –** Refueling experience significantly increases at Retail Oil Outlets through IoT
- **Connecting Customers' Mobile Phones to Petrol Pumps –** IoT provides information on the nearest Oil Outlet, shortest route to the Outlet, track the chain of past transactions, payment modes and offers smart discount offers to customers
- **Increased In-store Sales from Formerly Fuel-only Customers –** Personalized offers bring more customers to convenience stores who used to formerly only refuel at the pump

- **Convenience –** Apart from cashless transaction, IoT can help a customer can identify closest parking spot, alerts the driver when the vehicle runs low on fuel and navigates the driver to the nearest Retail Service Station
- **Customer Expectation –** IoT can provide value, flexibility, simplicity and options to customer
- **Relations with Stakeholders –** IoT can help create more sustained value through moving from a one-time transaction focus to a continuous, relationship focus with customers, suppliers, workers and assets
- **Brand Value –** The brand value significantly increases as a result of IoT adoption
- **Workforce at Outlets –** IoT adoption significantly reduces the work force at Retail outlets
- **Marketing –** Communicating the value of the IoT adoption to prospective customers will enhance sales
- **Return on Investment –** IoT helps generate superior returns and increases the return on R&D investments
- **Automation of Manual Processes –** Many of the manual processes could be automated through IoT thereby eliminating the need for repetitive human labor, improving ease of use and removing human error
- **Cost Optimization** - IoT holds the key to cutting costs in Retail Oil Outlets
- **Efficient new method for performing existing tasks –** IoT enables the existing tasks to be executed faster and provides new ways of delivering services
- **Cashless Transaction –** It involves scanning a QR code at the pump, selecting how much fuel to be refilled without having to pay through wallet
- **Process Optimization –** IoT enables optimization of processes at Retail Oil Outlets

- **Generation of New Revenue Stream –**IoT enables to sell new products and services at Retail Oil Outlets thereby enabling fuel retailers to gain new revenue streams Example: Usage based insurance policies
- **Competitive Advantage –** IoT presents a new means for the business to build competitive advantage. Integrating IoT into the main business is necessary to remain competitive
- **Application Service Provider –** Service Providers need to be engaged with for interpretation and analysis of generated data
- **Wearables –** Wearable watches increase collaboration with workers
- **Sensors –** They collect information about physical assets to monitor status or behavior. They can monitor inventory on real time basis. IoT enabled sensors can be used to monitor power use, tailor the operation of equipment to business hours, customer traffic and even weather conditions at the Retail Oil Outlets
- **Asset Optimization -** With improved tracking of assets (machinery, equipment, tools, etc.) using sensors, businesses can benefit from real-time insights and visibility into their assets and supply chains. They could more easily locate assets and run preventive maintenance on critical pieces of infrastructure and machinery to improve throughput and utilization
- **Business Value –** Connected devices can unlock tremendous business value for Retail Oil Outlet business through higher speed networks, cloud storage, computing power and falling cost of sensors

The 'Osterwalder's Business Model Canvas tool (Osterwalder & Pigneur, 2009) has been used to develop the IoT business model for Indian Public Sector Retail Oil Outlets. It divides a business model into nine different building blocks. These are given below:

- **Customer Segments**: the different customer groups for which the product adds value

- **Value Proposition**: the value the product delivered to satisfy the customer needs
- **Channels**: how your company reaches its customer segments to deliver the value
- **Customer Relations**: the types of relationships your company maintains with the customer segments
- **Revenue Streams**: the ways how a company generates revenue from offering value to each customer segment
- **Key Resources**: resources which allow a company to create and offer a value proposition
- **Key Activities**: actions a company undertakes in order to create and offer value
- **Key Partners**: partnerships a company makes in order to create and offer value
- **Cost Structure**: the different costs a company makes in order to create and offer value and the main cost structure.

