'Planning for the Unplanned: The Dynamics of Improvisation in the Design and Use of Interorganizational Systems'

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Abstract

This dissertation engages in theory-building research, which seeks to explain the dynamics of improvisation as it occurs in Inter-organizational systems (IOS) implementations. It is grounded in the literature on Inter-organizational Systems, Improvisation, studies of IT use, and System Design. The study draws upon a model that guides research into IOS called the "IOS Interaction Zone Model" that maps multiple "touchpoints" between organizations in the supply chain, where improvisation (and other IOS) research should be focused. The study serves as the first phase of a multiple case study research program that will examine the interplay of different variables over time that determine the nature, scope and frequency of improvisation and the resulting organizational changes during IOS implementation. Included study variables cover IOS types (e.g., EDI vs. eCollaboration), improvisation contexts (e.g., design, development, use and implementation) and contextual variables (e.g., organizational types and structures, inter-organizational relationship characteristics, and systems types). Through my initial research, a framework of improvisation types, contexts and variables has been constructed that aids in the discovery of regularities that govern the phenomenon. The theory building research draws upon and is augmented by an empirical study of an organization, Big Brake Company (BBC) as it implemented a new IOS throughout its supply chain over a two-year period. Through qualitative analysis of actors' design, development, implementation, and use of this IOS, the investigation generates substantive theory to further our understanding of the drivers and dynamics of improvisations occurring in the context of IOS. The developed taxonomy is applied to analyze improvisations at BBC. Through this analysis, I hope to increase clarity on the role of improvisation in system design and use, and the nature of organizational changes that result from it (e.g., ad hoc changes vs. metamorphoses).

Keywords: Improvisation, Interorganizational Systems, Organizational Change, eCollaboration

I. Introduction

Since the inception of information technology, a variety of information systems have evolved; each designed and developed with different functional and technical characteristics; and implemented and used in a different organizational environment. In response to this, the IS discipline has focused itself, in research and in practice, on the furtherance of systems which promote standardization, uniformity, efficiency and order (Johnston 1988). This is especially true in the case of Inter-organizational Systems (IOS) such as EDI, which are designed to draw upon and implement rigid standards that limit and routinize the interactions that take place between organizations (Clark 2000). This suggests the following fundamental questions: Are these conservative traits really what information systems are all about? Should the study of the IS field really be focused on them? Or is there an entirely different realm of IS research which takes the opposite tact, exploring the need for openness and "freeplay" (Nachmanovitch 1990), where actors deviate from planned scripts during the use of information systems. To further understanding of IOS from this perspective, this dissertation engages in theory-building research, which seeks to explore the dynamics of improvisation as it occurs during Inter-organizational System (IOS) implementations. Through this study, I seek answers to the following research questions:

- **Q1** - What are the factors that drive and inhibit improvisation in IOS environments?
- **Q2** - How do these dynamics vary among different IOS types (e.g., EDI vs. eCollaboration)?
- **Q3** - How do IOS improvisations evolve from ad hoc adjustments into significant organizational changes?

Research Justification

My primary contributions fall in two IS research areas: IS improvisation and Inter-organizational Systems. First, there is limited improvisation research in the IS field, and its scope has been

confined to the **use** of **intra** organizational systems. Further, this research has not examined longitudinal evolution of organizations and systems that result from improvisation. Specifically, this stream has concentrated on improvisation that takes place solely during the system **implementation and use** within the confines of discrete organizations, analyzing such systems as ERP, Groupware, and GDSS (Bakos 1987). I offer a significant contribution to improvisation research by looking at this phenomenon as it takes place with **inter** organizational systems. I also extend the research scope to include the **design and development** of the systems. My primary interest is in the interplay between these contexts and the resulting "stepwise" evolution of organizations and systems.

Second, there is a significant stream of past IOS research that focuses primarily on rigid **primary** systems that carry out formal business "transactions". This research looks separately at discrete transactions consisting of exchanges of information related to money, material, or well-defined activities (e.g., EDI, purchasing, order management, accounts payable). My second contribution is the development of the "Interaction Zone" framework (explained below), which seeks to study these transactions AND all associated interaction simultaneously, across all areas of the supply chain. I propose that transactions form but a small part of the overall array of "interactions" that take place in an IOS environment (Galliers 1995; Bensaou 1997; Lyytinen 1998). Therefore, I am claiming that of equal importance is an increase in our understanding of the flexible **secondary** systems in the surrounding environment of formalized interactions, where actors from separate organizations truly relate, and co-create. The core idea in my research is the notion that these non-structured and non-formalized systems create an inter-organizational environment that results in enhanced relationships, while potentially facilitating trust building and collaborative improvisation.

In summary, through the remaining dissertation process, I expect to produce the following deliverables:

- The development of the IOS Interaction Zone framework **(see Figure 1)**, which can be applied in the general study of different IOS phenomena (not just improvisation).
- A refined approach to the study of improvisation **(see Figures 2 and 3)** in the IS realm, focusing on the interrelation between the design and use contexts.
- A study of improvisation in IOS that uses an e-collaboration system. The study explores unique aspects of IOS improvisation as they unfold over time with this system (e.g., more difficult to control across organizational boundaries, offer more diverse perspectives from different organizations involved)
- The Improvisation Dynamics Model **(see Figure 4)**, which can explain variations in improvisation and how they evolve over time in the studied system.

These findings can be generalized into areas of other streams of IOS research, IS improvisation research and studies of IT use and design in organizations. It is hoped that the developed models and frameworks of this study will drive a broad stream of research in these areas, thereby creating a new perspective in the study of information systems that sees improvisation as an inherent element of both design and use of these systems.

