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Eliciting User Requirements Using Appreciative Inquiry

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Eliciting User Requirements using Appreciative Inquiry

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by

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Abstract

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Many software development projects fail because they do not meet the needs of users, are over-budget, and abandoned. To address this problem, the user requirements elicitation process was modified based on principles of Appreciative Inquiry. Appreciative Inquiry, commonly used in organizational development, aims to build organizations, processes, or systems based on success stories using a hopeful vision for an ideal future.

Spanning five studies, Appreciative Inquiry was evaluated for its effectiveness with eliciting user requirements. In the first two cases, it was compared with traditional approaches with end-users and proxy-users. The third study was a quasi-experiment comparing the use of Appreciative Inquiry in different phases of in the software development cycle. The final two case studies combined all lessons learned using Appreciative Inquiry, with multiple case studies to gain additional understanding for the requirements gathered during various project phases. Each study evaluated the requirements gathered, developer and user attitudes, and the Appreciative Inquiry process itself. Requirements were evaluated for the quantity and their type regardless of whether they were implemented or not. Attitudes were evaluated for process feedback, as well as requirements and project commitment.

The Appreciative Inquiry process was evaluated with differing groups, projects, and project phases to determine how and when it is best applied. Potentially interceding factors were also evaluated including: team effectiveness, emotional intelligence, perceived stress, the experience of the facilitator, and the development project type itself.

Appreciative Inquiry produced positive results for the participants, the requirements obtained, and the general requirements eliciting-process. Appreciative Inquiry demonstrated benefits to the requirements gathered by increasing the number of unique requirements as well as identifying more quality-based (non-functional) and forward-looking requirements. It worked well with defined projects, when there was time for participants to reflect on the thought-provoking questions, structured questions and extra time to facilitate the extraction and translation of requirements, and a knowledgeable interviewer. The participants (end-users and developers) expressed improved vision and confidence. End-users participated consistently with immediate buy-in and enthusiasm, especially those users who were technically-inhibited. Development teams expressed improved confidence, and improved user communication and understanding.

Dedication

I dedicate my dissertation and doctoral achievements to:

- My father, Daniel Kernitzki, for introducing me to my first computer, teaching me to set goals and work hard, and never setting limits on what I could possibly do;
- My husband, Ramon Gonzales, who continually gives me his strength, support and love to pursue my hopes and dreams; and
- My children - Justin Heins, Corey Heins, Adam Gonzales and Samuel Gonzales - for being my inspiration to be the best person I can be and for their countless hugs.

God, give us grace to accept with serenity the things that cannot be changed,

Courage to change the things which should be changed,

and the Wisdom to distinguish the one from the other.

Reinhold Neibuhr-1926

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Chapter 1 Introduction

Software development projects need to give the users what they want, which is difficult since many future users may not be sure what it is that they want or may not be able to communicate their needs. The goal of requirements analysis is to get the user's wants and needs articulated and described in such a way that developers can build their intended product successfully.

One of the greater challenges in procuring or developing any information system is capturing the user requirements since requirements decisions are affected by incomplete and uncertain information (Herrmann & Paech, 2009). Requirements analysis involves defining problems to be solved, the business and system goals, the processes to be accomplished, and inputs to and outputs from the system. Once requirements are documented, they can be used by the design team for system development or translated into a request for proposal to purchase a system (Gallegos, Senft, Manson, & Gonzales, 2004). Elicitation is the first step in user requirements gathering; it is the process of learning and discovering the needs of users and other stakeholders (Browne & Ramesh, 2002; Hickey & Davis, 2004). Following elicitation, the representation process analyzes the information obtained and transforms it into documentation of the system's desired behavior and operation. Finally, verification establishes the completeness, accuracy, and practicality of the requirements (Browne & Ramesh, 2002; Hickey & Davis, 2004).

The focus is on one of the critical steps, requirements elicitation. Overall the goal is to bring the analyst, users, and other stakeholders closer to a mutual

understanding of the requirements they want to address. Defining requirements calls for effective interaction and open communication between the user and developer to generate the necessary requirements information that can be used to develop the system that meets the needs of the user (Guinan & Bostrom, 1986). The process is a negotiation among the various system stakeholders (Guinan & Bostrom, 1986; Siau & Tan, 2006) and is intended to help people work together to define the attributes of a common solution, reduce ambiguity, and raise new issues (Hickey & Davis, 2004). Ideally, the communication involved in capturing requirements should increase participation, trust and a define a common understanding (Guinan & Bostrom, 1986).

Eliciting requirements involves getting into "someone's head" to capture the crucial knowledge and expertise (Guinan & Bostrom, 1986). An elicitation technique is a series of structured steps with questions or guidelines that assist analysts in obtaining requirements (Browne & Ramesh, 2002). Elicitation methodologies define activities, such as direct questions, what-if analysis or scenario-based methods that should be performed (Hickey & Davis, 2004). There are four general categories of techniques for eliciting requirements: pre-elicitation conditioning, prompting, indirect prompting, and external representation (Browne & Ramesh, 2002). The elicitation technique chosen is based on the requirements gathering problem being addressed or the phase of requirements gathering. One size does not fit all since the requirements being sought, problems addressed, solutions considered, characteristics of the project, as well as the preferences of the analyst play a role. The purpose of pre-

elicitation is to manage the user expectations by explaining to the user what will be asked and what information the user will need to provide. Pre-elicitation allows explanation of terms, opportunity to understand what type of information is needed, and clarification of inconsistencies which can help minimize biases. Prompting techniques allow questions to improve recall, reduce satisficing, and address faulty reasoning including cognitive biases. Direct questioning and what-if analysis are examples of prompting techniques. Indirect prompting techniques attempt to draw out information that may be difficult to consciously recall. Scenario-based questioning is an example of indirect prompting. It allows users to consciously use their knowledge as opposed to just assuming knowledge. External representation techniques are diagrams that represent information. They help with memory recall, information linking for additional recall, and complexity. Examples of external techniques include flow charts, decision maps, and affinity diagrams (Browne & Ramesh, 2002).

Although many requirements gathering techniques exist, many software development projects still fail due to deficient user requirement gathering. Failure is a chronic and expensive problem. Increased costs, missed deadlines, and ill-defined scope together with misunderstood user needs increase the ongoing risk of project failure (Dieste, 2008). Recent studies estimated that 30% of all software projects are canceled before completion and over 50% go over budget (Gartner, 2009). Prior to 2005, the Government Accountability Office and the National Institute of Standards and Technology showed that 31% would be canceled before completion and that 53% were estimated to cost over 189% of

their original budget estimates (Rensin, 2005). In 1997, Gartner predicted that by 2000 there would be a 80% chance that half of all application development projects would be cancelled or would require double their original budget (Gartner, 1997). One of the most famous failures is the air traffic control system. In 1981, the U.S. Federal Aviation Administration began looking into upgrading its antiquated air-traffic-control system, but the effort to build a replacement soon became riddled with problems. By 1994, the agency gave up on the project. The predicted cost had tripled, more than $2.6 billion had been spent, and the expected delivery date had slipped by several years. If costs for delayed and cancelled flights are also considered, the cumulative costs to airlines in the United Stated could be as much as $50 billion (Charette, 2005).

A main contributing factor to failed projects is misunderstood user requirements (Baroudi, Olson, & Ives, 1986). It is believe that a misunderstanding exists between users and developers. However, there is a lack of empirical data to define it further (Guinan & Bostrom, 1986). They lead to software defects and cause conflicts and misunderstanding between developers and users. Furthermore, a large majority (70%) of software defects is introduced during the requirements analysis and testing phases; with 60% of these defects not caught until user acceptance testing (Gartner, 2009). The longer it takes to fix the mistake, the more costly it becomes: it is 5 times more costly to correct a mistake during the design phase, 6 times more costly to fix it during development phase (Gartner, 2009; Schneider, Martin, & Tsai, 1992), 10 times more costly to correct it during coding phase, and 20 to 50 times more costly during acceptance

testing phase. If a problem is found once the application is put in operation, then the cost is 100 to 200 times higher (Schneider, et al., 1992). As an example, if a defect costs $100 to repair in the requirements phase, it will cost $500 to fix in the design phase, $600 to fix in development, $2000-$5000 to fix during testing, and $10,000-$20,000 if discovered in production.

Human factors negatively impact the ability to gather information requirements resulting in missed and misunderstood requirements (Siau & Tan, 2006) (Gartner, 2009). Some problems are the result of limitations in memory, cognition, behaviors, communication differences and reluctance to provide requirements (Browne & Ramesh, 2002). Each participant views the goals, problems and solutions differently, and therefore brings the challenge of bringing together this diversity of views and opinions (Guinan & Bostrom, 1986). A lack of a common language between the analysts, developers, and users also creates a gap of understanding. Developers and analysts should understand the user's language so that they can have a better understanding (Olfman & Bostrom, 1992). In addition to these human limitations, the complexities of the requirements, and the nature of the projects, such as tight deadlines or changing goals, add additional problems.