Using the Osterwalder's Business Model tool (Osterwalder & Pigneur, 2009) and the responses received from the stakeholders, the IoT Business model for Indian Public Sector Retail Oil Outlets is depicted below. The Relative importance of variables within each building block was computed through the mean score, the variables that scored significantly higher than the average were marked 'Green', variables that scored significantly lower than the average were marked 'pink' and variables that did not show significant deviation from the average were marked 'yellow'. The connections of the various significant variables obtained through the Network diagrams (Output of ATLAS.Ti) which were an outcome of the semi-structured interview (Open-ended questions) and the results of the mean comparison analysis were incorporated in the Business Model Canvas tool, this is depicted in the diagram below:

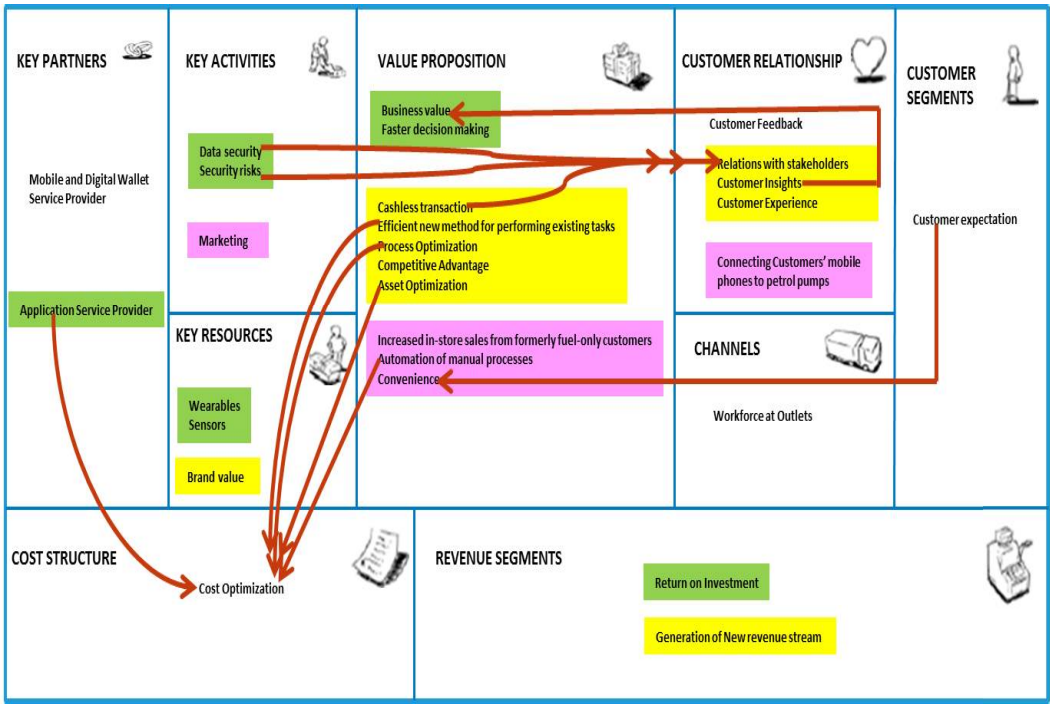


*Figure F.1: IoT Business Model for Indian Public Sector Retail Oil Outlets*

**Questions**

Q1) Do you agree the below statements on the IoT business model (Figure F.1) for Indian Public Sector Retail Oil Outlets:

**Connection of Processes with People, Data and Things**

- The variables on processes are 'Automation of manual processes', 'Process Optimization', ' Asset Optimization', 'Efficient new method for performing existing tasks' and 'Cashless transaction'.
- The variables 'Automation of manual processes', 'Process Optimization', ' Asset Optimization' and 'Efficient new method for performing existing tasks' were found to be associated with 'Cost Optimization'.
- The variable 'Cashless transaction' is related to the variable 'Customer Relationship'. Public Sector Retail Oil Outlets are looking to go cashless as customers want the same.

Q2) Are you in agreement with the below statements on the IoT business model (Figure F.1) for Indian Public Sector Retail Oil Outlets:

**Important Variables and the Interrelation among them**

- The variables 'Customer Insights', 'Data Security, 'Security Risks', 'Application Service Provider' and 'Customer Expectation' are considered as important variables.
- 'Customer Insights' is associated with 'Business Value'.
- 'Data Security' and 'Security Risks' are associated with 'Relations with Stakeholders'.
- 'Application Service Provider' is associated with 'Cost Optimization'.
- 'Customer Expectation' is associated with 'Convenience'.

Q3) Do you agree the below statement:

The IoT business model (Figure F.1) for Indian Public Sector Retail Oil Outlets depicts the interrelation of People, Processes, Data and Things among the various significant variables

Q4) Do you have any suggestion/feedback on the IoT business model developed for Indian Public Sector Retail Oil Outlets?