II. Inter-organizational Systems (IOS) Literature Review

Research on the concept of IOS began in the 1960s (Kaufman 1966), but gained considerable momentum in the 1980s, as successful IOS implementations demonstrated clear strategic benefits (Cleamons 1988). In past literature, we see a key initial driver for deploying IOS is that they offer competitive advantage by harnessing the efficiency of electronic communication for all participants (Meier 1995). In the 1970s, firms traditionally relied on vertical integration in order to maintain control over the critical resources necessary for their success (Pfeffer 1978). The

primary perspective that emerged in the 80s and early 90s concerning IOS was quite optimistic, stating that systems which cross boundaries have a positive impact on both owner and non-owner participants, providing benefits to parties involved, and by nature bringing the organizations closer together (Johnston HR 1988). From the mid-90s until now, failed implementations and increased organizational challenges that IOS implementations present have spawned a more realistic point of view as firms have recognized the complexity of these implementations (Bensaou 1997). This complexity is largely due to the necessity to manage newly created increased interdependence between independent firms and to carefully coordinate their activities to jointly optimize performance of the involved firms without vertical integration (Clark 2000). The coordination of independent firms is more challenging than within a single firm and requires a joint implementation of both policy and process changes (Lee 1996), as the firms struggle to optimize interdependence, performance and coordination (Clark 2000).

IOS Definition

The parameters of our review of the IOS literature are established through the following definition, which focuses on strategic motivation behind IOS (Bakos 1987), economic drivers for IOS (Williamson 1981) and resulting organizational impacts of IOS (Johnston 1988; Clark 2000):
Systems crossing organizational boundaries to facilitate efficiency, accuracy, and competitive advantage through interactive sharing of supply, demand, quality, design and other collaborative information.

III. Proposed "IOS Interaction Zone Model"

In order to guide the exploration of organizational dynamics such as improvisation between organizations in the context of IOS, I propose the following model, known as the "IOS Interaction Zone Model" **(see Figure 1)**. It is adopted from Ives' Customer Service Lifecycle

(1999) and Lee's and Whang's Supply Chain Integration Model (2001). The model serves as a sensitizing tool for any IOS study, as it maps pertinent research areas in a typical supply chain, and the role of different IOS and supporting backbone systems in this chain. It is designed to aggregate multiple "touch-points" that exist among a company and its suppliers/customers. These points represent key contact areas, referred to as IOS "Interaction Zones", for the flow of information, business transactions, and materials that are exchanged by the various primary and secondary systems. This holistic understanding of interactions in all systems needs to be present in order to gain insights into the organizational dynamics of IOS use and evolution. Research focused on interaction zones of various supply chain systems provides insights into the nature of inter-organizational dynamics that can be generalized to the B2B IOS space. This model and framework provide an elaboration of the inherent complexity of the IOS research domain by illustrating the complex web of interactions needed to orchestrate B2B processes. It serves as a tool to identify from a high-level, the zones of interaction in the model, and then explicate the details of the systems and interactions that take place in each zone. With this understanding as a backdrop, the stage is set for an expanded exploration into the details of IOS and their inherent organizational dynamics such as improvisation.

IV. Improvisation Literature Review

Research on improvisation has established its importance in the areas of organizational change (March 1981; Mintzberg 1985; Meyer 1988; Hutchins 1991; Weick 1999; Tsoukas 2002), management (Mangham 1991; Barrett 1998; Weick 1998; Cunha 1999) and information systems development and implementation (Orlikowski 1996; Orlikowski 2000; Bansler 2003). The literature defines its foundational areas as sensemaking (Weick 1995), innovation (Weick 1999; Kamoche 2001), emergent change (March 1981; Mintzberg 1985), adaptive structuration (Desanctis 1994), and metamorphosis (Escher 1986). It is characterized as a phenomenon that

strikes a balance between structure and flexibility, as it redefines the concept of structural boundaries to permit creativity, innovation and continuous learning (Kamoche 2001). The pervasive theme in the literature is that the scope of the impact of improvisation is widespread, and it is vital to advancing understanding of organizational change. The management literature consistently states that improvisation is more than just a metaphor; it is a phenomenon that pervades every aspect of organizational life (Lewin 1998). It is one of the few concepts and tools that we have to develop the capacity to be innovative in the moment, which is a key requirement for organizations in the 21st century (Crossan 1998).

Improvising Organizational Change in IS

Orlikowski's (1996) seminal study on improvising organizational change examined the role of ad hoc improvisations in the use of information systems, which she calls situated changes. This notion is summarized as follows:

"Each variation of a given form is not an abrupt or discrete event, neither is it by itself discontinuous. Rather through a series of ongoing and situated accommodations, adaptations and alterations (that draw on previous variations and mediate future ones), sufficient modifications may be enacted over time that fundamental changes are achieved" (Orlikowski 1996).

Hence, during IT use, a series of ongoing situated accommodations occurs, which can culminate in fundamental changes when enacted over time. The recognition of these situated changes, the key role that they play in enacting organizational transformation and the role of technology in that process, is essential to understanding improvisation in the context of IS. This notion seems more appropriate for reading and understanding modern organizations and their systems, such as B2B eCollaboration, which are focused on flexibility and learning.

Proposed Definition of Improvisation

Based on the above review, I offer the following definition of improvisation as applied to IOS design, development, implementation and use:

The creative practice of ad hoc exception handling and adaptation in the design, development, implementation and use of IOS, employed within the confines of existing systems (technical and organizational), as actors react to technical opportunities, unanticipated problems, emerging inter-organizational requirements, and external environment fluctuations, which result in joint adjustments of existing systems and processes.

V. A Framework for Studying Improvisation

I have developed the following model of elements of improvisation research **(see Figure 2)**, which integrates all outlined concepts into a sequential path of inquiry. Each "step" shows the specific research goal in the overall process, the resulting intended contribution, and its associated literature stream. The field study in this paper is focused on the first three steps (shown in gray), while impact determination and its extent remain for future studies.

My review of the literature combined with empirical exploration of IOS deployment in one case study of a company suggest a series of taxonomies that aid researchers in the study of improvisation drivers and dynamics. Through this toolset, the identification of relevant improvisation contexts and conditions that drive or inhibit improvisation (called contextual variables) is possible **(see Table 1)**. Any individual variable in the table explains an aspect of the nature of improvisation. Yet, I am proposing that they should be considered in an aggregated fashion in this and future studies due to the complex and poorly understood nature of this phenomenon. I also introduce improvisation types and improvisation results into my analysis. Together these constructs form a framework **(see Figure 3)**, which provides an integrated way to

answer the following: **where** (contexts) and **how** (environmental variables) improvisation occurs, **what** it is (types), and what the possible outcomes of improvisation will be (**results**).

