RUTGERS

THE STATE UNIVERSITY
OF NEW JERSEY

Expert Knowledge Elicitations in a Procurement Card Context:

Towards Continuous Monitoring and Assurance

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INTRODUCTION: P-Card Fraud Risk and Project Story

- Why do P-cards create higher fraud risk than employee credit cards?
  - P-card owners have a <u>higher volume</u> of transactions on a <u>normal</u> basis, while employee credit card usage is typically limited to a periodic event or business trip.
  - For P-card transactions, no pre-approval is required, while employee credit card transactions may require formal manager approval before the credit card provider is reimbursed.
  - Transaction amounts are higher due to type of goods/services purchased, which may increase the <u>rationalization</u> to commit fraud, even in small amounts.
  - Difficulty to detect misuse increases <u>opportunity</u>, which, together with rationalization, constitute two out of three fraud triangle components.
- Previous software audit tools were found not effective, and the firm's procurement card fraud expert, Lisa, is manually reviewing transactional data every month
- Large international consumer goods manufacturer with many diverse products and divisions. P-cards mainly used for MRO and research purposes.

2 Phases of the project:
- Build an expert system (an "electronic Lisa")
- Improve anomaly detection rate in p-card data

Introduction: Project Story

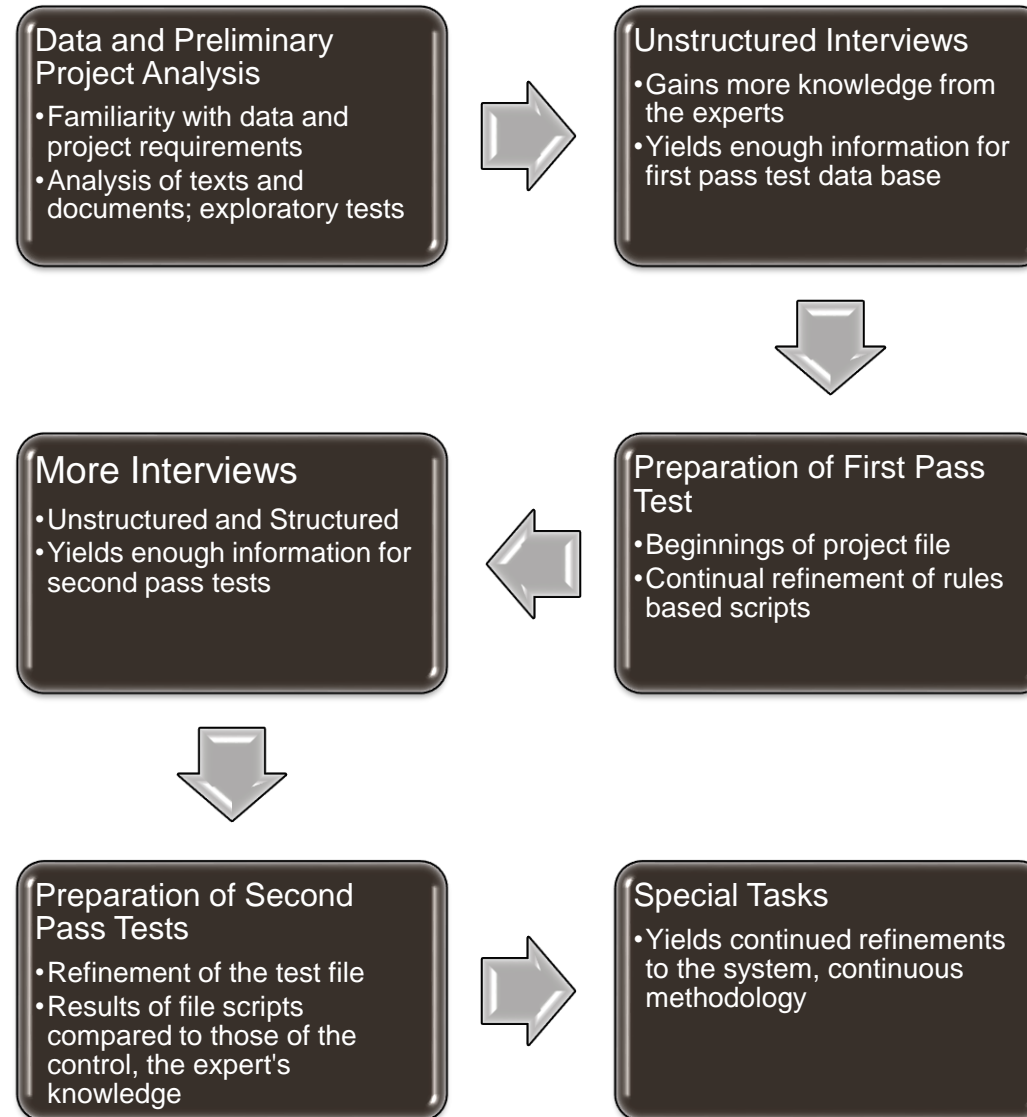| Measure for Jan 2013 to April 2014	Total Data Set	Missing Purchase Item Information Data Set
# of Transactions	741,710	194,528 (26% of total)
# of Employee IDs	4532 (cards are 5600)	4339
Total $ Fin Original Currency	$157,115,184	$65,926,544 (42% of total)
Total # of vendors	101,900	41,258

Methodology: Data Preprocessing and Exploration

Merchant	# of Trans	# of Emp	$ Total
Walmart	4171	1290	$343,750
Sam's Club	819	259	$126,612
Amazon	11,690	276	$19,302
Target	224	115	$37,170
Ulta/Sally B	51	21	$6804
Petsmart	174	43	$12,328
PetCo	116	9	$60,764

...ne of the main challenges: missing data!!!