## *Appendix G* Convergent Validity

In **Convergent validity,** we examine the degree to which the operationalization is similar to (converges on) other operationalizations that it theoretically should be similar to. The Cronbach's alpha was calculated for 26 scenarios whereby one variable out of 26 variables was removed in each scenario as shown in table G.1.

*Table G.1: One variable out of 26 variables removed at a time*

| **One variable, out of 26 variables removed at a time** | **Cronbach's alpha** |
|---|---|
| Variable# 1 'Data Security' removed | 0.915 |
| Variable# 2 'Faster decision making' removed | 0.925 |
| Variable# 3 'Customer Insights' removed | 0.917 |
| Variable# 4 'Security Risks' removed | 0.917 |
| Variable# 5 'Customer Experience' removed | 0.919 |
| Variable# 6 'Connecting Customers' mobile phones to petrol pumps' removed | 0.919 |
| Variable# 7 'Increased in-store sales from formerly fuel-only customers' removed | 0.917 |
| Variable# 8 'Convenience' removed | 0.914 |
| Variable# 9 'Customer Expectation' removed | 0.919 |
| Variable# 10 'Customer Relationship' removed | 0.914 |
| Variable# 11 'Brand Value' removed | 0.915 |
| Variable# 12 'Workforce at Outlets' removed | 0.917 |

| | |
|---|---|
| Variable# 13 ‘Marketing’ removed | 0.920 |
| Variable# 14 ‘Return on Investment’ removed | 0.918 |
| Variable# 15 ‘Automation of manual processes’ removed | 0.917 |
| Variable# 16 ‘Cost Optimization’ removed | 0.914 |
| Variable# 17 ‘Efficient new method for performing existing tasks’ removed | 0.918 |
| Variable# 18 ‘Cashless Transaction’ removed | 0.914 |
| Variable# 19 ‘Process Optimization’ removed | 0.915 |
| Variable# 20 ‘Generation of new revenue stream’ removed | 0.917 |
| Variable# 21 ‘Competitive Advantage’ removed | 0.918 |
| Variable# 22 ‘Application Service Provider’ removed | 0.920 |
| Variable# 23 ‘Wearables’ removed | 0.919 |
| Variable# 24 ‘Sensors’ removed | 0.917 |
| Variable# 25 ‘Asset Optimization’ removed | 0.918 |
| Variable# 26 ‘Business Value’ removed | 0.918 |

When all the 26 variables were included, the Cronbach’s alpha was **0.920**. The above tests indicate that the correlation between the 26 variables exists and it validates the overall Cronbach’s alpha as **0.920**. Cronbach's alpha will generally increase as the intercorrelations among test items increase. Cronbach's alpha is a function of the number of items in a test, the average covariance between item-pairs, and the variance of the total score. Cronbach’s alpha should be between 0.7 and 0.95 as shown in Table G.2. *“Very high reliabilities (0.95 or higher) are not necessarily desirable, as this indicates that the items may be redundant”* (Streiner, 2003).

*Table G.2: Cronbach's alpha*

| **Cronbach's Alpha** | **Internal Consistency** |
|---|---|
| $\alpha \geq 0.9$ | Excellent |
| $0.9 > \alpha \geq 0.8$ | Good |
| $0.8 > \alpha \geq 0.7$ | Acceptable |
| $0.7 > \alpha \geq 0.6$ | Questionable |
| $0.6 > \alpha \geq 0.5$ | Poor |
| $0.5 > \alpha$ | Unacceptable |

## *Appendix H* Construct Validity

Construct validity refers to the extent to which operationalizations of a construct (e.g., practical tests developed from a theory) measure a construct as defined by a theory.