IOS Improvisation Contexts, Types and Results

I will now elaborate two contexts in which improvisation can take place in IOS, the types of improvisations that occur and results of those improvisations **(see Table 2)**. While existing research focuses on improvisation primarily in the use context (Orlikowski 1996), I will expand this by adding the design context into improvisation space.

IS Design Context

This area is focused on shaping the system, which sets the stage for improvisation in the use context. This context also involves designers observing improvisation during use for the purpose of ongoing modification and maintenance of systems as they evolve based on changing contextual contingencies.

IS Use Context

In this context, the point of interest is the way that users improvise in response to the technology and the environment that it creates. Actors in this context provide feedback to the design/development context to determine the future shape and content of their improvisational environment.

Improvisation Types

Within each context, improvisations can adopt different characteristics based on contextual variables that drive them. For each type of improvisation, there are two primary characteristics that underlie each: system design (improvisations that take place because the system was

designed for it vs. "workarounds" which are driven by technical or process gaps) and permanence (improvisations that are temporary vs. those that are permanently instantiated). With those characteristics as a basis, I propose the following typology of improvisations:

Temporary Workaround – a temporary modification of a process or technology due to an unmet requirement in an IOS.

Permanent Workaround - a permanent modification of a process or technology due to an unmet requirement in an IOS.

Temporary Designed Improvisation – a temporary modification of process or technology that is facilitated by system design functionality, which promotes agile responses to changing requirements and creatively expands system use.

Permanent Designed Improvisation - a permanent modification of process or technology that is facilitated by system design functionality which promotes agile responses to changing requirements. These are often temporary improvisations made permanent.

Improvisation Results

A host of different outcomes are possible with regard to improvisations. This characterization of improvisation outcomes is similar to that of Weick's Improvisation Continuum (1998), and Orlikowski's Metamorphosis Model (1996). As such, they describe individual improvisation outcomes, but also offer an improvisation evolution continuum for IOS. This continuum shows how an ad hoc adjustment can evolve into a full-scale metamorphosis while it is adopted. Improvisation results are defined as follows:

Ongoing Ad Hoc Adjustments – improvisation results in no modifications of IOS processes or technology; improvisation is not adopted due to sporadic nature of unmet need that drove it.

Embellishment – improvisation results in slight changes in IOS process or technology; partially adopted.

Modification – improvisation results in a significant modification to IOS process or technology; fully instantiated on a local level, but having a minimal impact on the overall supply chain.

Metamorphosis – improvisation results in a significant modification, and the overall impact on the supply chain is significant. Processes, technology and policies are changed as a result.

VI. Context and Change Interplay in IOS Improvisation

This section integrates improvisation, its contexts, types, results, and their relation to organizational change. The purpose is more effective description of the dynamics of the underlying IOS improvisation. To this end, I introduce the "Improvisation Dynamics Model" **(see Figure 4)**, which depicts the interplay between IS use and IS design, as well as planned and emergent change, during improvisation. Understanding these dynamics is vital in illustrating the evolution of the IOS, as they exhibit a larger variation of planned and unplanned activities and they exercise no central control over the emergent change that takes place.

Improvisation Dynamics Model

The model is first intended to show the dialectics as planned change sets the stage for emergent change, and how emergent change evolves into permanently instantiated planned change. Secondly, it is designed to show how the boundaries between the different contexts (design and use) in which these changes occur need to be crossed in the improvisation process and how these crossings are critical for successful improvisation outcomes. Finally, it shows the evolutionary nature of improvisation over time (ad hoc adjustment, embellishment, modification, and metamorphosis). Tracing paths 1-5, separately and in concert, my intent is to show how each of them represents a critical step in the overall improvisational process:

Path 1 – Planned change sets stage for improvisation. Exceptions cause either ad hoc adjustment or a reciprocal effect, which later results in a process change referred to as an embellishment.

Path 2 – Evolution of IS use improvisation into IS design improvisation.

Path 3 – Evolution of IS use improvisation into planned IS design modification.

Path 4 – Evolution of IS design improvisation to IS design modification.

Path 5 - Planned progression of IS requirements into IS use processes. This is the final step of the metamorphosis process.

This model provides a dynamic view of the improvisation and how it unfolds across its different contexts.

VII. Improvisation Hypotheses

I will next offer a set of propositions that will guide my future research in IOS improvisation. Due to time constraints of the study, this is a limited set of propositions, which represents an initial direction for collecting and analyzing empirical data gathered at the proposed research sites. Obviously, the rich framework proposed above offers a host of other potential research propositions, but these will be pursued in future studies. The bold phrases in the parentheses below correspond to one of the above research frameworks or models, which was used to develop the proposition. The research question that it addresses is also labeled.

P1. Buyers and suppliers that establish long-term partnerships will improvise more frequently in the use of IOS than those that form short-term relationships. **Q1 - (Contextual Variables Framework)**

P2. Global suppliers will improvise more frequently than local suppliers in the use of IOS. **Q1 - (Contextual Variables Framework)**

P3. Users will improvise temporary workarounds more frequently in the use of complex IOS than in the use of simple IOS. **Q1 - (Contextual Variables Framework)**

P4. IOS that are newly implemented will require more improvisation than those that are mature. **Q1 - (Contextual Variables Framework)**

P5. Users will improvise more in the use of flexible, Secondary IOS than in the use of rigid, Primary IOS. **Q2 - (Interaction Zone Model)**

P6. As ad hoc adjustments and modifications are made which result in changes in IOS design, metamorphoses will occur which will transform system use. **Q3 - (Improvisation Dynamics Model)**

VIII. Research Design

The initial phase of this study has focused on an implementation of "XXX", an eCollaboration system, at Big Truck Brake Company (BBC). BBC is a manufacturer of OEM and aftermarket brake assemblies and replacement parts for large commercial trucks, operating as a Tier 1 supplier to the trucking industry. Subsequent phases will also explore other eCollaboration and EDI implementations to compare the impact of variables that affect the nature and scope of improvisation. The research reported here is exploratory in nature, with the objective being to generate substantive theory through descriptions, themes and assertions (Creswell 1997), regarding the nature of improvisation in the context of the IOS being utilized at BBC. The BBC company is an ideal site for this initial study, as it allows me to begin comparing EDI with eCollaboration. This is true because BBC had just transitioned between the two systems on the supplier side, while remaining firmly entrenched in EDI on the customer side. Data gathering activities are targeted at suppliers and those at BBC that interact with them. Interviews and observation were used to collect data from with designers and developers at Express (the

developers of the XXX eCollaboration system), with the intent being to examine the impacts of design decisions on the improvisation during the evolution of the XXX system.

