The Emergence of Data Analytics in Auditing: Perspectives from Internal and External Auditors through the Lens of Institutional Theory

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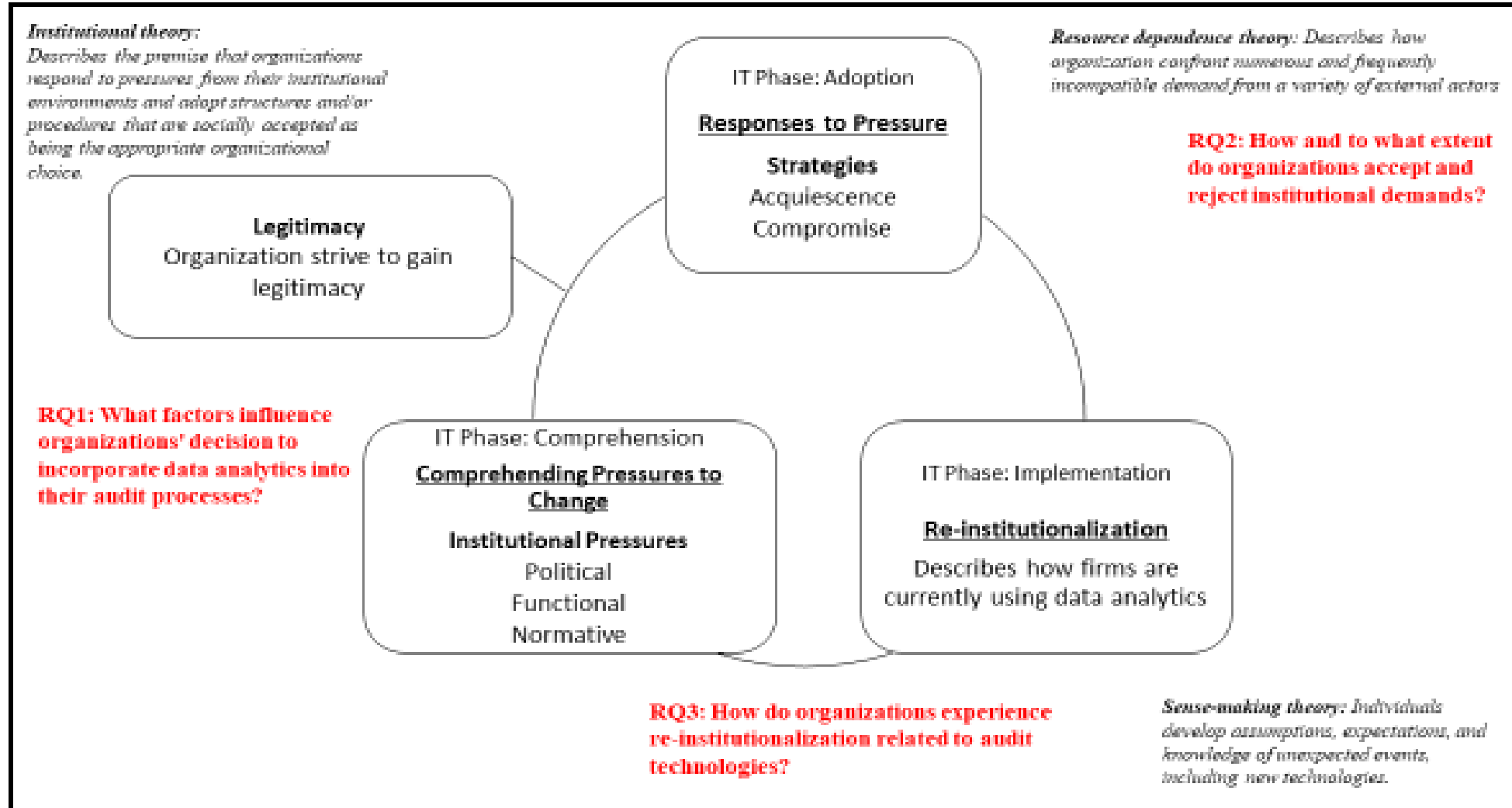Helen Brown-Liburd, *Rutgers The State University of New Jersey*