We wish to check whether all the 26 significant variables have factor loading greater than 0.40. After determining that the 9 factors would be enough to explain the 68.7% of variance, rotated component matrix was generated. The rotated component matrix is shown in table H.1 below:

*Table H.1: Rotated Component Matrix*

| **Rotated Component Matrix** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Component | | | | | | | | |
| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 | Factor 8 | Factor 9 |
| Data security | | | | 0.779 | | | | | |
| Faster decision making | | | | 0.748 | | | | | |
| Customer insights | | | | | | | | 0.755 | |
| Security risks | | | | | | 0.727 | | | |
| Customer experience | 0.697 | | | | | | | | |
| Connecting Customers' mobile phones to petrol pumps | | | | | | 0.603 | | | |
| Increased in-store sales from formerly fuel-only customers | | | | | | 0.404 | | | |
| Convenience | | | | | | | | | 0.493 |
| Customer expectation | 0.587 | | | | | | | | |
| Relations with | 0.791 | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Stakeholders | | | | | | | | | |
| Brand value | 0.866 | | | | | | | | |
| Workforce at Outlets | 0.713 | | | | | | | | |
| Marketing | 0.635 | | | | | | | | |
| Return on Investment | | 0.808 | | | | | | | |
| Automation of manual processes | | 0.509 | | | | | | | |
| Cost Optimization | | 0.673 | | | | | | | |
| Efficient new method for performing existing tasks | | | | | 0.618 | | | | |
| Cashless transaction | | | | | 0.709 | | | | |
| Process Optimization | 0.461 | | | | | | | | |
| Generation of New revenue stream | | | 0.787 | | | | | | |
| Competitive Advantage | | | 0.790 | | | | | | |
| Application Service Provider | | | | | | | | | 0.815 |
| Wearables | | | | | | | 0.811 | | |
| Sensors | | | | | | | 0.705 | | |
| Asset Optimization | | | | | | 0.516 | | | |
| Business value | | | | 0.561 | | | | | |

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 34 iterations.

The above Table H.1 shows that all the 26 variables have factor loading greater than 0.40 which validates the earlier statement in RM1 *"Variables having factor loading greater than 0.3* (Hair, Anderson, Tatham, & Black, 1998) *were considered significant for sample size of 398* (Yamane, 1967)*"*

It is inferred from the Rotated Component Matrix (above Table) that each variable loads significantly on only one factor. The varimax rotation distributes the variations equally among the nine factors. After getting the Rotated Component Matrix, we are able to identify the variables under the respective 9 factors.

*Table H.2: Variables grouped under nine factors*

| | Rotated Component Matrix | | |
|---|---|---|---|
| **S.No.** | **Factor Name** | **Factor Loading** | **Variables loading on a factor** |
| 1 | Customer focus | 0.697 | Customer experience |
| | | 0.587 | Customer Expectation |
| | | 0.791 | Relations with Stakeholders |
| | | 0.866 | Brand value |
| | | 0.713 | Workforce at Outlets |
| | | 0.635 | Marketing |
| | | 0.461 | Process Optimization |
| 2 | Increase in operating profit | 0.808 | Return on Investment |
| | | 0.509 | Automation of manual processes |
| | | 0.673 | Cost Optimization |
| 3 | Differentiation | 0.787 | Generation of new revenue stream |
| | | 0.790 | Competitive advantage |
| 4 | Value to customer | 0.779 | Data Security |
| | | 0.748 | Faster decision making |
| | | 0.561 | Business value |
| 5 | Adoption of latest technology | 0.618 | Efficient new method for performing existing tasks |
| | | 0.709 | Cashless transaction |
| 6 | Enabling IoT ecosystem | 0.727 | Security Risks |
| | | 0.603 | Connecting Customers' mobile phones to petrol pumps |
| | | 0.404 | Increased in-store sales from formerly fuel-only customers |
| | | 0.516 | Asset Optimization |
| 7 | Connected objects | 0.811 | Wearables |
| | | 0.705 | Sensors |
| 8 | Better usage of customer data | 0.755 | Customer Insights |
| 9 | Partnership with IT service provider | 0.493 | Convenience |
| | | 0.815 | Application Service Provider |

*Extraction Method: Principal Component Analysis*

Rotation Method: Varimax with Kaiser Normalization

Rotation converged in 34 iterations

## *Appendix I* Content Validity

**Content Validity** is a non-statistical type of validity that involves "the systematic examination of the test content to determine whether it covers a representative sample of the behavior domain to be measured".

We wish to check that the variables which are loaded for the respective 9 factors mention about that respective factor. The Rotated Component Matrix is provided in table H.2. The description of each factor obtained from table H.2 is given below.