ID	City	Original Currency Amount	Merchant Name	Item Description	P... Code	Purchase Date
ID0484	ORLANDO	2,367.68	WM SUPERCENTER			
ID2934	CINCINNATI	2,472.93	WM SUPERCENTER			
ID0918	CINCINNATI	2,231.71	WM SUPERCENTER			
ID0918	CINCINNATI	2,393.84	WM SUPERCENTER			
ID0918	CINCINNATI	2,450.16	WM SUPERCENTER			
ID0918	CINCINNATI	2,454.88	WM SUPERCENTER			
ID0918	CINCINNATI	2,499.41	WM SUPERCENTER			
ID3264	WEST CHESTER	2,417.45	WM SUPERCENTER#3502			
ID0918	CINCINNATI	2,320.69	WM SUPERCENTER			
ID4347	JACKSON	2,459.78	WALMART.COM			
ID4347	JACKSON	2,384.48	WALMART.COM			
ID1547	RUSSELLVILLE	2,200	WAL-MART			
ID1547	RUSSELLVILLE	2,500	WM SUPERCENTER			
	TOTAL	31,153.01				

Phases of Expert System Development

Data and Preliminary Project Analysis
- Familiarity with data and project requirements
- Analysis of texts and documents; exploratory tests

Unstructured Interviews
- Gains more knowledge from the experts
- Yields enough information for first pass test data base

More Interviews
- Unstructured and Structured
- Yields enough information for second pass tests

Preparation of First Pass Test
- Beginnings of project file
- Continual refinement of rules based scripts

Preparation of Second Pass Tests
- Refinement of the test file
- Results of file scripts compared to those of the control, the expert's knowledge

Special Tasks
- Yields continued refinements to the system, continuous methodology

# KNOWLEDGE ACQUISITION

Limits analysis:

ID	Purchase Date	Total dollar amount spent per day	Monthly Credit Limit	Single Transaction Limit	Transactions per day	Difference - Single limit	Difference - Monthly limit
ID2974	11/29/2012	267,087.61	75,000	2,500	141	264,587.6	192,087.6
ID1929	9/10/2012	136,551.81	60,000	10,000	574	126,551.8	76,551.8
ID5209	5/17/2012	99,599.03	75,000	2500	3	97,099.0	24,599.0
ID1967	12/19/2012	96,250.89	75,000	2,500	3	93,750.9	21,250.9
ID1929	11/12/2012	99,821.08	60,000	10,000	193	89,821.1	39,821.1
ID3723	5/15/2012	89,625.26	75,000	10,000	421	79,625.3	14,625.3

Geo Heat-Maps:
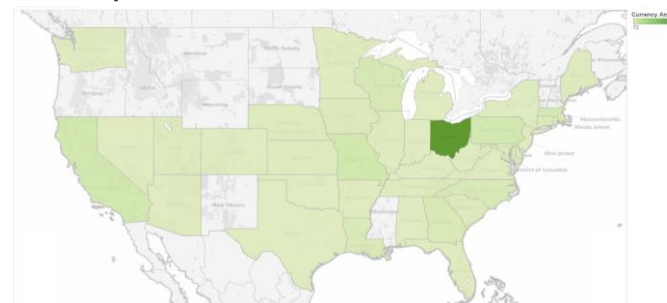
Employee Transactions:

Text Mining:
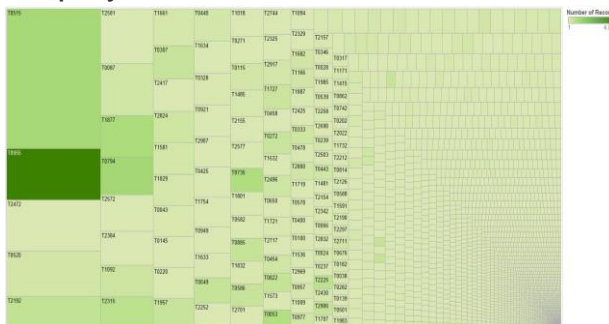
| ID	Purchase Date	Original Currency Amount	Extended Item Amount	Merchant Name	Item Description
ID1637	2/17/2011	0	50	STAPLES 00101907	$ 50 APPLES ITUNES
ID1917	2/22/2012	0	7.59	TARGET 00014472	POKER CHIPS 11.5G GAME ESSEN
ID0925	3/25/2011	84.95	75	AMAZON MKTPLACE PMTS	ITUNES GIFT CARD
ID4720	7/22/2011	0	10	BOLDEN INSTRUMENT	FUEL CHARGE $10
ID2503	10/6/2011	31.95	31.95	AMAZON MKTPLACE PMTS	PROACTIV SOLUTION ORIGINAL REPAIRIN
ID0305	10/11/2011	16.28	12.99	AMAZON.COM	CONAIR TOUCH AND TONE MASSAGER WITH
ID2315	10/11/2012	49.69	41.66	STAPLES	STRESS BUSTER MASSAGE FOOT
ID5477	11/14/2012	24.5	22	AMAZON MKTPLACE PMTS	BRIDAL WEDDING JEWELRY HAIR HEADBAN

