

Introduction and Background

- “ The rapid recovery of the oil and gas sector from natural disasters such as Hurricane Harvey is important for the local economic development of Southeast Texas.
- “ The recovery of this industry depends on efficient risk management from natural disasters.
- “ In this study Participatory Analysis of Risk Management (PARM) methodology is developed and used to determine the best risk management practices of recovery and resiliency from natural disasters.

Introduction and Background

- “ The oil and gas sector of the economy, directly and indirectly, employed more than 50,000 people in Beaumont - Port Arthur MSA. It is more than 30% of the employed population of this region and the sector showed GDP annual compound growth of between 9.3% (2018/2017) and 21% (2017/2016)
- “ Examples of major employers in this sector are: refineries - Exxon Mobil, Motiva, Valero, Total, and petrochemical plants - Dupont, BASF, Chevron, Goodyear. These companies have billions of dollars of assets and revenues invested in the Southeast Texas region. The oil and gas sector is important for the stability and growth of the local economy.

Introduction and Background

Table 1. Major storms in Texas and financial losses

#	Storm	Year	Economic loss	Insured loss
1	Allison	2001	\$ 12.0 billion	\$ 5 billion
2	Rita	2005	\$ 23.9 billion	\$ 11 billion
3	Ike	2008	\$ 43.0 billion	\$ 21 billion
4	Harvey	2017	\$ 125.0 billion	\$ 30 billion

Introduction and Background

The most serious storm for the oil and gas sector was Harvey

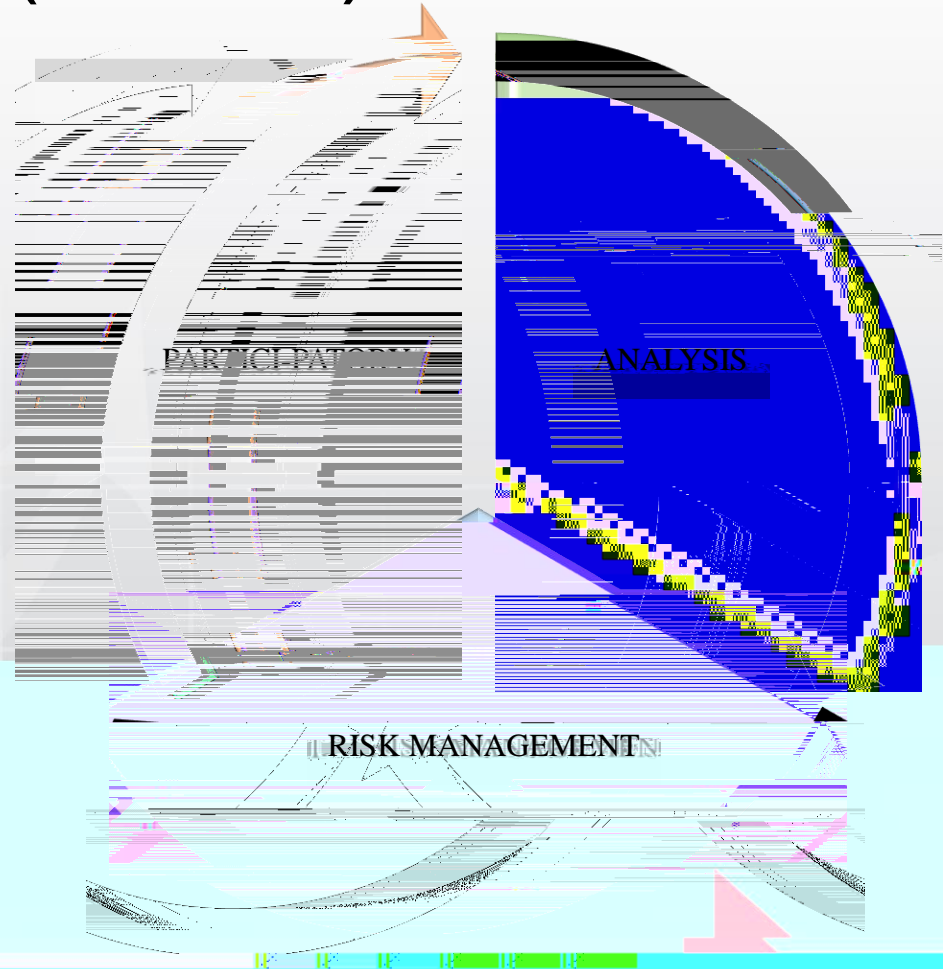
- “ 60% of U.S. upstream chemical manufacturing capacity impacted
- “ shut down of:
 - “ 25% of U.S. refining capacity (24 refineries - 3,871,449 barrels per day)
 - “ 24.5% of oil production in the Gulf of Mexico (428,568 barrels per day)
 - “ 25.9% of natural gas production (835 mln cubic feet per day)
 - “ more than 50% of the US production of ethylene
 - “ 50% of the US of polyethylene production
 - “ 60% of the US production of polypropylene
- “ 105 of 737 production platforms in the Gulf of Mexico were closed
- “ disruption of more than one-third of US chemical production
- “ pipelines were affected, transportation backlog
- “ on September 15, 2017, a month after Harvey made landfall most refineries and chemical plants had restarted