Motivation

- Data analytics is transforming how organizations operate, (Issa 2013; Vasarhelyi et al. 2015; Moffitt and Vasarhelyi 2013) and the advent of more advanced data analytic tools has the potential to drastically transform the audit process, and facilitate audit quality (Brown-Liburd et al. 2015; Cao et al. 2015; PwC 2015).

- Despite the acknowledged power of data analytics, and the significant financial investments being made by organizations, auditors primarily use data analytics in a limited capacity (Austin et al. 2018).

- Our understanding about the use of data analytics in auditing is **limited** (Wang and Cuthbertson 2015).

- The question remains as to why the audit profession has not fully embraced data analytics.

- What institutional, organizational, and auditor specific factors influence the transformation of the audit process, and how auditors respond to these institutional factors

Research Highlights

- Overall research question" How is data analytics transforming audit processes
  - institutional field (i.e., environment-level),
  - organizational (i.e., audit firm-level), and
  - individual level
- Specifically:
  1. What are the institutional drivers of adoption of audit data analytics?
  2. How and to what extent do organizations incorporate audit data analytics?
  3. How are organizations currently using audit data analytics?
- Qualitative study - Developed a conceptual model based on responses from semi-structured interviews with 27 internal and external auditors.

Conceptual Model

CONTRIBUTIONS

➢ Research
  ➢ Responds to calls for research (e.g., Wang and Cuthbertson 2015; Appelbaum et al. 2017) about determinants that affect the decisions to incorporate data analytics into the audit process.
  ➢ Development of a conceptual model to provide insight into how data analytics is transforming the audit process and the organizational and individual responses.

➢ Practice
  ➢ document the institutional and market pressures that drive the acceptance and usage of data analytics
  ➢ provide insight into why organizations do not fully utilize data analytics

➢ Policy
  ➢ provide evidence critical to regulators and standard setters as they debate whether and how the auditing standards should be amended to address incorporating data analytics in the audit process.

Conceptual Model

- Comprehensively describes the emergence of the use of data analytics by audit professionals from the institutional perspective based on the IS Innovation Framework (Swanson and Ramiller 2004)
  - Comprehension
  - Adoption
  - Implementation
  - Assimilation

1. Institutional theory the institutional pressures organizations experience to transform and incorporate data analytics into the audit process,
2. the strategies they adopt in response to these pressures to change, and
3. their attempts to gain legitimacy within their environment.

RQ1: Institutional Pressures

- **Institutional theory** is used to describe the comprehension phase
  - Institutional theory is concerned with how an organization's institutional environment affects decision making, and how the organization adapts to forces from their institutional environment in order to maintain legitimacy
  - The advent of advanced technological tools has caused audit institutions to rethink established auditing processes and to respond to competing forces as they rethink the traditional audit approach
  - Institutions impose institutional pressures on organizations which can shape the implementation and assimilation of new technologies by guiding institutional norms (Liang, et al. 2007).
    - External vs. inter organization pressures

What factors influence organizations' decision to incorporate data analytics into their audit processes?

RQ2: Strategies

- **Resource dependency theory** is used to express the organization's choice of response strategies to institutional pressures to **adopt** data analytics
    - The resource dependence perspective suggests that organizations adopt a combination of legitimization strategies in response to institutional pressures (Oliver 1991).
    - Transformation of existing audit processes is likely to result in differential to manage stakeholder reactions.
    - There are five strategic responses to institutional processes ranging from passivity to increasing active resistance (Oliver 1991)
        - acquiescence,
        - compromise,
        - avoidance,
        - defiance, and
        - Manipulation

How and to what extent do organizations accept or reject institutional demands?