Expert System Decision Tree:
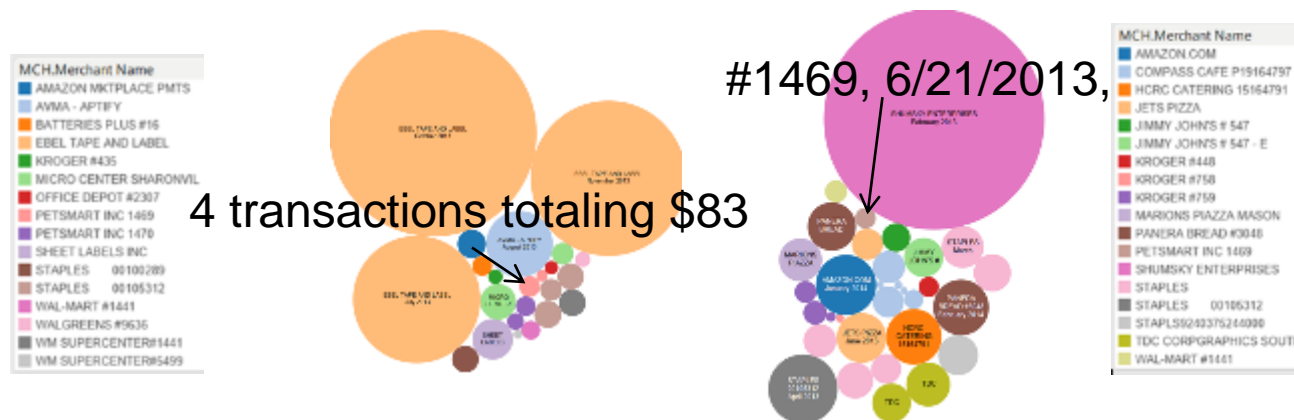
EXPERT

P-CARD TOOL

- The tool was also developed in an EXCEL version due to the firm's request.

- The tool has different levels of exceptions, from high false positives to high false negatives
  - The expert will have the ability to decide which level to focus on
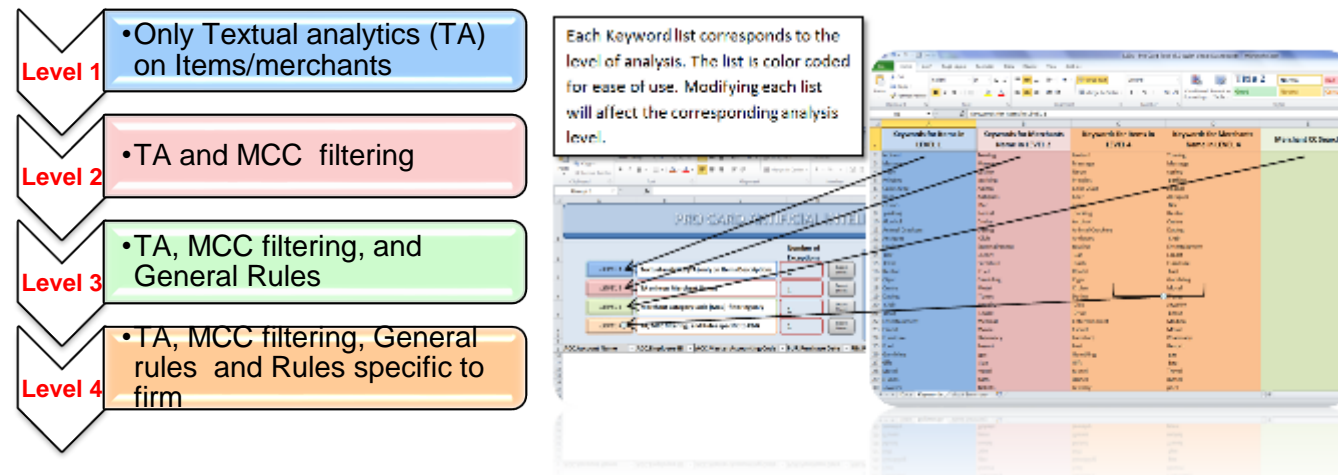
P-CARD TOOL - ILISA

- We added a new feature which includes a visual dashboard of exceptions founds.

- The dashboard provides a quick and efficient way of observing exceptions and noticing any spikes in the visuals.