Technologists tend to use a problem/solution-focus and technical prescriptive processes to gather requirements which are not effective at addressing these problems encountered with eliciting requirements (Gonzales, Leroy, & De Leo, 2009). Problem/solution focused limits participants to focus on the immediate business or technical problems that they are trying to solve as

compared to a positive/goal focus redirects participants to direct their attention to the business or technical goals that they want to achieve. A problem/solution focus can unintentionally detract from goals and opportunities (Avital, Boland, & Cooperrider, 2008; Gonzales, Leroy, & De Leo, 2009). Shared comprehension is needed to produce and understand messages between developers and users (Gonzales, Leroy, & DeLeo, 2009). Developers need the ability to think of the social and technical aspects of an organization and be outcome thinkers. This allows developers and users to think together in terms of the expected outcomes and evaluate their progress (Olfman & Bostrom, 1992).

Prior research has shown that effective communication improves productivity and that ineffective communication negatively correlates to system success (Guinan & Bostrom, 1986). Communication relies on the person's skill, the context of the conversation, who they are communicating with and the intent of the message (Gonzales, Leroy, & DeLeo, 2009). Communication competence influences the outcomes (Guinan & Bostrom, 1986). Developers and users should feel equal in the interaction so that they feel comfortable communicating accurately and genuinely (Gonzales, Leroy, & DeLeo, 2009). There is a need for open communication and improved negotiations between users and development teams. Interviews, feedback sessions and ongoing reviews, as well a effective communication modeling, can be beneficial in capturing critical knowledge and expertise (Guinan & Bostrom, 1986).

Communication with the user improves when enough effort is devoted to gathering requirements. A coherent set of requirements serves as a basis for

development and establishes fitting user expectations (Gartner, 2009). Additionally, development time and costs will be lowered when there is an accurate and complete understanding of requirements (Schneider, et al., 1992). One technique that can produce more accurate and complete requirements is Appreciative Inquiry (Gonzales, Leroy, & De Leo, 2009).

Chapter 2 Appreciative Inquiry

Overview

Appreciative Inquiry is a form of Action Research that is participatory in nature. It is a collaborative technique used in organizational development to facilitate change (Denning, 2008). The aim of Appreciative Inquiry is to use direct participation to solve problems in a positive, goal-oriented manner. It adopts constructionist and positivist approaches to focus on the strengths of people and the organization (Avital, et al., 2008). Because of its positive and goal-oriented nature and its use of the participant's "language", we believe Appreciative Inquiry can be adjusted to capture user requirements and address the aforementioned challenges.

Appreciative Inquiry uses positive experiences from the past and hope for the future to collaboratively define expectations (Hammond, 1998). The focus is on desired results not problems (Avital, et al, 2008). Its premise is that our reality is based on what we focus on and it is better to focus on our strengths and what we do best as opposed to focus on our problems and weaknesses (Hammond, 1998). In focusing on problems, we tend to focus on an incomplete set of suboptimal solutions as opposed to focusing on desired outcomes (Cooperrider, 2008).

Appreciative Inquiry Process

Improvements are needed to address the high costs associated with faulty user requirements. We believe Appreciative Inquiry, and its positive approach,

can improve requirements gathering by improving communication and addressing automaticity, complexities and biases. It has seldom been used in information systems design despite its similarities with other approaches for eliciting requirements. For example, it is similar to what-if analysis where users are asked to imagine what might occur during a specific scenario (Browne & Ramesh, 2002). However, Appreciative Inquiry helps users imagine future tasks while encouraging them to think about past successes. Appreciative Inquiry is also similar to scenario-based approaches for soliciting requirements. Scenarios are designed to solicit knowledge through non-routine scenarios as a means of limiting automaticity and improving recall (Browne & Ramesh, 2002). The scenarios used in Appreciative Inquiry are based on past successes that can be applied to a future goal.

The Appreciative Inquiry process is comprised of a series of facilitated and collaborative meetings with a representative group of stakeholders that can include users, technical support staff, and management. The core process consists of an iterative 4-D cycle – Discovery, Dream, Design and Destiny (Cooperrider, 2008) that starts with defining an affirmative topic. An affirmative topic sets the tone for the four phases.

The outcome for the **Discovery Phase** is to discover the best of "what is". The group is interviewed about high points in their careers, organizations, and relationships. Sharing positive stories allows the group to define and describe those factors and conditions that contributed to prior successes. Participants share details of their stories and the facilitator captures common themes. This

step creates excitement among the participants. The three basic questions for initiating an Appreciative Inquiry session are (Cooperrider, 2008):

- What would you describe as your highest experience or a time when you were most alive?
- What do you value most about yourself, your work and your organization?
- What are the core factors that give life to your organization?

The **Dream Phase** focuses on "what might be". Participants are asked to look in the distant future and envision the ideal organization, process, and system. Creativity and imagination are encouraged with no constraints. This is particularly effective since it follows the Dream Phase where participants gain excitement and commitment through the sharing of positive stories of prior successes (Cooperrider, 2008).

The **Design Phase** comes next to define "how can it be" by taking the identified strengths and future visions and defining "possibility propositions", which are descriptions and images of what can be created. It takes a holistic approach by including system information and the supporting organization roles, relationships, processes and policies. The proposals should be challenging, realistic, desirable and positive (Cooperrider, 2008).

The 4D cycle is concluded with the **Destiny Phase** which details "what will be." The goal is to define actions and confirm wide-spread support. The objective is that the participants, who have been energized from the Appreciative Inquiry process, will come forward to lead and support the identified actions (Cooperrider, 2008).

Benefits of Appreciative Inquiry

Appreciative Inquiry, like other participatory design techniques, is a natural fit for compiling user requirements since it promotes a partnership between system analysts, developers, and users. It enables and enriches communication (Davies, Marcella, McGrenere, & Purves, 2004). As with other facilitated processes that encourage collaboration, the stakeholders work together toward a common goal with group agreement (Denning, 2008). Any technique that promotes user participation increases the success and longevity of information systems (Farzan, et al., 2008). When users participate in system design, they are able to communicate their needs and problems that they hope to solve. Otherwise, if their needs are not met, the system will not be used (Avital, et al., 2008). User participation leads to user involvement and involvement leads to system use. Moreover, users are motivated by involvement and they gain a sense of community (Kollock, 1999). Appreciative Inquiry cultivates all these factors while increasing a sense of responsibility, another important factor in gaining user participation (Hartwick & Barki, 1994).

There has been limited research using Appreciative Inquiry in the field of Information Systems. There have been no prior comparative studies with Appreciative Inquiry in the area of information systems development. At the time of this research, only three example evaluations have been conducted to improve requirements. One set was part of a systems analysis course taught at Case Western to learn accelerated requirements specification. The results showed that Appreciative Inquiry provided students with a better understanding of

requirements specification and system design (Avital, 2005). Appreciative Inquiry was also modified and applied to several system development projects showing success with inspiring users, effectiveness of storytelling as opposed to articulating requirements, and creating a common understanding (Bergvall-Kareborn, Holst, & Stahlbrost, 2008). Finally, Appreciative Inquiry was discussed as a means to improve the motivation to adopt Knowledge Management Systems as well as promote the creation and exchange of knowledge due to its story-sharing and positive approach (Avital, 2004).

Research Interests

Overall, our goal is to improve the elicitation of user requirements. This research provides an opportunity to evaluate Appreciative Inquiry, an element of positive psychology, for eliciting user requirements. In addition to its positive focus, Appreciative Inquiry brings a visionary futuristic view that may allow an opportunity to capture requirements not otherwise identified. Appreciative Inquiry can be evaluated with different audiences, contexts, and research methods.

Chapter 3 Appreciative Inquiry to Elicit User Requirements

During five case studies, Appreciative Inquiry was applied, modified and improved as part of user requirements gathering. Specifically, this research focused on adding more unique, quality-based (non-functional), and more forward-looking (futuristic) requirements than those identified by traditional methods. In addition to fine-tuning the process, participant attitudes were also evaluated to better understand the results of these studies.

The case studies were conducted in the form of Action Research. Action Research is a social science research method that was introduced in the 1950's which gained popularity in information systems in the 1990's. One of its key assumptions is that action brings understanding (Baskerville, 1999). The goal of Action Research is to solve practical problems and improve scientific knowledge (Baskerville & Myers, 2004). The goal is to create change while studying the process as opposed to traditional research methods that study a process but don't attempt to change it. Action Research is a partnership of the researcher with the study participants who use an iterative process to initiate change and study it. The researcher brings her knowledge of Action Research while the participants bring their practical knowledge and context (Baskerville & Myers, 2004).

Action Research is considered to be practical by attempting to ask the right question and get empirical answers to those questions to explain why things

work or don't work. There are four key principles: 1) Peirce's principle that all human ideas and actions are defined by their consequences; 2) James' tenet that truth is materialized in practical outcomes; 3) Dewey's principle that rational thought is blended with action (controlled inquiry); and 4) Mead's principle that human action is within a social context and that ideas reflect the social context (Baskerville & Myers, 2004).