RQ3: Re-Institutionalization

- **Sensemaking theory** is used to examine the procedures that auditors engage in when **implementing** data analytics in their attempts to gain legitimacy within their environment.

  – Sensemaking theory emphasizes micro-level processes (Weick 1995; Weber and Glynn 2006), and focuses on how implementation is influenced by those in the organization who will use the new technology (Barley 1986; Orlikowski and Robey 1991).

  – During re-institutionalization new ideas begin to emerge, and the possibility of change now exists.

  – The need to make sense intensifies in circumstances where individuals face unexpected situations in their organizations, experience a high degree of ambiguity, and there is no predetermined way to act.

  – During sensemaking, auditors' subsequent actions toward the use of data analytics are shaped to create a new institutional context (Jensen et al. 2009).

How do organizations experience re-institutionalization related to audit technologies?

Research Method

- Our approach to examine our research questions:
  - 27 Semi-Structured Interviews
    - 14 external auditors and 13 internal auditors.
    - Variety of industries represented: manufacturing, healthcare, entertainment, and telecom.

- Interviews
  - All authors participated in conducting and coding interviews.
    - Occurred in person or via phone
  - Conducted interviews until we reached saturation.
  - Average length of time: 49 minutes
    - Longest 61 minutes
    - Shortest 25 minutes
  - Collection Period
    - 11/16 – 3/18

Demographics of Interview Participants

ID	Firm Size	Title	Auditing Experience	Primary Industry
External Auditor				
E1	Big 4	Managing Director	15	Industrial Products
E4	Big 4	Partner	15	Telecom, IT, Media
E9	Non Big4	Manager	5	Healthcare
Internal Auditor				
I5	-	Director	21	Manufacturing
I9	-	IT Audit Manger	14	Insurance
112	-	Director	13	Natural Gas

Phase I – Pressures to Change

POLITICAL PRESSURES

- PCAOB and Institute of Internal Auditors (IIA)
- Business/Client Environment
- Internal Audit Function (IAF) Constituents

*"[The] **PCAOB is very interested in seeing us move forward** with analytics but in terms of I think encouraging it or really providing guidance, I think it's very limited." -* IA Manager

*"Within the realm of the **competitive landscape** of a big firm compared to competitors and/or even at the mid-tier level, it's [audit data analytics] almost a requirement or a necessity at this point." -* EA National Director

*"We'll start with the areas where there is that risk of fraud or misuse or abuse and in this case it's even better because the **management of the area itself is very motivated** to have us involved and help them put a program in place." -* IA Director

Phase I - Pressures to Change

FUNCTIONAL (innovative) PRESSURES

• Innovative Technology

*"I think **complexity is definitely increasing**. I'm hoping data quality improves and **I think that there's going to be more continuous assurance within audit** and then more continuous monitoring within management just to insure that things are working well." –* IA Information Technology (IT) Manager

SOCIAL PRESSURES

• Normative Pressures
  – Audit Profession
  – Changes in societal expectations

Why do organizations respond to pressure?

- Gain and maintain **legitimacy**

- Organization legitimacy *is the perceived appropriateness of an organization to a social system in terms of rules, values, norms, and definitions*. (Deephouse et al. 2017)

Legitimacy influences organizational
  - Behavior,
  - Performance, and
  - Survival

Phase II – Responses to Pressures

ACQUIESCENCE (acceptance) STRATEGY

- **Compliance tactic**

*"I know the IIA [Institute of Internal Auditors] like the AICPA and the PCAOB **are very interested** in seeing us **move forward** with analytics."* - IA Manager

- **Imitation tactic**

*" I get the impression that we're maybe **lagging 12 to 18 months**, maybe even more than that, behind some of the others firms…"* - EA Manager