In order to gain the needed variety of perspectives specified by the Interaction Zone Model, interviews were conducted with three groups of actors: Big Truck Brake, Big Truck Brake Suppliers and Express **(see Table 3).**

In accordance with the previously described model, Interaction Zone concepts were used to guide composition of informal scripts, which consisted of questions designed to serve as guidelines for discussions. Questions were developed which pertained to the types and contexts of interactions that occurred in each interaction zone, as well as what types of primary and secondary systems were in place. Interviews were 1-2 hours in length, and were conducted either at the workplace for the Big Truck Brake and Express participants or over the phone in the case of Big Truck Brake Suppliers. Interviews, which took place throughout February and March 2003, were recorded, transcribed, and submitted to participants for verification. Follow-up interviews were conducted in cases where clarification or more in-depth questioning was necessary. Invoking Glaser and Strauss's approach to exploratory qualitative research (Glaser 1967; Strauss 1998), interview notes were also taken throughout, as I was specifically attempting to document my initial impression, central/recurring themes, and categories of responses. After each interview, an interview summary was written up which elaborated on the above. This important step served as the initial portion of data analysis while ideas were still clear. After transcription and verification, in-depth review of transcripts took place, again looking to document impressions, assertions and themes with regards to the improvisational environment at BBC. The results from this initial phase can be found in **Appendix I**.

IX. Conclusion

The goals of this study are to focus on the implementation of an IOS, learn as much as possible about improvisation in this context, and in doing so, begin to construct a theory to identify and explain it. In this process, I have developed an appreciation for the magnitude of study necessary to grasp the improvisation phenomenon. I have also gained clarity on its potential importance to the future of IS research.

Specifically, I have constructed a continuum of elements that guide the study of IOS improvisation, and a number of frameworks within each research area that help promote understanding of the details of the dynamics of improvisation in IOS. These constructs are formulated to serve as a high-level map to guide more focused improvisation studies on its variations and organizational impacts.

The study of the dynamics of improvisation that is inherent in the design, development, implementation and use of IOS forms a research subject that I find both fascinating and important. This is especially true when considering the pervasive nature of emergent change in the rapidly evolving organizational and technical systems present in today's B2B environment. The study represents a largely untapped topic of research, which offers an array of opportunities for uncovering new phenomena in IS. I see it as having the potential to create new perspectives and paradigms in and of itself, while enhancing other more traditional modes of thinking. The topic has the potential to change the face of IS research by furthering understanding of organic and emergent phenomena. In my mind, the only uncertainty is the extent and rapidity of the transformation that will take place in these systems and in our thinking with regards to them.