Action Research is considered a collection of research approaches, rather than just one particular research method. As a group, the various forms of Action Research share four similar attributes which differentiate Action Research from other social inquiry methods: 1) an aspect of action or change; 2) a focus on a problem; 3) an iterative systemic process involving phases, and; 4) a collaboration among the participants (Baskerville & Myers, 2004). Participatory Action Research is a specialized form of Action Research. In participatory action research, the researcher and participant work together. The participant is actively involved in analyzing results and determining future actions (Baskerville, 1999).

This work is conducted as a Participatory Action Research project. Appreciative Inquiry was modified to improve eliciting requirements and acknowledging the importance of communication with the stakeholders in the system development process. Each case studied shares the Appreciative Inquiry principles which include an Appreciative Inquiry Theme and Appreciative Inquiry Questions.

The Appreciative Inquiry Theme is intended to provide a positive and hopeful focus and vision for the inquiry session that can be either developed by participants or provided by the facilitator based on obtaining an understanding for the desired session goals. An example of an Appreciative Inquiry Theme is shown in Table 1.

"When <project/teams> are successful, the <user/customer/company/team-member> realizes their vision and goals; <user/customer/company/team-member> are successful at producing desired results and achieving their goals, and <projects/companies>obtain their goals through meeting current and future needs. Technology is a tool that facilitates the achievement of this vision and goals. It frees people from processes and methods. It greatly improves <user/customer/company/team-member> success, as well as supports successful relationships between the <user, customer, company and/or team-member>. It supports creativity, enables quality and produces desired results."

Table 1: Generic Appreciative Inquiry Theme adjusted based on the context of each study and project team.

The theme is adjusted in each case study to fit the context of the project. In addition to this theme, there are seven questions which are used to help participants recall their positive past experiences and project those positive experiences to a future vision as part of the Discover and Dream phases as shown in Table 2.

- What were your hopes and dreams when you chose this <career/project>?
- Think over your past experiences. What was the greatest experience you have had with prior <projects, groups, teams>? Describe an experience when you were most successful and satisfied? Did the experience help you with another friend/colleague? Were you able to help another friend/colleague? Did the experience provide an important experience, better relationships, unexpected opportunities, or the ability to face a difficult challenge? What was it like? What was valued and worked well? What conditions contributed to that extraordinary level of success and satisfaction? What would you want to carry over or repeat in other <projects, groups, teams>?
- What do you value most about yourself and your capabilities as a member of <a team> or a contributor of <a project>?
- What do you value most about yourself as a member of an <organization> and/or member of a <team/community>?
- What are the most important attributes that support your highest levels of success and satisfaction?
- What results do you want from a <project/team>?
- What do you envision as an ideal <project/team> in the future - several years in the future (when your children have children)?

Table 2: General Appreciative Inquiry questions adjusted based on the context of each study and/or project team.

The Appreciative Inquiry Theme and Appreciative Inquiry Questions are customized as needed to comply with the intent of Action Research and Appreciative Inquiry. They need to be relevant to the context and goals of the audience and problem to be solved.

Chapter 4 Methodology

The requirements elicitation process and researcher involvement was progressively modified through the evolution of five case studies with the ultimate goal of developing an Appreciative Inquiry user-requirements elicitation process that can be used by any development team. Table 3 provides an overview of the progressive studies followed by a description of each study.

	Research Method	**Development Project Context**	**Requirements Facilitator**	**Measures**
Study 1 End User – Case Study	Comparative Case Study between Appreciative questions and traditional requirements eliciting questions (direct questioning).	Actual - Teacher Online Community	Appreciative Inquiry Expert & Developer	Requirements User attitudes
Study 2 Proxy User – Controlled Experiment	Comparative Controlled Experiment between Appreciative questions and traditional requirements eliciting questions (brainstorming).	Fictitious - Campus Online Community	Appreciative Inquiry Expert	Requirements User attitudes
Study 3 Project Team – Appreciative Inquiry Field Experiment	Quasi-experiment using Appreciative Inquiry questions.	Actual – Retail Websites	Appreciative Inquiry Expert	Requirements Developer & Customer attitudes Project Phases
Study 4 Developer Team – Appreciative Inquiry Multiple Case Study	Multiple case-studies using a repeated process of Appreciative questions.	Actual – Retail and Campus Websites	Developer Teams	Requirements Developer attitudes Team effectiveness Project Phases Emotional Intelligence Perceived Stress
Study 5 Project Team (Customer & Developers) Appreciative Inquiry Multiple Case Study	Multiple case-studies using a repeated process of Appreciative questions.	Actual – Retail Websites and process automation	Appreciative Inquiry Expert & Developer Teams	Requirements Developer attitudes Team effectiveness Project Phases Emotional Intelligence Customer attitudes Requirements Effort and Disposition

Table 3: Overview of study variations

The first study was a comparative case study with end-users to determine if Appreciative Inquiry would improve requirements gathering and user attitudes

as compared to traditional direct questioning using brainstorming. The second case study compared Appreciative Inquiry with brainstorming to determine if the prior results from the end-user case study could be duplicated in a controlled experiment with a fictitious scenario. The third study evaluated the use of Appreciative Inquiry with an actual project team of students in an undergraduate Computer Information Systems (CIS) course to measure the results of requirements and attitudes at various project phases.

To improve generalization of the results, the fourth and fifth studies were conducted as multiple case studies using a replicated process and measures for cross-case comparison to identify recurring practices(Miles & Huberman, 1994; Yin, 2009). Both studies were conducted with project teams of CIS course students. The purpose of the fourth study was to fine-tune the Appreciative Inquiry's effectiveness (requirements and attitudes) as well as other possible related factors such as team effectiveness, perceived stress, and emotional intelligence. The purpose of the fifth and final study was to evaluate methods that can be used by development teams to improve their elicitation of requirements. The final study repeated the evaluation of requirements and attitudes using Appreciative Inquiry with team effectiveness and emotional intelligence. However, the final study was modified from the previous study to include researcher Appreciative Inquiry intervention sessions with the project teams, and the evaluation of requirements implementation disposition and effort, as well as customer attitudes.

Evaluation Measures

Since the research focus is on user requirements, the main outcome measurements are user requirements. They are measured in every study with variations of attributes to include quantity, type (functional, quality, future), disposition (current or future implementation) and effort (major or minor) In addition, the following other items were measured: participant and process feedback, team effectiveness, participant perception of stress, and participant emotional intelligence to better understand the variables at play during user requirements elicitation. Below is an overview of all measures collected throughout all five studies. However, not all measures were collected for each study. As listed in Table 3, measures and methods were modified as the cases progressed.

Requirements

Requirements are defined as the explicit needs that a system is expected to meet (Azuma, 2004). The type and the quality of the requirements were collected and the researcher applied the classification of “functional”, “non-functional” and “quality” using the definitions provided below. Additionally, the implementation disposition and effort related to each requirement was collected as provided by the project teams.

The two types of requirements measured were functional and non-functional (quality-based) requirements. Functional requirements are those that relate to a required function that the system must perform. It defines “what” functions are performed. Examples of functional requirements include enabling

product purchase, updating inventory quantities after a purchase, and calculating sales tax into the purchase price.

Non-functional requirements are also known as quality requirements or constraints (Azuma, 2004). Non-functional requirements relate to "how" functions are performed such as performance requirements, specific quality requirements, and constraints (Azuma, 2004; Boegh, 2008; Glinz, 2008; ISO/IEC, 2007). Examples of non-functional (quality-based) requirements include using a content management system for easy content update by a novice user, using radio-buttons for choice selection and a user-interface with "sleek, modern graphics related to motorcycles and cars" for a race-car import company website.

The quality of the requirements refers to their stability, diversity, and analyzability. Stability is the extent that requirements change over the course of the project; it is usually defined as instability since changing requirements introduce risk to project success; diversity is the extent to which requirements differ and are not consistent; and analyzability is the extent that a user's need can be translated to a requirement (Moynihan, 2000). Requirements uncertainty and instability are measured by the degree that a requirement changes during the development process (Barney, Aurum, & Wohlin, 2008; Hsu, Chan, Liu, & Chen, 2008); and participant prediction for future project success (Procaccino, Verner, Overmyer, & Darter, 2002). Diversity was measured by the uniqueness of the requirement if it was not previously identified. Analyzability was evaluated

by the ability to design a test for the requirement once implemented (Azuma, 2004).

To measure the impact of Appreciative Inquiry's visionary future goal, the second, third and fourth studies noted whether the requirements specified a future or an immediate need. Future needs were those that reflected potential business goals as opposed to something that met a current business need. As an example, an e-commerce website had a current requirement to sell ready-to-wear clothing but the future requirement was to enable the sales of custom-clothing based on measurements provided by the customer. Requirements were classified as either "future" or "current" by the researcher.

For the fifth study, the concept of future or current need was evaluated using the disposition of a requirement's implementation (current or future). A "current" disposition was assigned to those requirements that were being implemented by the development team as part of the currently studied project. The "future" disposition was assigned to those requirements that would be considered for future implementations. A requirement could change disposition throughout the life of a project as requirements were added and removed from the current implementation. For the fifth study the "disposition measure" was applied by the development teams for each requirement replacing the researcher's classification of "current" or "future" as done in the prior four studies.