- **Customer Focus** (Factor 1) **–**The set of variables loaded on this factor highlight the refueling experience of customers, availability of options to consumers; they also focus on value creation with various stakeholders through moving from a one-time transaction to a continuous relationship. It also highlights the increase of brand value due to IoT adoption at OMCs' oil outlets as perceived by customers apart from effectively communicating to them about the benefits such as optimization of processes and optimization of workforce. As the variables focus on customers so the factor name was chosen as 'Customer Focus'.

- **Increase in Operating Profit** (Factor 2) **-** The set of variables loaded on this factor highlight the importance of superior returns and cost minimization due to IoT adoption at the OMCs' oil outlets apart from savings due to automation of manual processes. As the variables focus on improving the operating margins so the factor name was chosen as 'Increase in Operating Profit'

- **Differentiation** (Factor 3) **-** The set of variables loaded on this factor highlight the competitive advantage to OMCs due to the adoption of IoT at

their oil outlets. It also highlights the new revenue stream generation due to selling of new products and services enabled by IoT at their oil outlets. As the variables focus on differentiation and competitive advantage so the factor name was chosen as 'Differentiation'.

- **Value to Customer** (Factor 4) - The set of variables loaded on this factor highlight the business value to OMCs' oil outlets through cloud storage, high speed networks. It also highlights faster decision making enabled by IoT apart from security of customer data. As the variables focus on business value provided to customers so the factor name was chosen as 'Value to Customer'

- **Adoption of Latest Technology** (Factor 5) - The set of variables loaded on this factor highlight the cashless transactions and new ways of performing existing tasks through the adoption of latest technology such as IoT at OMCs' oil outlets. As the variables focus on adoption of latest technology so the factor name was chosen as 'Adoption of latest technology'.

- **Enabling IoT Ecosystem** (Factor 6) - The set of variables loaded on this factor highlight the real-time secure data provided to consumers through their smart phones such as smart discount offers, past transaction history, shortest route to the oil outlet etc. It also highlights the tracking of assets (machinery, equipment, tools, etc.) using sensors. As the variables focus on running the ecosystem enabled by IoT so the factor name was chosen as 'Enabling IoT Ecosystem'.

- **Connected Objects** (Factor 7) - The set of variables loaded on this factor highlight the sensors and wearables being used at OMCs' oil outlets to monitor and generate data which is churned into valuable information. As the variables focus on objects which are connected for generation of useful information so the factor name was chosen as 'Connected Objects'.

- **Better Usage of Customer Data** (Factor 8) **-** The variables loaded on this factor highlight the customer insights generated through the use of predictive analytics. As the variable focuses on usage of customer data effectively so the factor name was chosen as 'Better usage of customer data'

- **Application Service Provider** (Factor 9) - The set of variables loaded on this factor highlight the importance of Application Service Providers in implementation of IoT at OMCs' oil outlets so the factor name was chosen as 'Application Service Provider'.

The above clearly show that the variables(s) loaded for each factor mention about that respective factor.

## *Appendix J* Face Validity

**Face validity** is an estimate of whether a test appears to measure a certain criterion; it does not guarantee that the test actually measures phenomena in that domain. We wish to check that the identified variables are the digital enablers that help increase employee productivity and operational efficiency in Indian Public Sector Retail Oil Outlets. Based on the outcome of the semi-structured interview (15 respondents, till data saturation happened) the following 26 variables were finalized:

- **Data Security –** IoT enables secure payment through Smartphones
- **Faster Decision Making –** IoT enables decisions to be taken faster through analysis of the data
- **Customer Insights –** IoT provides customer insights through predictive analytics
- **Security Risks –** Customer data and security risks need to be addressed effectively for effective IoT implementation
- **Customer Experience –** Refueling experience significantly increases at Retail Oil Outlets through IoT
- **Connecting Customers' Mobile Phones to Petrol Pumps –** IoT provides information on the nearest Oil Outlet, shortest route to the Outlet, track the chain of past transactions, payment modes and offers smart discount offers to customers
- **Increased In-store Sales from Formerly Fuel-only Customers –** Personalized offers bring more customers to Convenience stores who used to formerly only refuel at the pump