Participatory Analysis of Risk Management (PARM)

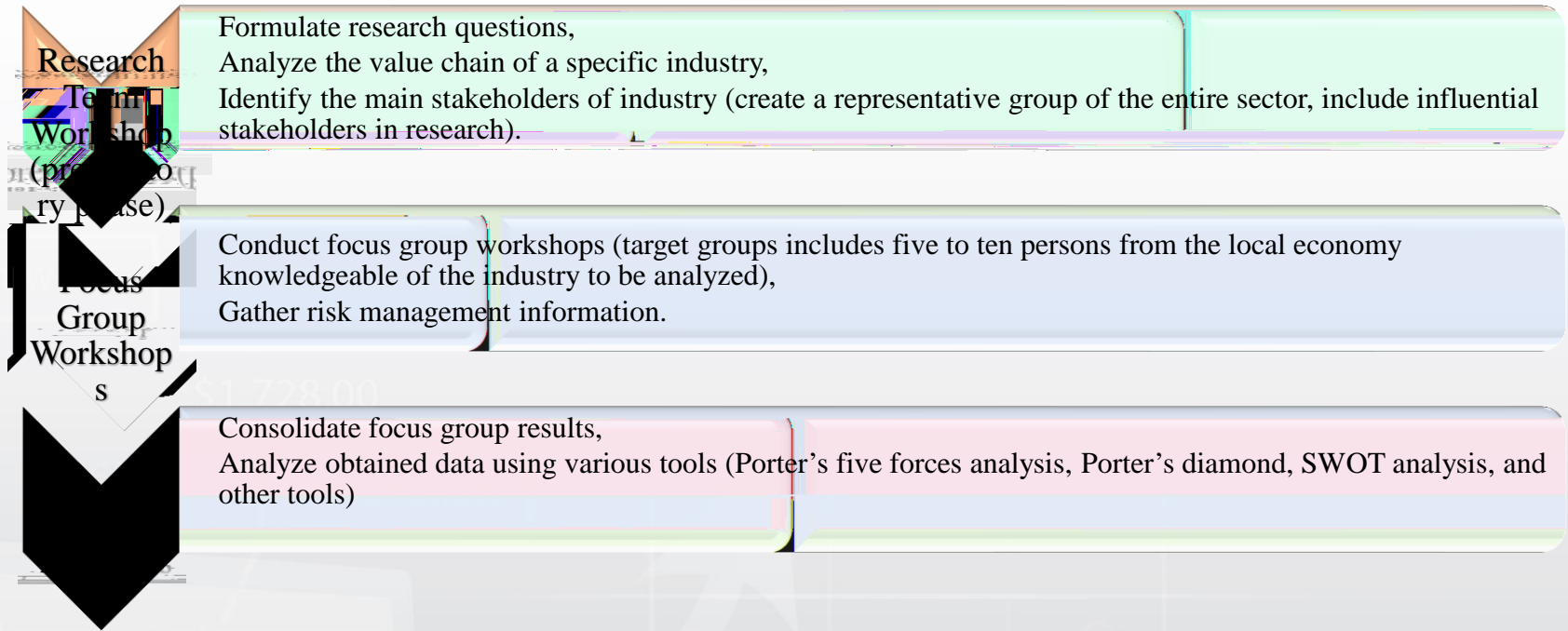
- “ Based on the Participatory Appraisal of Competitive Advantage (PACA).
- “ PACA method emerged from the cooperation between the Chamber of Industry and Commerce, Brazil and the Chamber of Arts and Crafts, Germany. (Meyer-Stamer, 2006)
- “ The PACA model uses the theory of location competition and economic development by well-known researcher and Harvard Business School professor Michael Porter.
- “ Value chain analysis and value chain analysis to capture the structure of each sector of the local economy
- “ PACA methodology has been successfully used in more than twenty countries by researchers, universities, international organizations, local governments, and others.