IOS Interaction Zone Model*

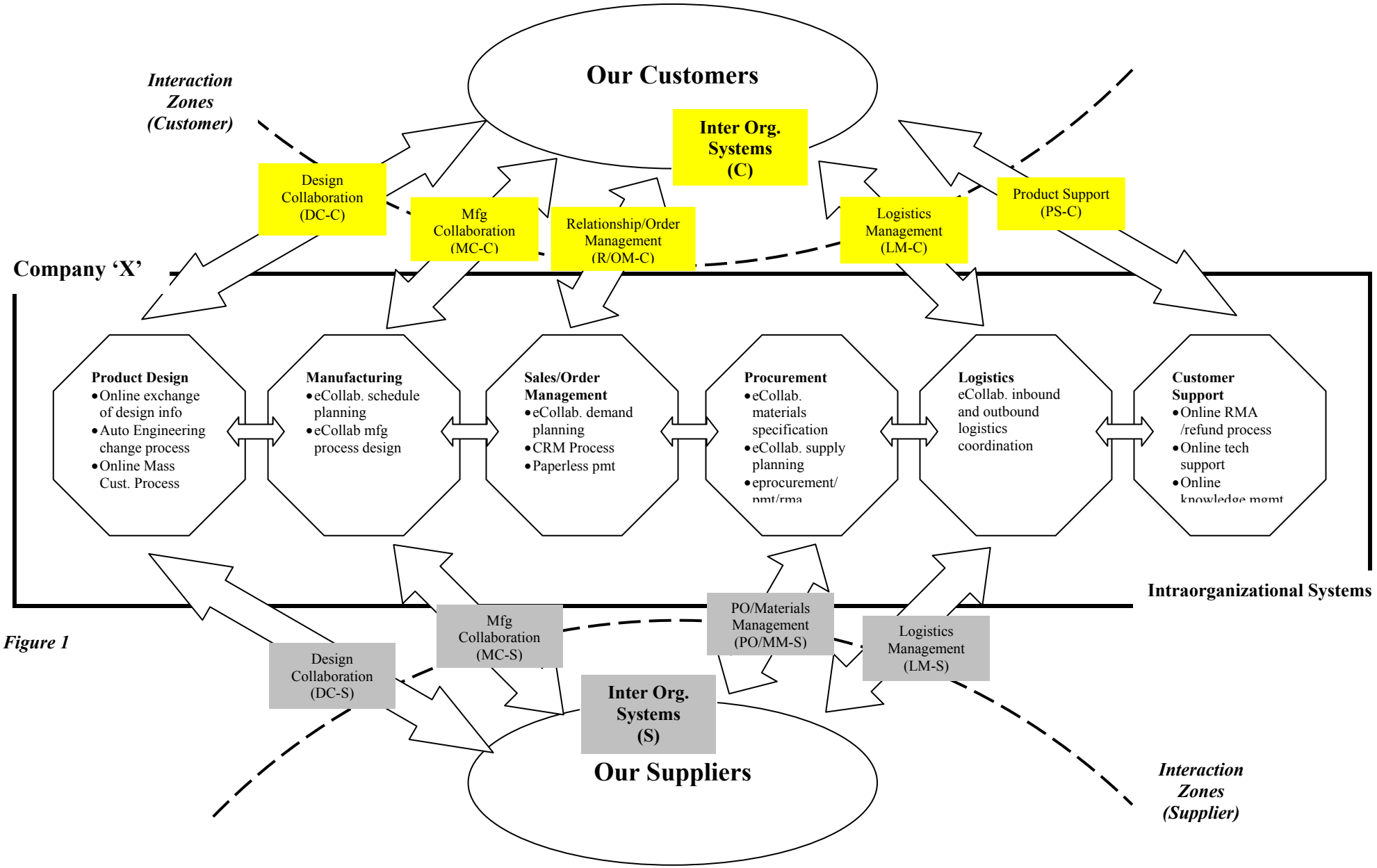

Figure 1

*Adopted from Ives' CSLC (1999), and Lee and Whang's eBusiness Supply Chain

IOS Improvisation Research Elements

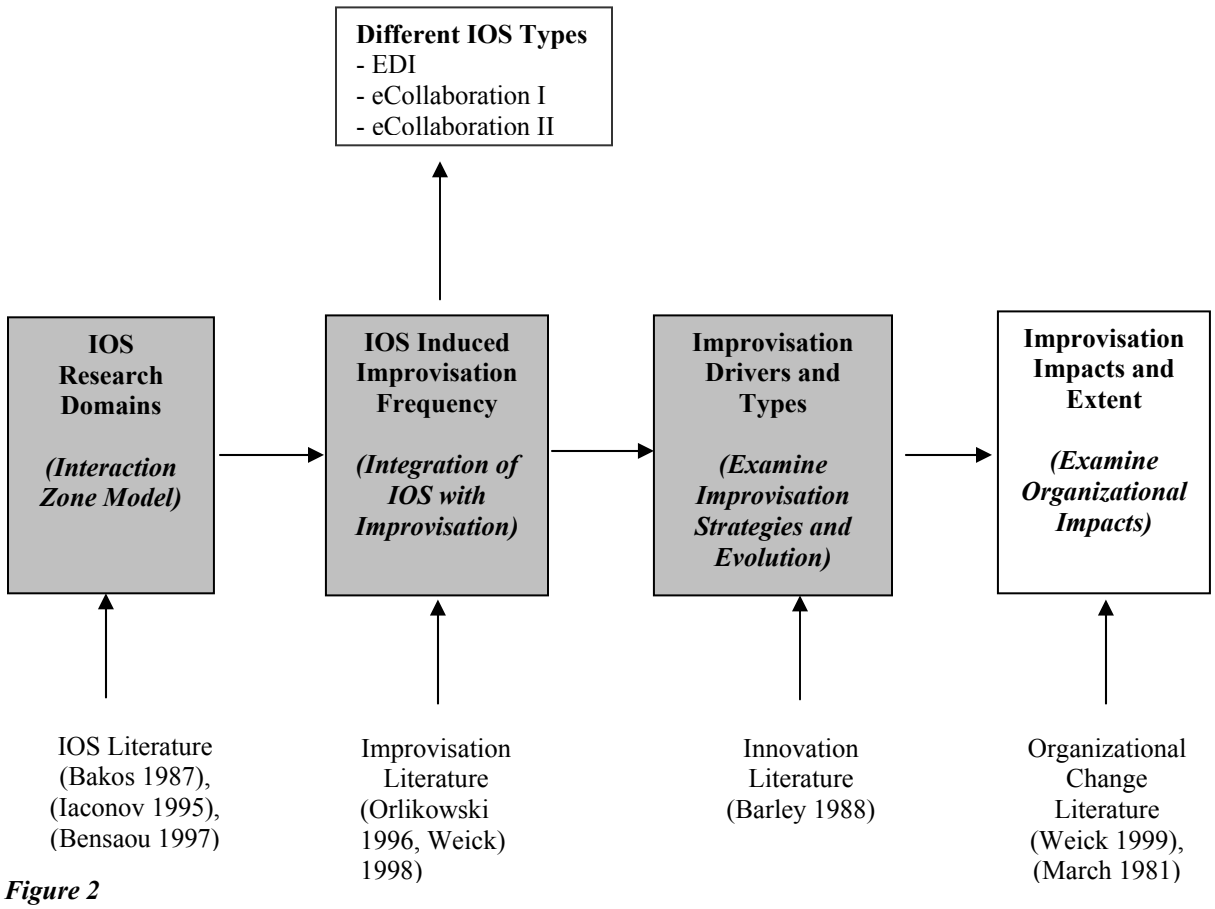

Figure 2

IOS Improvisation Descriptive Framework

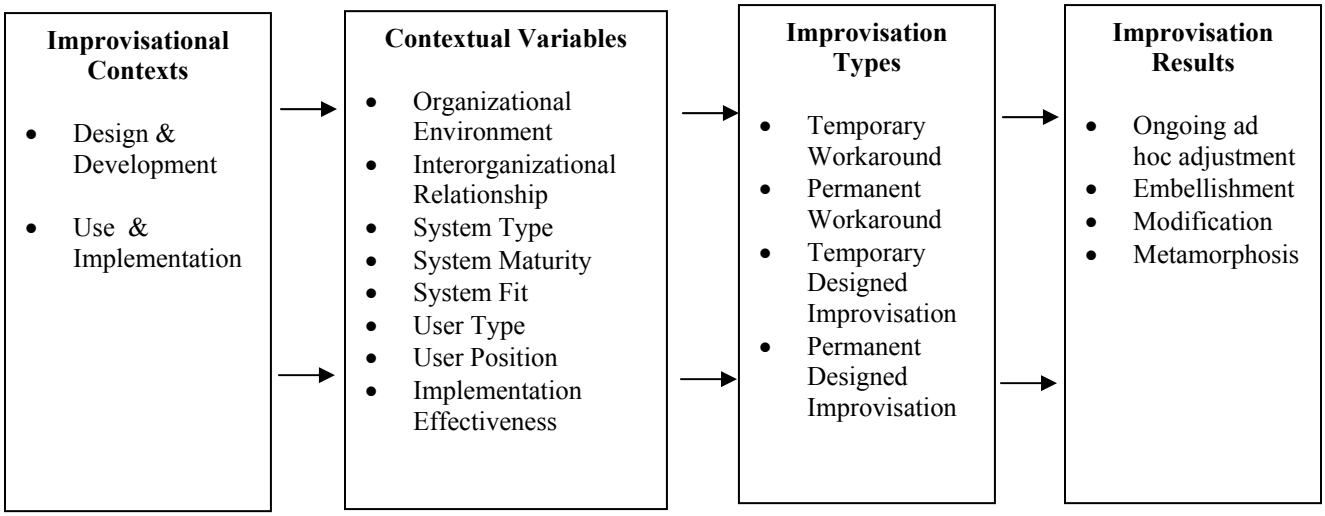

Figure 3

Improvisation Dynamics Model

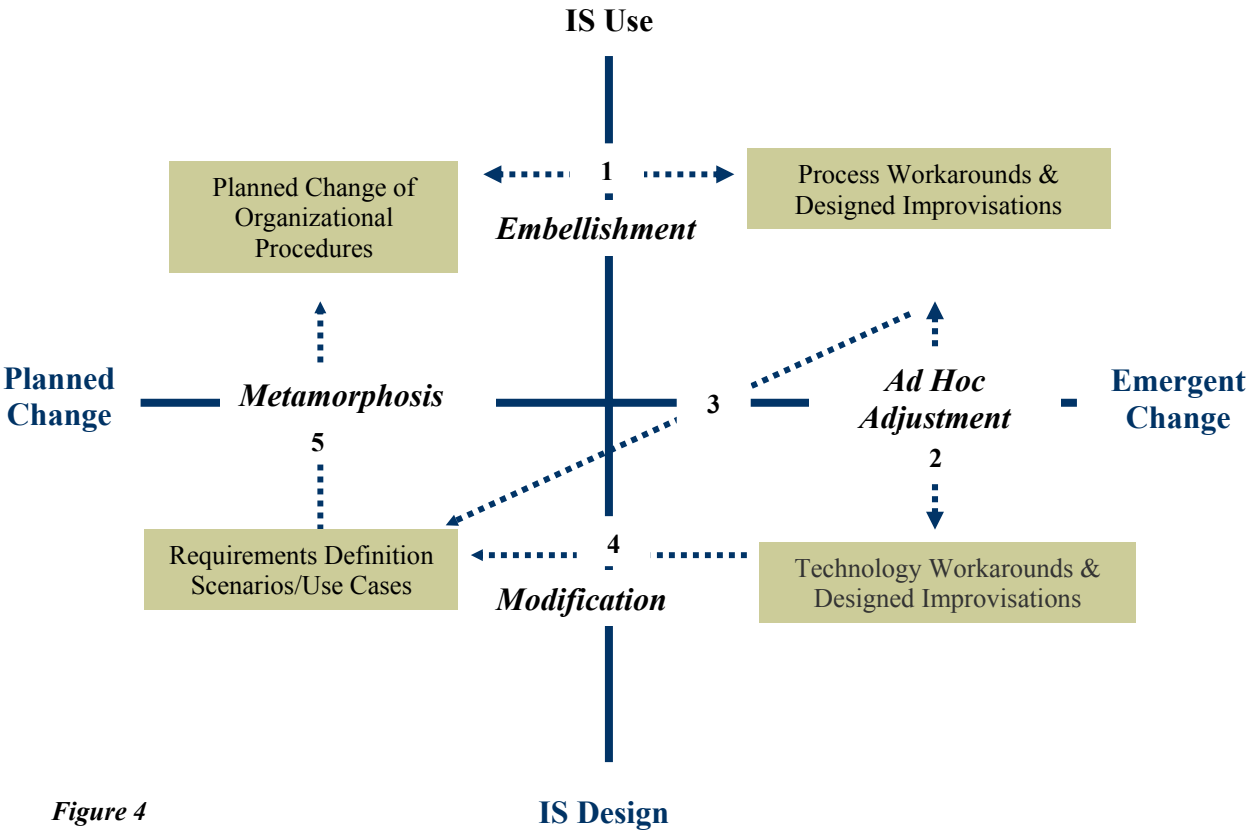

Figure 4

IOS Improvisation Contextual Variables

Variable Name	Factors	Improvisation Driver	Improvisation Inhibitor
Organizational Environment	• Innovativeness • Change Culture • Org Size • Complexity • Volatility	• Innovative • Change Adept • Large vs. SME • Complex • Volatile	• Conservative • Change Averse • Large vs. SME • Simple • Non-Volatile
Interorganizational Relationship	• Exchange Mode • Supplier Size • Location • Part Criticality	• Voice mode supplier • Large Supplier • Global supplier • Critical parts	• Exit mode supplier • Small Supplier • Local supplier • Non-critical parts
System Type	• Complexity • Configurability • Flexibility • Formality • Improvisation Design	• Complex • Packaged • Flexible • Unstructured • Pro-Improvisation Design	• Simple • Configurable • Rigid • Structured • Anti-Improvisation Design