- **Convenience –** Apart from cashless transaction, IoT can help a customer to identify closest parking spot, alerts the driver when the vehicle runs low on fuel and navigates the driver to the nearest Retail Service Station
- **Customer Expectation –** IoT can provide value, flexibility, simplicity and options to customer
- **Relations with Stakeholders –** IoT can help create more sustained value through moving from a one-time transaction focus to a continuous, relationship focus with customers, suppliers, workers and assets
- **Brand Value –** The brand value significantly increases as a result of IoT adoption
- **Workforce at Outlets –** IoT adoption significantly reduces the work force at Retail outlets
- **Marketing –** Communicating the value of the IoT adoption to prospective customers will enhance sales
- **Return on Investment –** IoT helps to generate superior returns and increases the return on R&D investments
- **Automation of Manual Processes –** Many of the manual processes could be automated through IoT thereby eliminating the need for repetitive human labor, improving ease of use and removing human error
- **Cost Optimization** – IoT holds the key to cutting costs in Retail Oil Outlets
- **Efficient New Method for Performing Existing Tasks** – IoT enables the existing tasks to be executed faster and provides new ways of delivering services
- **Cashless Transaction –** It involves scanning a QR code at the pump, selecting how much fuel to be refilled without having to pay through wallet
- **Process Optimization –** IoT enables optimization of processes at Retail Oil Outlets

- **Generation of New revenue stream –**IoT enables to sell new products and services at Retail Oil Outlets, thereby, enabling fuel retailers to gain new revenue streams Example: Usage based insurance policies
- **Competitive Advantage –** IoT presents a new means for the business to build competitive advantage. Integrating IoT into the main business is necessary to remain competitive
- **Application Service Provider –** Service providers need to be engaged with for interpretation and analysis of generated data
- **Wearables –** Wearable watches increase collaboration with workers
- **Sensors –** They collect information about physical assets to monitor status or behavior. They can monitor inventory on real time basis. IoT enabled sensors can be used to monitor power use, tailor the operation of equipment to business hours, customer traffic and even weather conditions at the Retail Oil Outlets
- **Asset Optimization –** With improved tracking of assets (machinery, equipment, tools, etc.) using sensors, businesses can benefit from real-time insights and visibility into their assets and supply chains. They could more easily locate assets and run preventive maintenance on critical pieces of infrastructure and machinery to improve throughput and utilization
- **Business Value –** Connected devices can unlock tremendous business value for Retail Oil Outlet business through higher speed networks, cloud storage, computing power and falling cost of sensors

Thus, the above 26 variables are the digital enablers that help to increase employee productivity and operational efficiency in Indian Public Sector Retail Oil Outlets. The following three variables were eliminated based on the responses of the respondents.

- **Sensor and Hardware Producers –** Tie-ups have to be set up with Service Providers for IoT adoption

- **Mass Market –** Scalability of IoT adoption will address the broader mass market over a period of time
- **Market Share –** IoT grows the market share for Indian Public Sector fuel retailers by adding more customers to the respective Company /Outlet

## *Appendix K* Criterion Validity

**Criterion validity** evidence involves the correlation between the test and a criterion variable (or variables) taken as representative of the construct. In other words, it compares the test with other measures or outcomes (the criteria) already held to be valid.

Here, we have taken the correlation between the Cronbach's alpha test (0.920) and the criterion as KMO test and Bartlett test of sphericity. The sampling adequacy was checked using the Kaise-Meyer-Olkin (KMO) test. To be eligible for Factor Analysis, the KMO score of 0.5 or higher was preferred. In the current research, the KMO score was **0.715** which was adequate to proceed with Factor Analysis.

*Table K.1: KMO and Bartlett's test*

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .715 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3791.459 |
| | Df | 325 |
| | Sig. | .000 |

Bartlett Test of Sphericity tests the interrelation among the variables being used for factor analysis. It is used to verify the null hypothesis 'the variables are independent of each other'. If the null hypothesis is accepted, it means that the variables are independent of each other, thus there is no emergence of any factor.

This null hypothesis should be rejected so as to confirm to assumption of factor analysis that there exists significant correlation among the variables. In the current research, the Bartlett test of sphericity is significant which rejects the null hypothesis that the variables are independent of each other. This signifies that the variables are correlated, which is a necessary condition to proceed with factor analysis.

Both the KMO and Bartlett tests were adequate to proceed with factor analysis. As the sampling adequacy came out as **0.715** so the Principal Component Analysis (PCA) method of factor analysis was applied.