For the fifth study, the effort to implement a requirement was collected from the development teams. The effort of a requirement refers to the amount of time the develop team estimates to implement the requirement. It was measured

simply as “major” or “minor”. “Major” effort was assigned to those requirements that were expected to take over 10 or more hours for the development team to implement. Requirements with “minor” effort were those expected to take less than 10 hours to implement. The 10-hour measure was selected arbitrarily based on the professor and course context where the research was conducted since the course is limited to 10 weeks and the teams are expected to record a minimum of 10 hours per week.

Requirements were collected using various methods based on the study context. During the first two studies, the researcher collected the requirements through active participation of the participants and confirmed by the study participants as they were documented during the session. The fourth study collected requirements through formal documentation (reports) produced by the development teams and submitted to the professor, as well as through the Appreciative sessions facilitated individually with each project team. Requirements in the fifth and final study were collected requirements exclusively from the final documentation (reports) developed by the project teams and submitted to the course professor. Sample requirements reports are provided in Appendix G: Sample Project Team Report.

Participant Information

Participant information was collected via survey. The survey included six questions, such as gender, degree obtained, PC experience, and IS system development experience. The survey is provided in Appendix A: Participant Information Survey.

Participant and Process Feedback:

Participant feedback was evaluated based on participants' positive feelings, commitment, and future vision. These are reported as expected outcomes from Appreciative Inquiry sessions (Cooperrider, 2008; Hammond, 1998). Additionally, the following measures were added: Commitment, buy-in and motivation (Kauppinen, Vartiainen, Kontio, Kujala, & Sulonen, 2004), and perception of project success or failure as measured by confidence in results (Procaccino, et al., 2002). A survey was provided to participants to measure these items. We posed 11 questions and provided a 4 point Likert scale with 1 as "strongly disagree", 2 as "disagree, 3 as "agree", and 4 as "strongly agree." For example, to measure project feedback, we provided the item: "*I am satisfied with our current prototype and/or identified requirements*." In addition to the measurable items mentioned above, the participant was asked how many months or years they considered into the future when identifying requirements. (All measures of time were converted to months for analysis.) The complete survey is provided in Appendix B: Participant and Process Feedback Survey. The survey was modified to generalize the same questions in the fifth study for the requirements sessions that did not use Appreciative Inquiry.

Team effectiveness was measured in the fourth and fifth studies using questions identified by Bushe et al. (1995) in their experiment using Appreciative Inquiry as a team intervention. Team effectiveness was evaluated to determine if there were any correlations with process feedback or requirements collected. The survey includes eight sections that measure: cohesion, conflict

management, decision-making, participation, confidence in team ability, satisfaction with membership, satisfaction with team performance and trust. The team effectiveness measures are also rated on a scale of 1 to 4 with 1 as "strongly disagree", 2 as "disagree, 3 as "agree", and 4 as "strongly agree." For example, to measure cohesion, the question "I feel a part of this team" was asked. The complete survey is provided in Appendix C: Team Effectiveness (Bushe & Coetzer, 1995).

Perception of Stress was measured only in the fourth study using the 10 item scale for Perceived Stress developed by Cohen (1983) to determine if there were any trends related to the project cycle. This instrument uses a 5 point scale with 0 as "never", 1 as "almost never", 2 as "sometimes", 3 as "fairly often", and 4 as "very often." A sample question is "In the last month, how often have you felt nervous and 'stressed'?" The complete survey is provided in Appendix D: 10-item scale for Perceived Stress (Cohen, Kamarck, & Mermelstein, 1983).

Emotional Intelligence was measured using a 33-item Emotional Intelligence scale (Schutte, et al., 1998) in the fourth and fifth studies to evaluate if emotional intelligence was correlated with successful requirements elicitation, Appreciative Inquiry, and team effectiveness. This instrument uses a 5 points scale with 1 as "almost never", 2 as "rarely", 3 as "sometimes", 4 as "often", and 5 as "most of the time." Emotional intelligence measures how in-tune a person is with his or her emotions and the emotions of others. For example, one question states "I find it hard to understand the non-verbal messages of other people

(reversed scale)." The complete survey is provided in Appendix E: 33-item Emotional Intelligence Scale (Schutte, et al., 1998).

Chapter 5 End-User Case Study (Study 1)

The first case study was part of an ongoing software development project with special education teachers who work in different school districts in Southern California. As part of a software project for children with autism (PixTalk communication software), we investigated the usefulness of an online community and wanted to define the user requirements to make that community useful to special education teachers. During the software development of PixTalk, these teachers had expressed a wish to have a way to share information with each other and with new teachers across the country on how the teachers best work with children with autism.

Participants

Four teachers participated in three separate cases executed in the spring of 2008.

Methodology and Procedure

The participants met with the researcher, either in-person or via phone, and were verbally given a simple description of an online user community in terms of how it can support the developed PDA communication software application (Pixtalk).

The teachers were then interviewed in a traditional manner using 15 traditional questions to gather requirements (first interview) as shown in Appendix F: Traditional Direct Brainstorming Questions. Each interview started with an explanation of the proposed online user community, possible features,

functionality and resources, e.g., discussion boards to interact with others using traditional questions used for eliciting user requirements. Some sample questions were: "What is the goal for our system?", "What do we want to accomplish?", "What benefits do we want to provide?", "What useful features do we want available in our system?", and "What security do we want in our system?"

Once the responses were received, the participants were introduced to the concept of Appreciative Inquiry, using the general procedure described above, and interviewed again by phone (second interview) using the Appreciative Inquiry theme and questions identified previously in Table 1 and Table 2. The Appreciative Inquiry interview was conducted 1-2 weeks later to give them time to reflect on the Appreciative Inquiry questions. At the interview, the Appreciative Inquiry process was re-explained; questions re-presented; and detailed responses recorded. All interviews were transcribed and answers and attitudes compared with those from the traditional approach.

Measurements

The following items were measured: requirements gathered, the responses of the participants, and the effectiveness of the Appreciative Inquiry process itself. Requirements and participant attitudes were compared between Appreciative Inquiry and the direct brainstorming questions.

Requirements Results

Results showed that there were no requirements gathered with the traditional process. This non-technical end-user group politely refused to produce any requirements and could not acknowledge any possible benefits that could be

derived from the proposed online community with comments, such “I won’t have time to participate, I already have so many things going on.” They also expressed that they did not how they would use an online community since they currently did not use one either at work or home and that all of their interaction with other teachers was face-to-face.

In contrast, during the Appreciative Inquiry session, the participants were able to immediately present meaningful quality-based requirements as opposed to technical specifications. The requirements obtained were also different from requirements gathered using a traditional direct requirements elicitation method: the requirements were not “technical” criteria and reflected values and the qualities that they desired in the proposed online community. A summary is provided below in Table 4.

Traditional Direct Questions	**Appreciative Inquiry Approach.**
None	Support for their sense of community via group discussion and individual communication;
	Support for one-on-one relationships with the ability to share individual background and experiences;
	An open membership to all segments of the autistic community;
	A repository for sharing available resources with other community members; and
	An easy-to-use simple interface that is instinctive for novice users.

Table 4: Comparison of requirements gathered with traditional direct questions and Appreciative Inquiry questions.

Participant Feedback

Results showed that traditional requirements questions reinforced the teachers' feelings of being overwhelming by the prospective online community and their lack of belief for any benefits. They continued to discuss the challenges that they faced such as the lack of time, money, leadership support, family support and computer knowledge. It was noticeable that the participants provided no positive or hopeful statements during this session.

In direct comparison, Table 5 shows that the answers provided during the introduction of the Appreciative Inquiry session were significantly more energetic, positive and hopeful to the possibilities. Even though they had previously expressed negative responses, their attitudes changed with the Appreciative Inquiry introduction. During the follow-up Appreciative Inquiry interview, they continued to have positive and energetic attitudes. They did show realism by discussing possible limitations but were able to quickly bring themselves back to positive language and attitudes. They responded to the experience of reflecting on their past aspirations for their career choices. They appeared to enjoy reflecting on their success and value as individuals and as part of groups despite their selfless nature. It provided them an opportunity to look past their overwhelming day-to-day challenges and see their progress over time. They were able to quickly demonstrate their altruistic nature and easily acknowledged the value they placed on the personal relationships they shared with the children and families that they support, and their peers.

Traditional Brainstorming Approach	**Appreciative Inquiry Approach**
No interest expressed	Immediate and sustainable positive and hopeful attitudes
Lack of understanding for how it would help them	Limited negative statements that were easily redirected
Overwhelmed	Encouraged by their past progress allowing them to overlook day-to-day challenges
Consistent negative statements expressed	
No one attempted to answer the questions provided	
Traditional questions did not provide participants an outlet to share openly	

Table 5: Comparison of attitude differences between a traditional requirements' elicitation approach (brainstorming) and the Appreciative Inquiry approach.