System Maturity	• Maturity	• Newly Implemented (e.g., 2<years)	• Mature (e.g., > 2 years)
System Fit	• Fit • Modification Policy	• Poor Fit • No system modification Policy	• Meets Requirements • System modification policy
User Type	• Experience • Tech Skills • Innovativeness • Enthusiasm	• Experienced User • Tech Savvy • Innovative • Enthusiastic	• New User • Non-Tech Savvy • Conservative • Non-enthusiastic
User Position	• Org Level • Ownership	• Mgmt. vs. Subordinate • Manufacturer (system owner)	• Mgmt. vs. Subordinate • Supplier (non-owner)
Implementation Effectiveness	• Issues	• Many Issues/Problems	• Few Issues/Problems

Table 1

Improvisation Context	Improvisation Types	Possible Results
System Design/Development	• Temporary IT Workaround • Permanent IT Workaround • Temporary Designed IT Improvisation • Permanent Designed IT Improvisation	• Ad hoc IT **adjustments** • IT **embellishment** • IT **modification** • IT **metamorphosis**
System Use/Implementation	• Temporary Process Workaround • Permanent Process Workaround • Temporary Designed Process Improvisation • Permanent Designed Process Improvisation	• Ad hoc process **adjustments** • Process **embellishment** • Process **modification** • Process **metamorphosis**