Phase II – Responses to Pressures

COMPROMISE STRATEGY – External Auditors

- Balance - Conflicting institutional demands and expectations

  – PCAOB inspection findings

  – Auditor technical knowledge

  – Audit engagement feasibility

"*my skill set is **not thinking** about what's possible out there from a **technology standpoint**.*" - EA Partner

"*There is a bigger push to adopt and to automate areas where you can so that you truly can **free up valuable resource time** and put it where it should be.*" - EA National Director

Phase III – Re-institutionalization

CURRENT USAGE

- **To extract and test full population datasets**
  - Continuous auditing – monitor the population

- **To assess fraud** (i.e. journal entry testing)
  - Ex. Credit card transactions, accounts payable (duplicate vendors/payments), insurance

- **Risk Assessment**
  - Identify areas of focus
  - What drives risk

Phase III – Re-institutionalization

Areas organizations are NOT using audit data analytics

- Decision on whether to accept or continue an audit engagement

- Substantive analytical procedures

- Review stage of the audit

Phase III – Re-institutionalization

TRAINING

– Majority of training is provided by a national office or third-party.

– Technology related training is not mandatory for all auditors.

- *""it's kind of a **national group** where you call them and tell them what you're trying to do, and the data set, and they work with you on your engagement to figure out what you need to do and what you need to get from a data perspective."* - EA Manager

- *"we have, I wouldn't say required [training], but it's definitely training that is offered. [The training] is like a **cafeteria-style type plan**, if you like it, they have it at their disposal."* - EA Senior

Overview Main Findings

Phase I - Pressures to Change

Auditors are influenced by competition, client/management, and regulatory bodies to incorporate data analytics.

Phase II – Responses to Pressures

Auditors are faced with competing incentives and factors that influence their decision to incorporate audit data analytics.

– The current usage of audit data analytics is very simple, i.e., excel and ACL. Auditors are starting to use more complex tools

Phase III – Re-institutionalization

Training is a significant factor that influences how audit data analytics is becoming an institutionalized activity.

– the knowledge and skill set of the auditor will have to change. For example, two auditors at the same rank/level could have diverse expertise and will approach problems differently
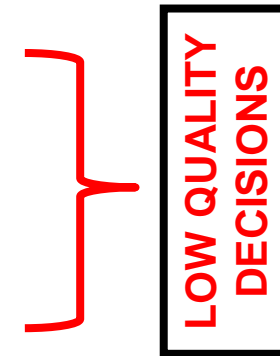
Introduction

- Increased use of computerized systems and decreased cost of storage led to generation and capture of large amounts of data.

- While capturing data is easy, the process of analyzing it can be problematic.
  - Specifically, the unstructured nature of big data potentially lead to greater challenges for auditors (Alles 2013; Titera 2013).
  - Decision makers have limited ability to process large amounts of information required for complex judgments (Kleinmuntz 1990; Iselin 1988)
  - Auditor judgments are vulnerable to various problems (e.g., Shanteau 1989)
- ***The power of Big Data lies in the ability to find patterns, which drives the way in which Big Data is analyzed (Alles 2013)***
- How can auditors derive value from Big Data and ensure that audit judgments and decisions are based on quality information that is relevant and trustworthy?

Behavioral Implications-Information Overload

- Information overload is experienced at the point where decisions reflect a lesser utilization of the available information (Chewning and Harrell 1988) or potentially useful information received becomes a hindrance rather than a help (Bawden et al. 1999).
  - Complications in distinguishing relevant information
  - Difficulties in recognizing correlation between details & overall perspective
  - Lengthier decision times
  - Disregard for large amounts of information
  - Inaccurate decisions

LOW QUALITY DECISIONS

- It is not only the amount of information that determines information overload, but also the specific characteristics of information, such as the level of uncertainty associated with information and the level of ambiguity, complexity, etc.
- Information overload can also be due to the characteristic of the decision maker (e.g., personal skills, experience, etc.)