Process Results

Results showed that the Appreciative Inquiry process took more effort and a knowledgeable facilitator to translate their lengthy narratives into useful requirements. Though each interview took an average of one hour, additional time was required to translate the narratives from the interviews to more concise user requirements. An example of the requirements translation process is provided in Figure 1.

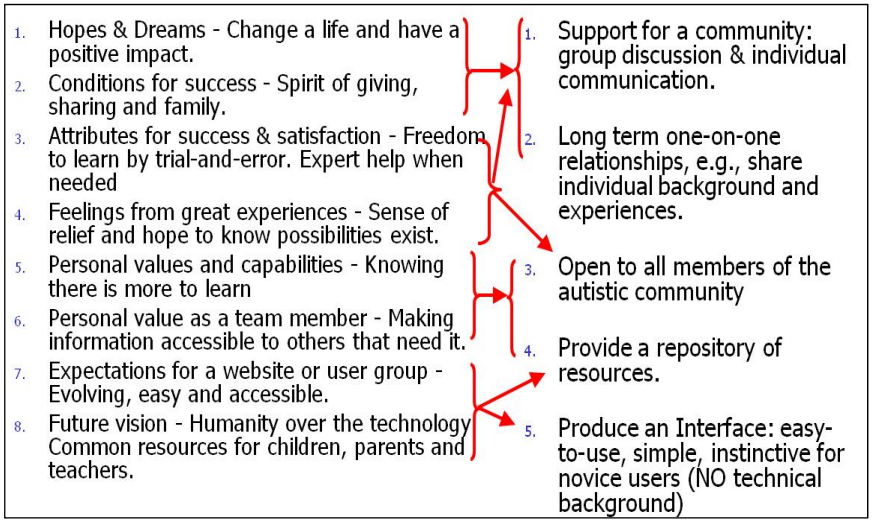

Figure 1: Sample of transformation of requirements gathered using Appreciative Inquiry.

This first study did not collect measures for team effectiveness, perception of stress or emotional intelligence.

Lessons Learned

Appreciative Inquiry effectively initiated a conversation and obtained user commitment and excitement with this technically-inhibited audience. The

participants benefited from using the language of their “community” as opposed to a technically-prescriptive process. The participants struggled with the thought provoking Appreciative Inquiry questions and needed time to adequately reflect on the questions before being able to answer them in a meaningful way. The process also required some effort from the facilitator to keep the participants focused on the topic and also to translate their stories to significant requirements.

Chapter 6 Proxy User Controlled Experiment (Study 2)

The enormous success of the first study led to a second controlled user study. The goal for this study was to replicate findings and compare the process with another traditional requirements eliciting technique, i.e., brainstorming. Brainstorming was chosen because it resembles the Appreciative Inquiry process more than the traditional direct questioning process used in the first study.

Participants

This study consisted of 25 students. They were Claremont Graduate University Information Systems (IS) Master and Doctoral students during the summer semester 2008. The participants were invited via the department email listserv. The context of the experiment was a fictitious scenario described as developing requirements for “a 'connected' campus that integrates technology into course curriculum and campus life." Participants were provided $20 for their participation.

Methodology and Procedures

There were two conditions evaluated: the Appreciative Inquiry and the brainstorming conditions. Students were randomly assigned to teams and each team to a condition. For each condition, there were three groups with a total of 25 participants. Regardless of the requirements’ eliciting technique, participants were assigned team roles. There were three different roles: users, business analysts, and developers. Based on their assigned role, the study participants represented different types of participants in system development projects.

These roles were assigned in an effort to make the experiment realistic and provide context. ‘Users’ were described as the faculty and students at the university who would be considered users; ‘developers‘ were described as those who would design and develop the systems based on the requirements captured; and ‘business analysts’ were described as the liaison among users and developers in order to elicit, analyze, communicate and validate requirements for the information system.

In both the brainstorming and Appreciative Inquiry conditions, two group compositions were tested. The first composition consisted of the users, business analysts and developers roles; the second group composition consisted of the users and business analysts roles.

Participants received a description of the fictitious information system development project to create a "connected" university at their campus. The participants were told that the outcomes of the experiment were the identified requirements and their feedback on the process.

As explained above, the Appreciative Inquiry session started with a definition of an affirmative topic for the session. The general theme was adjusted for the connected campus example. Following the presentation of the theme and opportunity for the participants to ask questions, the researcher guided the participants through answering a basic set of Appreciative Inquiry questions. The outline of the Appreciative Inquiry theme and questions used were outlined previously in Table 1and Table 2.

The brainstorming session started with an explanation of brainstorming and an invitation to suggest requirements for the information system. Brainstorming was explained as open unconstrained conversation about the requirements for such an information system. Only as necessary, the research addressed lulls in the conversation with traditional questions used for gathering system requirements as provided in Appendix F: Traditional Direct Brainstorming Questions.

Measurements

As with the prior study, the following items were measured: the requirements gathered, the responses of the participants, and the effectiveness of the Appreciative Inquiry process itself. Requirements and participant attitudes were compared between Appreciative Inquiry and the brainstorming sessions.

Requirement Results

Results showed that Appreciative Inquiry produced an equal number of requirements. However, they produced more different requirements that were non-functional and futuristic as shown in Figure 2.

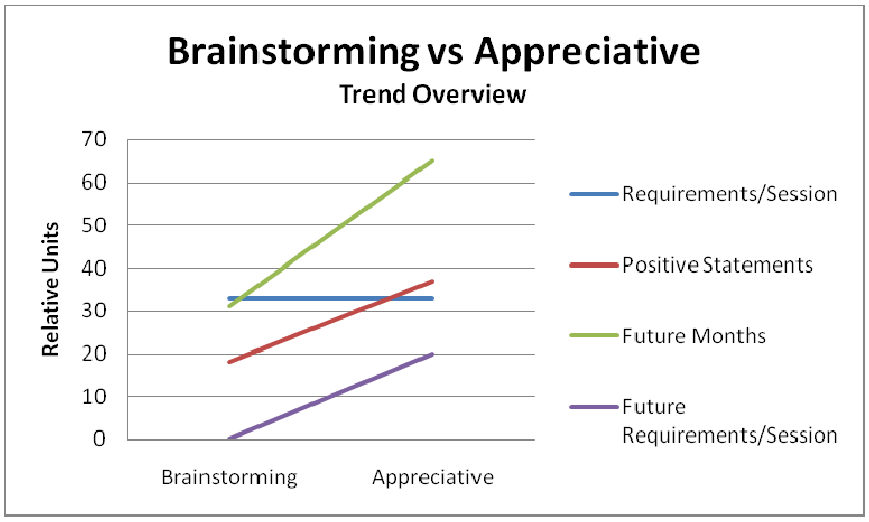

Figure 2: Analysis of brainstorming and Appreciative Inquiry of requirements, positive statements, future months and future requirements.

Participant Feedback

Results showed that Appreciative Inquiry produced a 53% increase in the number of future months considered when identifying requirements as compared to brainstorming. Appreciative Inquiry also produced more positive statements. Those with lower PC abilities showed a 22% increase in the number of months considered into the future when identifying requirements regardless of the elicitation method used. Since this experiment consisted of a distribution of men (10) and women (15), we were able to observe gender differences with Appreciative Inquiry. Interestingly, females considered the future further with

Appreciative Inquiry 2.5 times more than traditional methods as shown in Figure 3. Females also considered the future 2.7 times further than males using Appreciative Inquiry. Males seemed to consider the future more when using traditional requirements elicitation methods as shown in Figure 3.

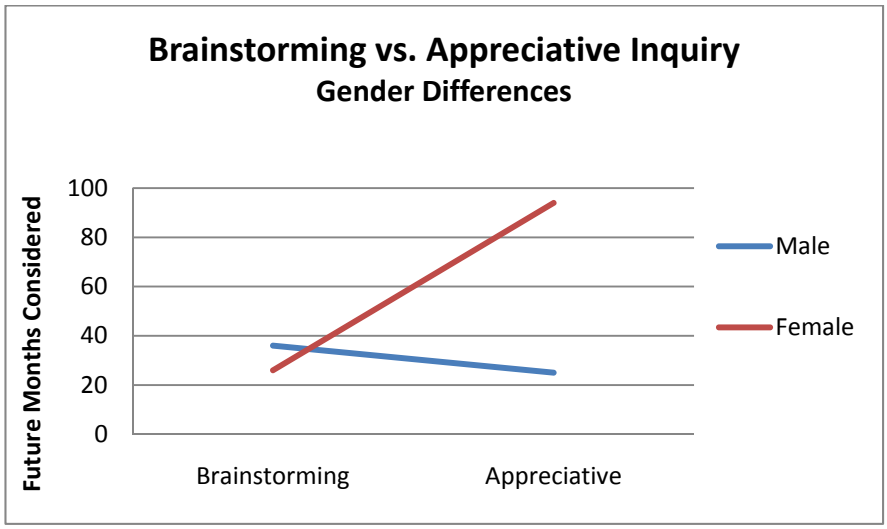

Figure 3: Comparison of future months projected by gender using brainstorming and Appreciative Inquiry.