Participatory Analysis of Risk Management (PARM)

Three core elements:



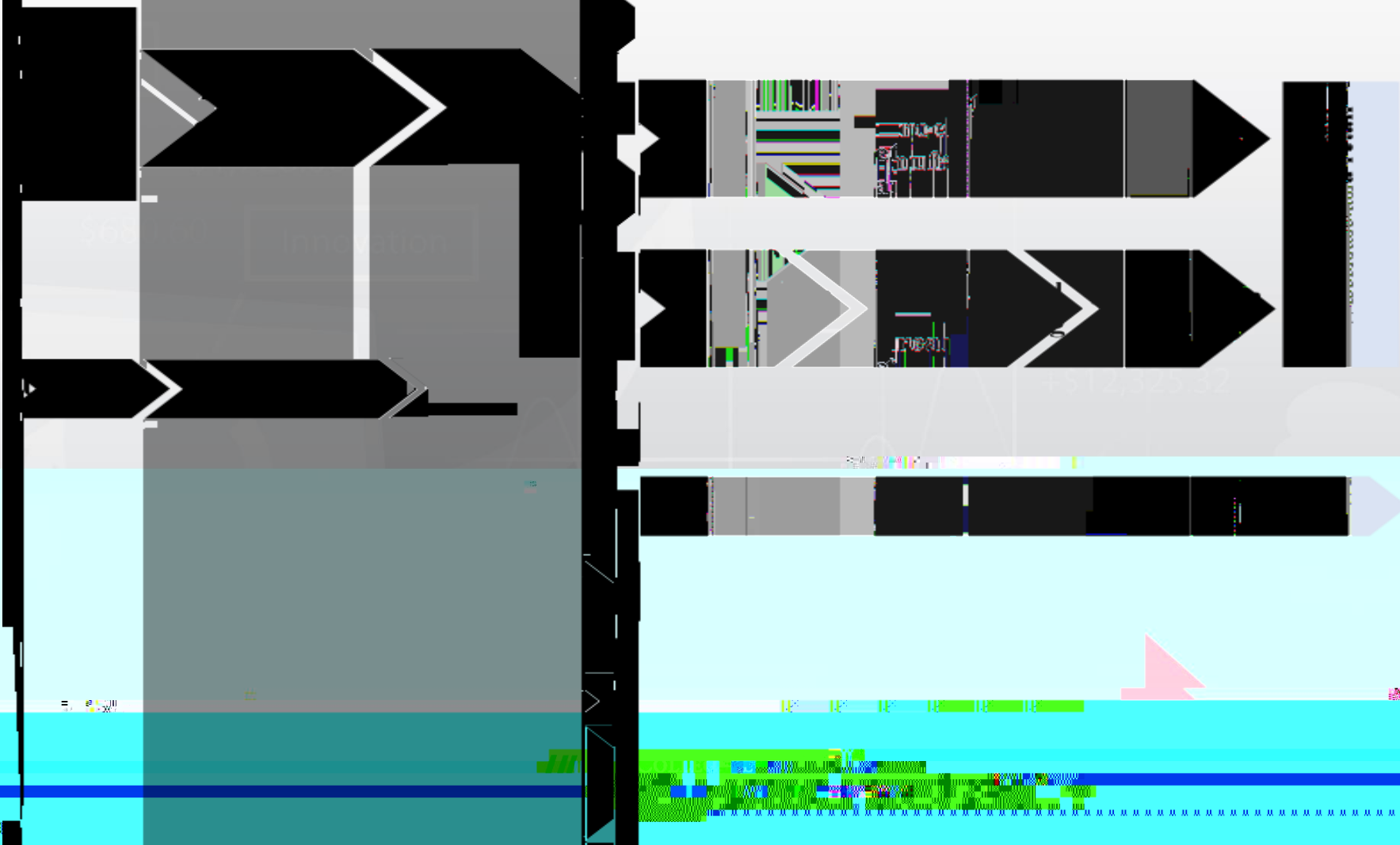
PARM's workflow chart



Application of PARM to the oil and gas sector in Southeast Texas

- “ What risks/problems did you experience during Hurricane Harvey?
- “ What were the most successful risk management strategies that you/your group used during Hurricane Harvey? Why?
- “ Were there risk management strategies that were not as successful that were used during Hurricane Harvey? Why?
- “ How did you manage the recovery process? What risks or challenges did you encounter during recovery?
- “ What role did technology (including communications) play in the Hurricane Harvey response? Which were the most critical technologies? What do you see as the role of technology in the future?