Table 2

BBC Study Interviewees

Firm/Position	Description	Interaction Zone Perspective
BB – Director of Materials	Strategic oversight of materials procurement process and supply chain projects	PO/MM-S
BB – Director of Supply Base	Development of long-term supply base strategy, global sourcing	PO/MM-S
BB – Supply Chain Program Manager	Requirements definition, design and testing of new supply chain solutions	PO/MM-S DC-S MC-S LM-S
BB - Head Analyst and Implementer	Implementation, training and support of supply chain projects	PO/MM-S DC-S MC-S LM-S
BB – IT Business Analyst	Analysis and design of legacy system projects	PO/MM-S DC-S MC-S LM-S
BB – Materials Planning Supervisor	Supervision of purchasing and production materials planning	PO-MM-S LM-S MC-S
BB – Buyer	Oversight of purchasing function at the plant level	PO-MM-S
BB – Purchasing Planners (4)	Interaction with suppliers dealing with demand and exceptions	PO-MM-S
BB – Materials Handler	Design and implementation of plant level material movement solutions	PO-MM-S LM-S
BB Suppliers (8)	Various suppliers to BBC (large vs. small, exit vs. voice, adopters vs. resistors, tech savvy vs. non-tech savvy, high volume vs. low volume, critical parts vs. non-critical parts)	PO-MM-S MC-S LM-S DC-S
Express – President and Founder	Founder and principal of Express	PO-MM-S MC-S LM-S
Express – Product Manager	New business development manager	PO-MM-S MC-S LM-S
Express – Lead Developer	In charge of design and development of each release of XXX	PO-MM-S MC-S LM-S
Express – Head Technical Architect	Oversees all development activities	PO-MM-S MC-S LM-S

Table 3

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Appendix I – Findings to Date - Description of Improvisational Environment at BBC

In this section I will apply the concepts of the IOS Improvisation Descriptive Framework **(see Figure 3)** in an analysis of the improvisation at BBC. I will first use contextual variables to provide a detailed description of the improvisation drivers and inhibitors. I will then extend the analysis by presenting a list of actual improvisations that were observed, classifying them by context, type, and result. The analysis begins with **Table 4**, which delivers an overall improvisation "scorecard" for BBC and its suppliers in the implementation of XXX eCollaboration. This table shows the nature of the Improvisation Contextual Variables in this setting

Analysis of Specific Improvisations at BBC

At BBC, my analysis of specific improvisation examples was focused on the evolution of improvisations into embellishments, modifications and metamorphoses as users and designers worked in close conjunction. In this process, participants were given an explanation of what improvisation is in their context, and then asked if they were aware of such behavior during the XXX implementation. From these conversations, I was able to extract the following descriptions of the improvisations, their type, who created them, and the results **(seeTable 5).**

Some observations about improvisations during the first year of XXX use at BBC are as follows:

The majority were temporary IT and process workarounds that resulted in the modification of the system. As the mode of operation was to design XXX for BBC based on their feedback, most workarounds were temporary in nature. In most cases, they were only necessary as a stopgap solution while new requirements were gathered and fed into the design/development process. The resulting modifications eliminated the need for these improvisations.

The majority of permanent designed improvisations resulted in embellishments. By nature, permanent designed improvisational tools in XXX are designed to aid in the integration process (data bridging) or to fill information needs with a flexible toolset (reporting and query tools). Both of these involve the ability to create unique process and IT solutions, which embellish the existing ones. This was the case at BBC, as suppliers with unique data and information needs could improvise their own means of integrating XXX into their organization with help of these tools.

Two metamorphoses took place in this timeframe. A metamorphosis is a significant occurrence in the IT improvisation realm. Therefore, the fact that I was able to identity two in the first year under the contextual variable conditions present was significant. The first was on a smaller scale, as suppliers of critical parts with long lead times had to log on to the system many times during the day to see if there were changes present. This drove the XXX modification, which sent an email alert to suppliers if there were demand changes or messages regarding exceptions. The impact of this modification was so significant for several interviewed suppliers that they were actually able to reassign users to other responsibilities. This resulted in a localized change in the organizational structure. The second metamorphosis was larger and more significant. As the BBC staff began the use of initial versions of XXX, they saw an opportunity for it to assist in the vendor-managed inventory (VMI) and vendor owned inventory processes (VOI). Planners were improvising using existing messaging fields to handle some requirements, and legacy systems for others. As a result, a mutual design process took place, which was large enough to warrant the development and implementation of an entirely new module in XXX with new associated processes.

This initial set of improvisations and the processes that created them were similar to those that took place in Orlikowski's study (1996). I make this comparison because they appeared in the form of ad-hoc adjustments and seemed to be moving toward metamorphoses in the use context. In two cases, these transformations actually took place. It will be interesting to follow the other improvisations to see how they evolve over time, and to focus more on the design context and its interaction with the use context.

Appendix II – Remaining Work

In determining next steps and the remaining scope of my dissertation, I first reflect on what was learned from the initial study, and how those lessons will drive work going forward. Through this exploration of IOS improvisation research, the first set of lessons came in the form of awareness of the breadth that studying improvisation in the IOS context entails. This research process made me increasingly aware of the complexity and scope of potential studies in this area. As I constructed the overall research framework, I saw the materialization of a web formed by the myriad of relationships between contexts and variables in the IOS improvisation. This certainly presents a unique challenge to IS researchers. This challenge is in the form of balancing the need for more focused studies, while considering all of the levels of complexity involved. To deal with this effectively, the next step will be for me to choose a subset of variables and construct frameworks for more focused studies that look at more specific improvisational phenomena. My research plan entails following the evolution of improvisation over an extended period of time, and in multiple cases (e.g., looking at specific contextual variables in the implementation of EDI vs. eCollaboration IOS over time). Specifically, my goal is to direct remaining studies at the "Organizational Environment", "Interorganizational Relationship" and "System Type" contextual variables **(see Table 1)**. I intend to continue to collect data at BBC for the next year, following the evolution of their eCollaboration system improvisations. To facilitate comparison, I have added another research site (also a large manufacturer), which uses EDI as their primary IOS. I will also be collecting data there for the next year. The methodology in both cases will be a qualitative approach similar to the one described in the Research Design section above.