Appreciative Inquiry also produced slightly improved confidence and satisfaction with the requirements as well as a slightly higher participant prediction for project success with within a given test group ranging from an increase of 7% to 12%.

Process Results

Results showed that the fictitious context and narrative of the experiment produced variable results in participant feedback, such as requirements satisfaction and project success. Results varied dependent on the participant's ability to associate with the fictitious scenario and roles provided. For example,

participants commented on confusion regarding the assigned roles, and how they related to the questions asked. Even though the group knew each other, the group needed to be warmed- up to get into the discussion and process. Measures were not collected in this study for team effectiveness, perception of stress or Emotional Intelligence.

Lessons Learned

In controlled conditions, Appreciative Inquiry continued to produce an increase in requirements especially those that are non-functional (quality-based) and futuristic. Females were more responsive with Appreciative Inquiry with an increase in the number of future months considered in defining requirements. Conversely, Appreciative Inquiry was slightly less effective with males in considering the future.

The fictitious scenario seemed to be a distraction to the Appreciative Inquiry process. Participants required time to understand the context of the fictitious scenario before they could effectively participate. The most interactive participants were those who appeared to have some belief that the system being discussed could actually evolve. Those who struggled with the fictitiousness were less interactive. Additionally, the assigned roles seemed to be more of a distraction as most participants gravitated to their natural role as a user as opposed to assuming a role that, again, wasn't realistic or natural for them.

In the next study, Appreciative Inquiry was evaluated to determine if it produced similar results at different times in the development cycle with real project development teams.

Chapter 7 Project Team Field Experiment (Study 3)

The goal of the third study was to provide further evidence of different requirements resulting from an Appreciative Inquiry approach, and also to fine-tune the process. More specifically, in study two, results were not evaluated to determine if different results would be obtained at different phases of the project since teams better understood the context and were more familiar with their team membership. Consequently, the Appreciative Inquiry process was evaluated to determine if it would provide different results at different phases of the system development cycle. Also, the first study was conducted with an existing team while the second study was conducted with ad-hoc teams, which may have affected the results. We therefore also wanted to use established teams with a defined goal. A quasi-experiment approach was chosen so that the study could be conducted with real projects and existing teams due to the inconsistent results with fictitious scenarios.

Participants

The participants were members of two student project teams within a Computer Information Systems (CIS) capstone course at California State Polytechnic University, Pomona, during summer quarter 2009. As part of this course, students develop software for a client which they have chosen from a list comprised of projects submitted by customers to the course professor. The course uses an “Evolutionary Prototyping” methodology that assumes that the requirements are not known at the beginning of the project and evolve as the

project progresses (McConnell, 1996). There were seven participants with four members in one project team and three members in the other.

Methodology and Procedures

Appreciative Inquiry user requirements were compared in different phases of the system development life cycle. For Team #1, the Appreciative Inquiry process was performed twice: immediately following a presentation of the customer's initial set of requirements and toward the end when the prototype was completed. For Team 2, the Appreciative Inquiry process was performed only at the conclusion when the prototype was presented to the customer. This allowed a comparison of different requirements as gathered in the beginning (Team 1, with Appreciative Inquiry, versus Team 2 without Appreciative Inquiry), while also providing insight into the best timing for Appreciative Inquiry user requirements gathering (initial user requirements and the course's Report 3 for Team 1).

For Team 1, an Appreciative Inquiry theme and questions were provided as in the previous case studies but were adjusted for the individual project. An example is shown below:

> *When customers and employees are successful, the company realizes their vision and goals; employees are successful at producing desired results and achieving their goals, and customers obtain their goals through meeting current and future needs. Technology is a tool that facilitates the achievement of this vision and goals. It frees people from processes and methods. It greatly improves company, customer and employee success, as well as supports successful relationships between the company, employees, and customers. It supports creativity, enables quality and produces desired results.*

When the prototype was presented, the Appreciative Inquiry session was adjusted for the different time in the project cycle (initial class meeting as opposed to following the first prototype, Report 3). The questions included some reference to the project team's relationship as well as their role in helping the customer realize the vision and goals. For example, the Discovery questions included reference to the team's work together:

> *Appreciate what worked well. Describe what worked well with this project. Features? Team dynamics? Client relationship? Learning Opportunities? What would you want to carry over to other projects? What was valued and worked well?*

Measurements

As with the prior study, the following measures were collected: the number and type of requirements gathered, the responses of the participants, and the effectiveness of the Appreciative Inquiry process itself. Requirements and participant attitudes were compared between the different project phases: For Team #1, the Appreciative Inquiry process was conducted after the initial requirements from the customer at the first class meeting and after their first prototype presentation, Report 3; For Team #2, the Appreciative Inquiry process was only conducted after their prototype presentation, Report 3.

Requirement Results

Results showed that Appreciative Inquiry improved requirements consistent with prior results. Appreciative Inquiry produced an equal number of quality-based (non-functional) requirements as compared to functional

requirements. However, Appreciative Inquiry identified over 50% fewer duplicate quality requirements and produced nearly 100% of the futuristic requirements identified.

In comparing the differences in the Appreciative Inquiry process at the different project phases, Appreciative Inquiry identified quality-based requirements and fewer duplicates regardless of phase. Project teams were able to identify additional requirements with the use of the Appreciative process even after finalizing their requirements and presented their prototype regardless of whether the Appreciative Inquiry process was used previously. (See Figure 4 and Figure 5.)

Figure 4 shows he results from applying Appreciative Inquiry following the customer's initial presentation of requirements and at the conclusion of the prototype session. The first Appreciative Inquiry session produced quality requirements not originally included by the customer. Additionally, a few more quality requirements were added following the prototype session.

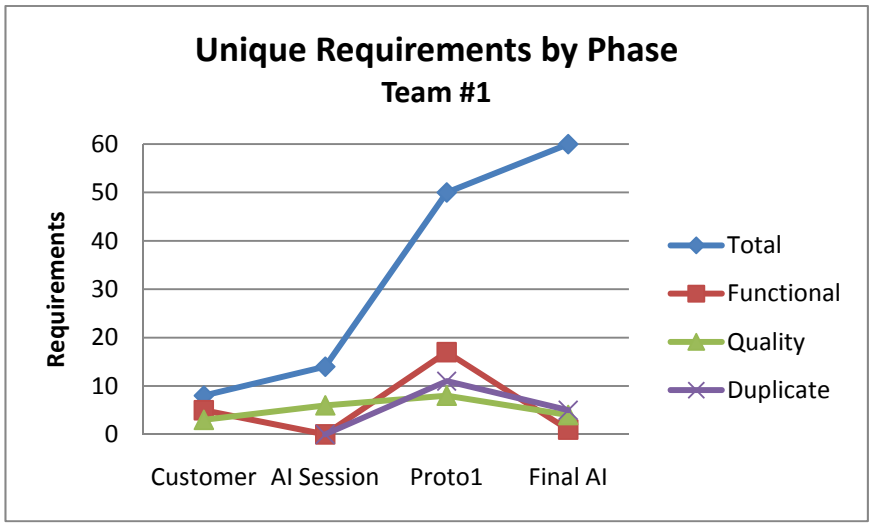

Figure 4: Unique requirements by phase (time in project) for Team #1

Figure 5 shows the application of Appreciative Inquiry with the second team only following the prototype session. Appreciative Inquiry produced additional requirements following the prototype session for this project.

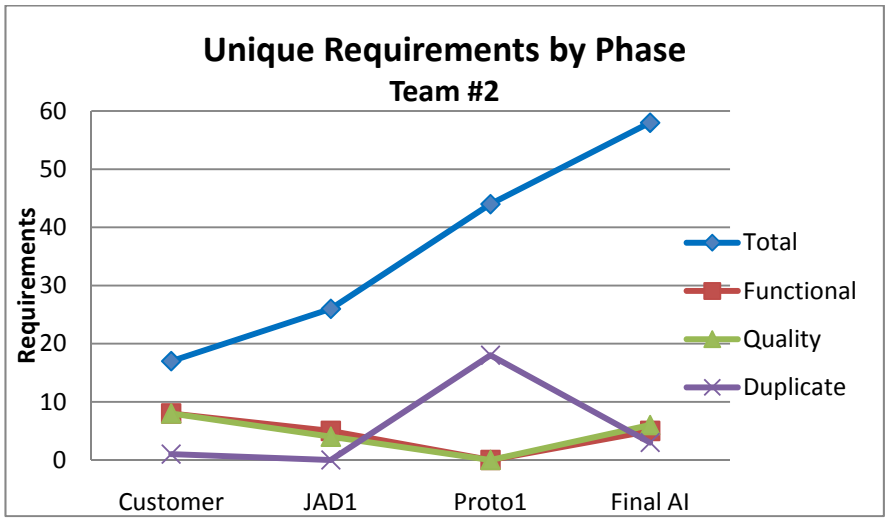

Figure 5: Unique requirements by phase (time in project) for Team #2

Participant Feedback

Feedback showed that they continued to be satisfied with their requirements and showed commitment to their project.