- “ What would you like to see happen if there is ever another hurricane in Southeast Texas and what steps will help us to move in that direction?

Value Chain Analysis of the oil and gas sector in Southeast Texas



Findings of PARM methodology for Plant Shutdown



Findings of PARM methodology for Plant Shutdown

- Most of the plants were prepared to receive Harvey.
- The facilities are designed to handle natural disasters of this kind.

was on the city's water system, it's quite a problem for certain conditions.

Some guard logs or supplies were disrupted.

Geography

Teamwork

\$1,728.00

\$680.60

Innovation

+\$12,325.32

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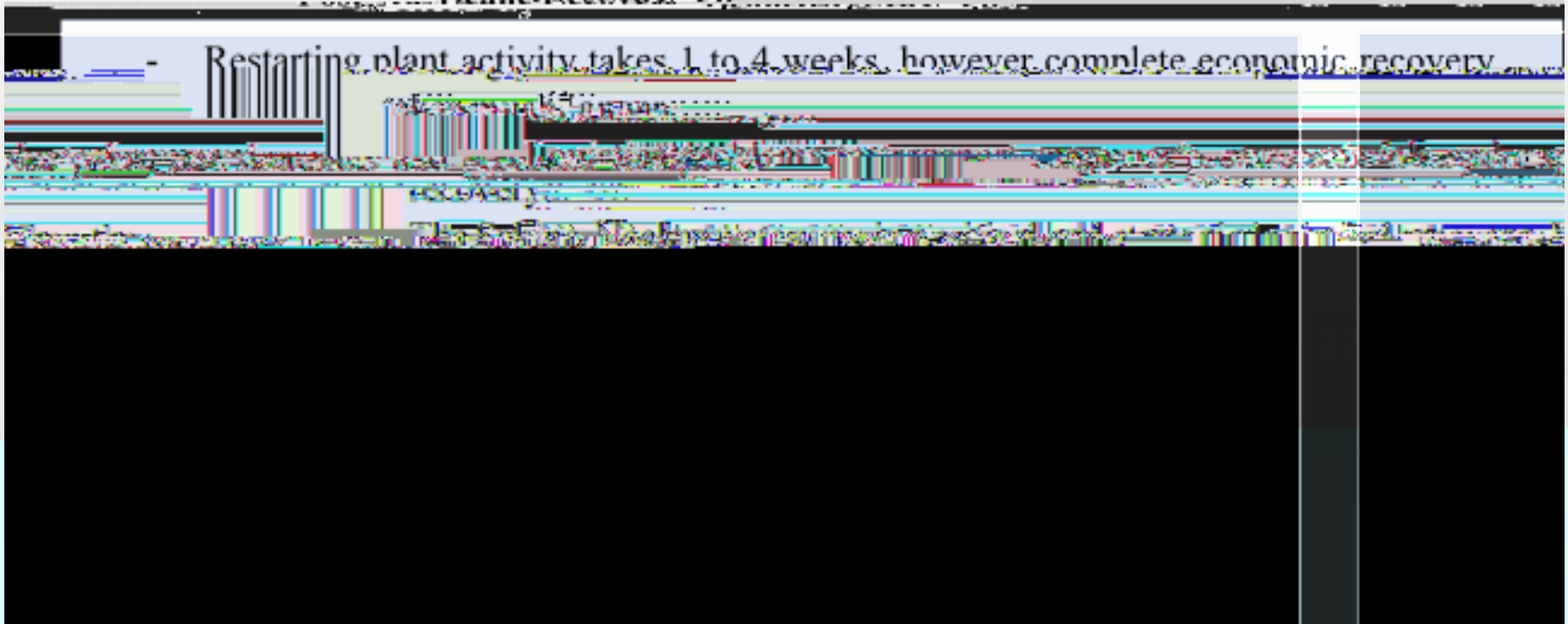
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Results of PARM methodology during Plant Restart