The second area of awareness that I developed was centered on the challenges and opportunities that such a new area of research present. In my review of existing research, it became apparent there was little precedent for improvisation studies in the IS field, and none in the area IOS. The

largest body of research found was in the Organizational Behavior, and most of that was not empirically supported. As such, there were limited research frameworks and past studies to draw on. As an interpretive researcher interested in theory generation, I welcome this opportunity to explore the new territory. However, with this opportunity comes the responsibility of creating new frameworks, methodologies and theories, which must be inferred from data and abstracted from related areas. This will be another formidable challenge I will face in the remainder of my dissertation.

As stated in the introduction, through the remaining dissertation process, I expect to produce the following deliverables:

- The development of the IOS Interaction Zone framework **(see Figure 1)**, which can be applied in the general study of different IOS phenomena (not just improvisation).
- A refined approach to the study of improvisation **(see Figures 2 and 3)** in the IS realm, and focusing on the interrelation between the design and use contexts.
- A study of improvisation in IOS that uses an e-collaboration system. The study explores unique aspects of IOS improvisation as they unfold over time with this system (e.g., more difficult to control across organizational boundaries vs. offers more diverse perspectives from different organizations involved)
- The Improvisation Dynamics Model **(see Figure 4)**, which can explain variations in improvisation and how they evolve over time in the studied system.

Through these outcomes, I intend to produce findings that can be generalized in the areas of IOS research, IS improvisation, IT use, and Is design, and IOS improvisation. I hope that the models and frameworks of this study will drive broad research in these areas, creating a new perspective in the study of information systems.

IOS Improvisation Contextual Variables at BBC

Variable Name	Factors	Improvisation Driver	Improvisation Inhibitor
Organizational Environment	• Innovativeness • Change Culture • Org Size • Complexity • Volatility	• **Innovative** • **Change Adept** • **SME**	• **Simple** • **Non-Volatile**
Interorganizational Relationship	• Exchange Mode • Supplier Size • Location • Part Criticality	• **Voice mode supplier** • **Large Supplier** • **Global supplier** • **Critical parts**	• **Small Supplier** • **Local supplier** • **Non-critical parts**
System Type	• Complexity • Configurability • Flexibility • Formality • Improvisation Design	• **Flexible** • **Unstructured** • **Pro-Improvisation Design**	• **Simple** • **Configurable**
System Maturity	• Maturity	• **Newly Implemented (e.g., 2<years)**	
System Fit	• Fit • Modification Policy		• **Meets Requirements** • **System modification policy**
User Type	• Experience • Tech Skills • Innovativeness • Enthusiasm	• **Experienced User** • **Tech Savvy** • **Innovative** • **Enthusiastic**	• **New User** • **Non-Tech Savvy** • **Conservative**
User Position	• Org Level • Ownership	• **Subordinate** • **Manufacturer (system owner)**	• **Supplier (non-owner)**
Implementation Effectiveness	• Issues		• **Few Issues/Problems**

Table 4

BBC Improvisations – Design and Use Contexts

Improvisation	Type	Improviser	Improvisation Result
Use of "Ship to" and "Ship from" filters in reports created by the supplier and planners	Temporary IT Workaround	Suppliers Plant level planners Developers Designers	**Modification** - Functionality added which allowed defaults to all "ship from" and "ship to" locations, Create option in Releases screen to pick individual plant or ship from location. This made it so users didn't have to create the ship to or ship from filter to use the site.
Use of the ASN screen by suppliers to enter in standard shipping information like units of measurement (e.g., inches or pounds)	Temporary IT Workaround	Suppliers Developers Designers	**Modification** - Creation of drop down boxes to automatically fill in the standard fields.
Suppliers viewed the net change module to see if there were any changes to the site since the last update.	Temporary Process Workaround	Suppliers Developers Designers	**Metamorphosis** - An automatic e-mail would be sent to the supplier when their schedules changed. This system modification resulted in significant changes in the eCollaboration process, as suppliers were able system use time was decreased dramatically
In the process of creating a "ship to" filter, if the user wanted to select all suppliers, they figured out that they could select the first item, hold down shift, then select the bottom supplier to select all.	Temporary IT Workaround	Plant Level Planners Corporate Planners Developers Designers	**Modification** - A "select all" option was implemented so that the users wouldn't have to go through this process. This also fixed the issue when a new supplier was added. This way the new supplier was automatically included without manually selecting them.
Use of messaging fields to display supplier part numbers.	Temporary IT Workaround	Plant Level Planners Corporate Planners Suppliers Developers Designers	**Modification** - Created a "Supplier Part Number" field
Improvised uses of download capabilities for creating custom reports in Excel and other tools (e.g., "in transit report" and "supply/demand report" by brake part supplier agent)	Permanent Designed Improvisation	Suppliers	**Embellishment** - Used XXX functionality to create a side process for reporting due to special in-transit requirements.
Use of messaging field for ASN #	Temporary IT Workaround	Plant Level Planners Suppliers Developers Designers	**Modification** - Added these fields to software in later release
Using mainframe system for ad hoc queries because of portal performance issues or due to the fact that they had to log on each time	Permanent IT Workaround	Plant Level Planners	**Embellishment** - Still have not resolved performance issues, but know it is a problem with BBC database

Use of messaging as a "workaround mechanism" for ad hoc information storage needs such as vendor part number and in-transit information.	Temporary IT workaround	Plant Level Planners Corporate Planners Suppliers Plant Buyers Developers Designers	**Modification** – Added vendor part number to software, still no in-transit fields.
Use of messaging fields to communicate vendor managed inventory information (VMI).	Temporary Process Workaround	Plant Level Planners Corporate Planners Suppliers Plant Buyers Developers Designers	**Metamorphosis –** The VMI process was vital enough that an entire module was added to XXX to support it. This resulted in new processes being created, and a small-scale implementation effort to roll it out to the user community.

Table 5