Process Results

Results showed that participants were more interactive with a real project since it was a project with real purpose and a vested purpose for them. However, the customers and developers alike seemed impatient with being distracted from initial technical discussions when asked to use an Appreciative Inquiry approach during their first-time meeting. Customers were anxious to

share a description of their project and the development team was eager to understand what might be expected of them.

Lessons Learned

Using a quasi-experiment approach with project teams, Appreciative Inquiry continued to produce different requirements that did not duplicate other requirements regardless of project phase of the project phase in which it was applied.

As is consistent with Action Research, the researcher continued her role as a direct participant in the process. It was still indeterminable whether Appreciative Inquiry can have similar positive effects when executed by the developers as opposed to the researcher as the Appreciative Inquiry expert. Though the results are promising during various phases of the project development cycle, they are not fully comparative between the two project teams in this study. There are indications that Appreciative Inquiry is effective with teams regardless of familiarity and comfort between the members based on the positive results shown at different project phases over time. However, the results do not provide concrete measures to evaluate this.

The subsequent study addressed these limitations by implementing consistent measures for teams at each project milestone as well as evaluating if a relationship exists with the Appreciative Inquiry feedback and team effectiveness, personal stress, and personal Emotional Intelligence. Additionally, the successive study evaluated whether the developers can apply Appreciative

Inquiry when interacting with their customers with indirect intervention by the researcher.

Chapter 8 Development Team - Multiple Case Study (Study 4)

The purpose of performing this multiple case study was to expand upon the prior studies by focusing on the development team as the Appreciative Inquiry implementers instead of the researcher. Specifically, for this study, the Appreciative process was evaluated as to whether it would produce different requirements (quality, futuristic, unique) documented by the developers with the customer, obtain positive developer feedback, as well as determine if the Appreciative Inquiry process provides different results at different phases of the system development cycle with multiple case studies. Additional measures were included to evaluate other factors that may correlate with Appreciative Inquiry and the elicitation of requirements: team effectiveness, stress, and Emotional Intelligence.

Participants

Similar to the preceding study, the participants of each case study were members of student project teams within a Computer Information Systems (CIS) capstone course at California State Polytechnic University, Pomona. The case studies were conducted during fall quarter 2009. As with the previous study, the students select a development project submitted by external customers to the course professor.

This study consisted of three individual case studies based on student development teams assigned to the following projects:

Team 1: A website for marketing and previewing acoustical panel and wall covering business for an existing business that caters to graphical designers and construction contractors.

Team 2: An e-commerce website that provides information regarding a specific make of classic cars.

Team 3: A website for a university violence prevention outreach program.

Each case study consisted of a team with 5 to 6 developer members and their corresponding customer. All developer team-members were undergraduate students within three to six months of receiving their degree. Each project had one customer who was responsible for defining the requirements. All the customers have undergraduate degrees.

Project types varied in complexity and definition. Team #1's and Team #2's projects were concise and more defined by their customer. Conversely, Team #3 project was presented by the customer with broad, vague and unconstrained requirements. Table 6 provides an overview of the structure of the project teams.

Team	**Team Size**	**Males**	**Females**	**Project Definition**	**Number of Customers**
1	6	6	0	More Defined	1
2	5	5	0	More Defined	1
3	5	5	0	Less Defined	1
Total	***16***	***16***	***0***		***Females=1; Males=2***

Table 6: Project and team overview (Study 4).

Methodology and Procedures

Multiple case studies were conducted and compared evolving changes in requirements, participant feedback, and team effectiveness as the project's evolved through the development process. For each case study, there were four instances where requirements were evaluated by the researcher.

1. The initial set of requirements (Initial) presented by the customer to their selected development team at their initial meeting.
2. The first developer-documented set of requirements (Report 1) that is submitted to the professor after the developer's first joint application development session (JAD1) between the development team and their customer.
3. The second developer-documented set of requirements (Report 2) that is submitted to the professor after the development team's second joint application development session (JAD2) between the development team and their customer. Report 2 is an opportunity for the development team to clarify their initial set of requirements as well as add more.
4. The third developer-documented set of requirements (Report 3) that is submitted to the professor after the developer's first prototype (Proto1) is demonstrated by the developers to their customer. Report 3 provides another opportunity for the development team to clarify requirements by demonstrating a system prototype. The customer and development team often suggest additional requirements at this stage once the customers

view this first working model of their project and the development team gains more confidence in their abilities to meet the customer's requirements.

All reports are submitted with a standardized format provided by the course professor who then provides feedback to the team prior to each report's final submission. The reports are cumulative with additional information being added as the project continues, such as requirement changes. A sample of the report content and format, including the requirements matrix, is provided in Appendix G: Sample Project Team Report. The reports are submitted to the course professor and to the customer at biweekly intervals throughout the progression of the course.

Appreciative Inquiry sessions were performed individually by the researcher alone with each development team after Report 2 and after Report 3. Report 1 was used as a baseline of user requirements for comparison with the other reports. The data collection for this study concluded with Report 3, the first prototype session even though the course and projects continue through to one more prototype session and a final presentation. (The teams continue their work with a second prototype session, Report 4, and the final application presentation and turnover to the user with a final report to the professor.)

The Appreciative Inquiry sessions were performed consistent with the prior studies. However, the researcher worked alone with the development teams individually to apply Appreciative Inquiry to their current project and encourage

their use of the Appreciative Inquiry method with their customer. Table 7 presents an overview of the timing of the team activities, team documentation, researcher activity, and data collected.

	Measure #1 – Initial	**Measure #2 – JAD1**	**Measure #3 – Appreciative Inquiry Session**	**Measure #4 – JAD2**	**Measure #5– Proto1**	**Measure #6 – Appreciative Inquiry Session**
Student team activity	Teams meet customers and obtain initial draft of requirements from user.	First joint application development session between developers and customer.	Meet with researcher	Second joint application development session between developers and customer.	Presentation of first prototype to customer.	Meet with researcher
Student team documentation (output from activity)	Report 0	Report 1	N/A	Report 2	Report 3	N/A
Researcher Activity	Perform initial team survey for team effectiveness and stress. Obtain copy of user's original request.	Obtain copy of current requirements developed before Appreciative Inquiry session.	Perform Appreciative Inquiry sessions with development teams. Provide team members with synopsis of Appreciative session. Survey for team effectiveness and feedback on Appreciative Inquiry session. Obtain self assessments for perception of stress and Emotional Intelligence.	Obtain copy of current requirements following Appreciative Inquiry session and second joint application development session.	Obtain copy of current requirements following second joint application development session.	Perform Appreciative Inquiry sessions with development teams. Survey team for current measures of team effectiveness and feedback on Appreciative Inquiry session. Obtain self assessments for perception of stress.
Study data collected	Define baseline measures for requirements, perception of team effectiveness and team member perception of stress.	Appreciative Inquiry requirements from developers. Current perception of team effectiveness. Feedback on Appreciative Inquiry session.		Requirements following Appreciative Inquiry session.	Final measures for team effectiveness and stress. Self assessment for emotional intelligence. Final set of requirements following prototype and 2nd Appreciative Inquiry session. Feed back on final Appreciative Inquiry session.	

Table 7: Overview of Study 4 activities and measures conducted for each case study.

Case Study Results

Results showed Appreciative Inquiry continued to be effective but it showed minimal transference to the requirements elicitation reports documented by the development teams even though the development teams reports requirements and positive feedback during their Appreciative Inquiry session with the researcher. Requirements results for each case are presented in the subsequent subsection.

Requirements

The unique number of requirements for each case study (team) by project phase and requirement type is shown in Table 8.

Team/ Requirement Type	Customer (Initial)	Report 1	Report 2	Appreciative Inquiry Session	Report 3	Total
Team 1	**13**	**10**	**4**	**12**	**1**	**40**
Functional	10	6	1	7	1	25
Quality	3	4	3	5		15
Team 2	**36**	**20**	**1**	**10**	**3**	**70**
Functional	32	14	1	4	3	54
Quality	4	6		6		16
Team 3	**6**	**9**	**8**	**10**	**5**	**38**
Functional	4	8	5	4	3	24
Quality	2	1	3	6	2	14
Total	**55**	**39**	**13**	**32**	**9**	**148**

Table 8: Unique requirements by team, requirement type and project phase.

Team 1: In this case, the user provided the developer with a concise list of requirements for the website including an in-depth and detailed page-layout

and graphic design, which gave the team members the impression that the initial set of requirements was complete. As shown in Figure 6, the total requirements remained nearly constant during the project life cycle. The team was able to refine and slightly amend the initial requirements list during their first JAD session with a majority of functional requirements with minimal changes during the second JAD session. However, the team was able to identify additional requirements, with a majority of quality requirements, due to the broadened perspective that was provided during the Appreciative Inquiry session. Subsequently, the team suggested and implemented an additional requirement for a portfolio page after the Appreciative Inquiry session.