Behavioral Implications-Information Relevance

- The unstructured nature of Big Data might potentially result in the difficulty in choosing relevant data (Costonis 2012; Davenport et al. 2012; Golia 2013; Hyle 2012; Hall 2012; Ede 2013)

- Exposure to excessive information can lead to inability to disregard irrelevant information.

- More irrelevant information reduces the auditor's ability to identify relevant information (distraction) and consequently reduces decision making performance.

- Prior research shows that less experienced auditors are unable to discount irrelevant information, which negatively affects their judgment.

- Semi-structured tasks (moderate judgment) are generally conducted by less experienced auditors, using Big Data becomes more challenging.

- Attention to irrelevant information has the potential to significantly limit the value that can be obtained from incorporating Big Data into the audit process.

Behavioral Implications-Pattern recognition

- Big Data provides the decision maker with the ability to search for patterns in a large population of data that would otherwise be undetectable in samples or even smaller data sets (Alles 2013).

- Big Data analyses Correlations vs causation (patterns)

- Auditor judgment in this area can be vulnerable to various problems (O'Donnell and Perkins 2011; Nelson 2009; Bedard and Biggs 1991) such as:
    - Difficulty recognizing patterns of evidence
    - Applying prior knowledge to current judgment task
    - Weighing evidence appropriately
    - Combining information into patterns

- Less experienced auditors pay less attention when conducting analytical procedures
- Many of the semi-structured tasks in auditing (where Big Data has potential of improving judgment) are generally conducted by such auditors.
- Providing auditors with more contextual experience and training will improve their ability to accurately recognize patterns (similar to insurance industry).

Behavioral Implications-Ambiguity

- Ambiguity may arise from variations in the amount and type of information available, differences in the source reliability and lack of causal knowledge of observed events (Einhorn and Hogarth 1986)

- Unstructured data may be viewed as ambiguous and information ambiguity has been found to result in incorrect audit judgments (e.g., Luippold and Kida 2012; Backof et al. 2011; Nelson and Kinney 1997).

- Ambiguity intolerant individuals actively seek to reduce uncertainty by focusing on simple solutions, and neglect additional information once a solution is identified (even one that is not optimal).

- Ambiguities that auditors encounter on an audit engagement affect their ability to accurately interpret evidence

- In general, ambiguity-intolerant auditors have been found to be less confident about rendering opinions on financial statements

- Ambiguity intolerant auditors will likely be uncomfortable with the unstructured nature of Big Data and as a result may avoid or downplay ambiguous information which could result in less than optimal judgments, leading to decreased overall audit efficiency (due to ignoring information cues)

Challenges of Auditing Big Data

- Machine readable unstructured nature of the Big Data
- Pattern recognition using unstructured data vs. deriving intelligence from benchmarks and models derived from structured data
- As a result of the increased amount of data, the number of identified exceptions and anomalies are expected to increase dramatically.
  - Big Data potentially aggravates the problem that already exists with traditional data, where auditors are inundated with such identified exceptions.
  - Consequently, the analysis and examination of these exceptions lies on the shoulders of the auditors, whose human limitations lead to decreased overall audit efficiency (Issa, 2013; Alles et al. 2006, 2008, Debreceny et al. 2003).
- Lack of adequate training and necessary skills to analyze Big Data
- Some analytical tools are like a black box to auditors (e.g. Neural Networks), leading to decreased popularity.

Future Research

1. *What mental models are necessary to help auditors build knowledge structures that will allow them to more effectively process and evaluate more complex data? How can these knowledge structures be developed?*

2. *What are the types of training interventions that can be utilized to mitigate inaccurate judgments?*

3. *How should the accounting curriculum be extended to provide future auditors with the necessary skills to deal with Big Data?*

4. *What skills should the audit engagement team now possess?*

5. *What are the effects of experience, if any?*

6. *Along the lines of experience, are less experienced auditors (i.e., the millennial generation) better prepared to integrate Big Data into their judgment process?*