Past Hurricane Recovery

- Restarting plant activity takes 1 to 4 weeks, however complete economic recovery



Results of PARM methodology during Plant Restart

Teamwork

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\$680.60

Innovation

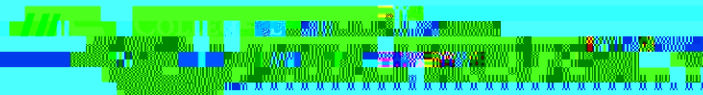
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Results of PARM methodology during Plant Restart

Best Practices of Risk Management and Lessons from Harvey



Results of PARM methodology for Human Resource Mgmt during Plant Shutdown and Restart

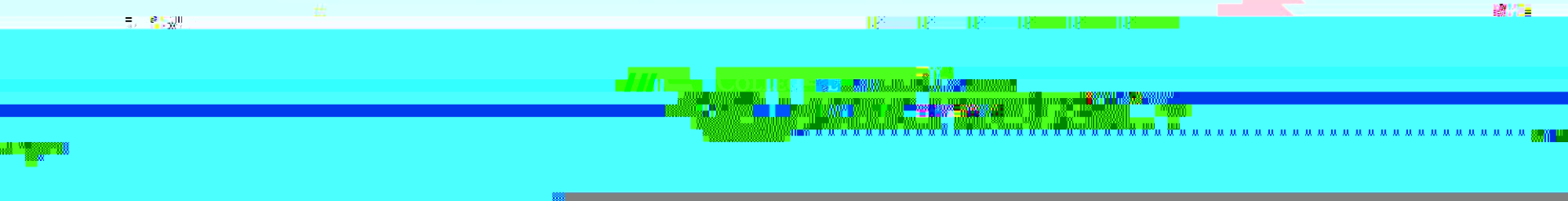
Hurricane's Impact on Human Resource Management

- Refinery shut down and especially recovery need extra manpower

How the shutdown and restart was managed using PARM methodology

CONSIDER...

Results of PARM methodology for Human Resource Mgmt during Plant Shutdown and Restart



- Remote work for those employees who could complete their tasks from distance

Richard Forman was interviewed by the author on 10/15/2017

...in the event of a disaster, the company's response is to have a disaster recovery plan that is based on geographic dispersion of data centers and employees.

...one of the main reasons for the company's success in recovering from the disaster was the ability to take over the emergency response actions (this strategy allows return to normal operations more quickly).

- Since Hurricane Rita, plants have implemented better communication with employees. These include text alerts and social media postings by oil and gas companies and by the city. A kit was distributed to employees and their families to ensure access to important sites.

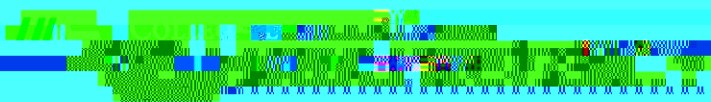
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Conclusions

Recovery and resiliency depend on motivation, engagement, and collaboration of local stakeholders. Risk management knowledge, skills, and resources are crucial for resiliency and recovery. Robust private and public collaboration during risk management is needed before, during and after natural disasters. Risk management education programs can help to implement efficient risk management. Best risk management practices/tools, emergency simulations, and risk management training can help to be better prepared for hurricanes and storms.