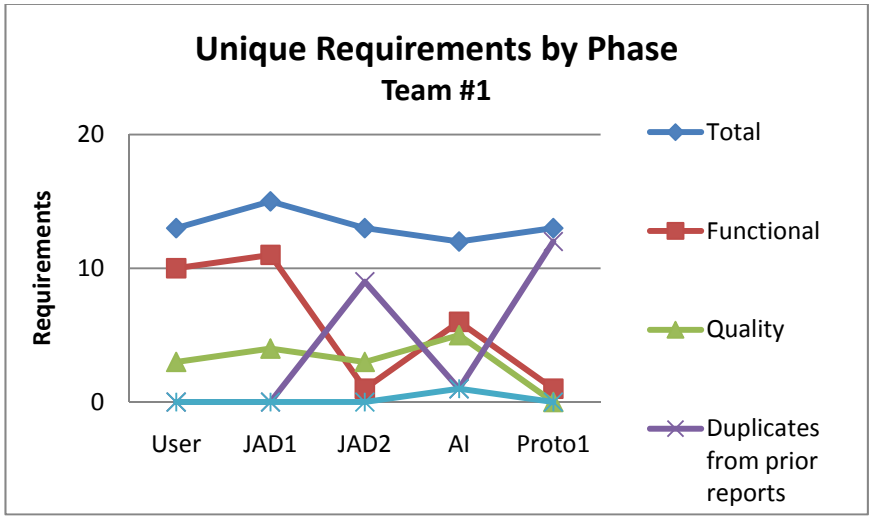

Figure 6: Unique requirements by phase for Team #1.

Team 2: As shown in Figure 7, this customer initially provided a concise and detailed list of requirements. The team subsequently worked with the customer in the JAD sessions to refine the extensive list to a scope that could be implemented within the ten-week timeframe. In this particular case, the project

included extensive database and a technically-focused team which may account for the project's low number of quality-based requirements. The technical nature of the project also destracted the technically-focused team from the user interface design until the first prototype. Despite the technical nature of the team and project, Appreciative Inquiry did produce additional new requirements including a majority of quality requirements, such as incorporating flash and other graphics website to improve visual appeal. However, as with the previous case of Team #1, there was no transference of requirements from the Appreciative Inquiry session to the following requirements matrix.

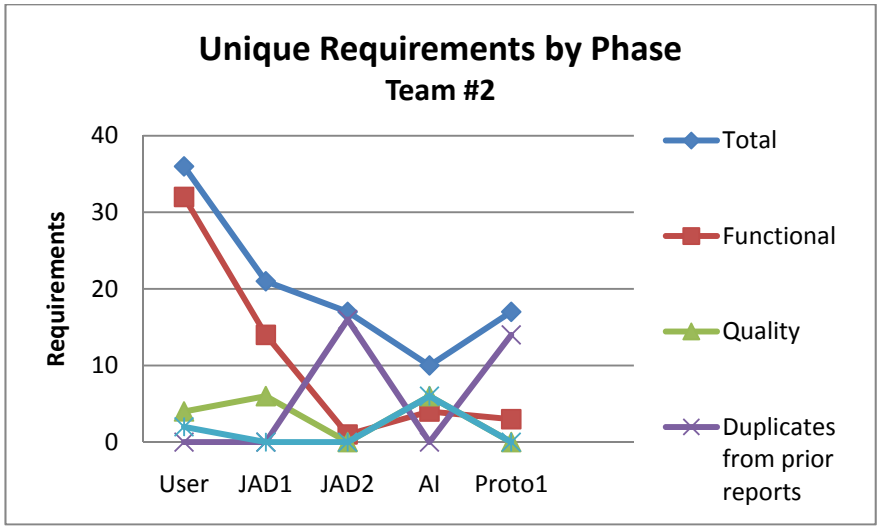

Figure 7: Unique requirements by phase for Team #2.

Team 3: This case's project started with little definition giving more opportunity and challenge for the development team to develop a cohesive set of requirements with their customer. As shown in Figure 8, this project's total unique requirements an increasing trend through the project's lifecycle. This team also reported the largest increase in unique requirements (total

requirements less duplicate requirements) following their Appreciative Inquiry session which included user-focused requirements such as user login, registration, accessibility, and instructions. The team reported that they did attempt Appreciative Inquiry with their client and it helped them get more productive answers from their customer. However, they felt it only helped them identify additional minor requirements. This team reported that additional graphics were added to the final implementation as a result of their Appreciative Inquiry session.

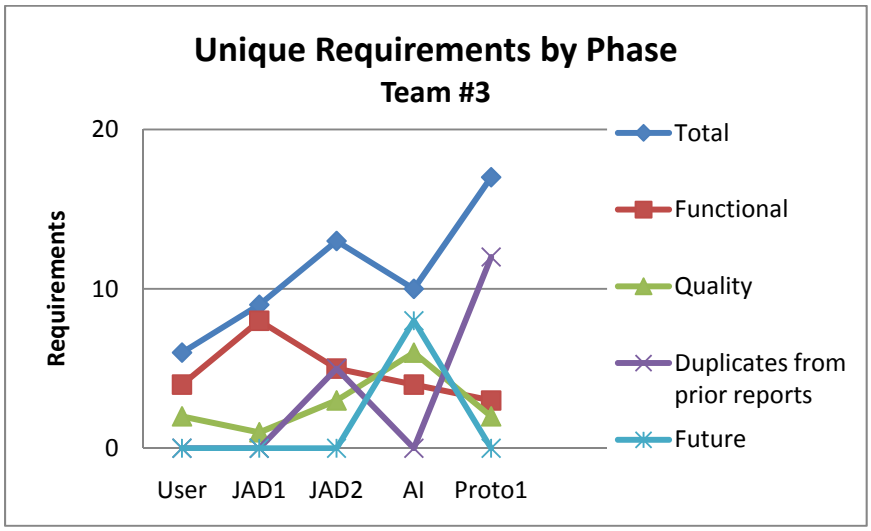

Figure 8: Unique requirements by phase for Team #3.

Cross-Case Comparison

Since each case followed a replicated process, a cross-case comparison is made in an effort to substantiate and generalize the results. In addition to the requirements data discussed for each case above, each case-study embedded data collection of team effectiveness, perceived stress, Emotional Intelligence,

future months considered, and Appreciative Inquiry feedback. The embedded data is compiled and compared across cases to provide an overall context and explanation for the requirements results of all cases. The subsections below present a comparison of all measures collected for all cases.

Requirements

The overall results for all cases (teams) are shown in Figure 9 which includes the total requirements identified at multiple instances during the development process broken down by unique (non-duplicated) functional, unique quality, duplicated, and futuristic requirements. Overall, the number of requirements either decreased from the original set submitted by the user or demonstrated no significant change in quantity as compared to the last requirements matrix (Proto 1) collected from the teams. The Appreciative Inquiry session (AI) identified a number of additional new requirements identified. However, there was minimal increase of new requirements in the teams' reports following the Appreciative Inquiry session.

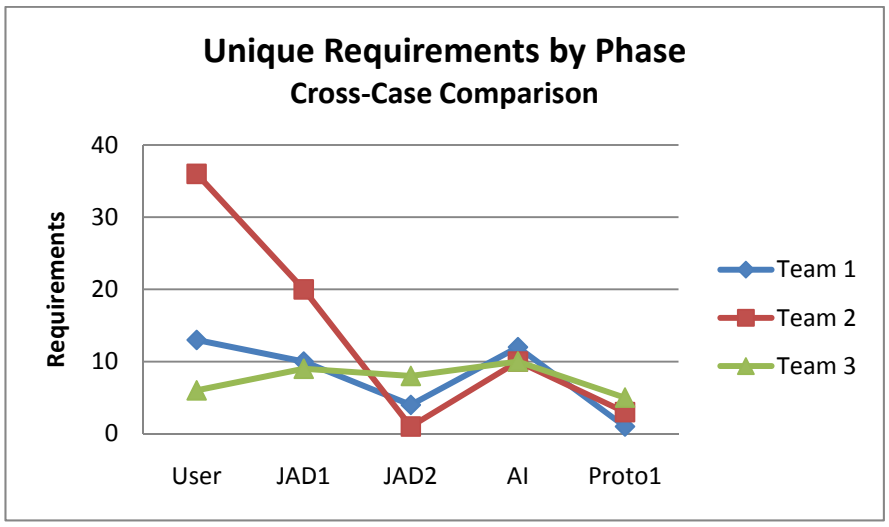

Figure 9: Cross-case comparison of unique requirements by phase and team (case).

The individual case graphs and the cross-case comparison all show an increase in futuristic and quality requirements identified during the Appreciative Inquiry sessions. As is shown in the overall results in Table 8 and Figure 10,

Appreciative Inquiry provided all of the futuristic requirements identified during the project. The Appreciative Inquiry sessions between the researcher and the developers also produced more quality-based requirements than the teams identified in their reports. Unfortunately, the quality-based requirements did not carry forward into the following report, Report 3. Consistent with prior studies, minimal duplicates were identified in the Appreciative Inquiry.

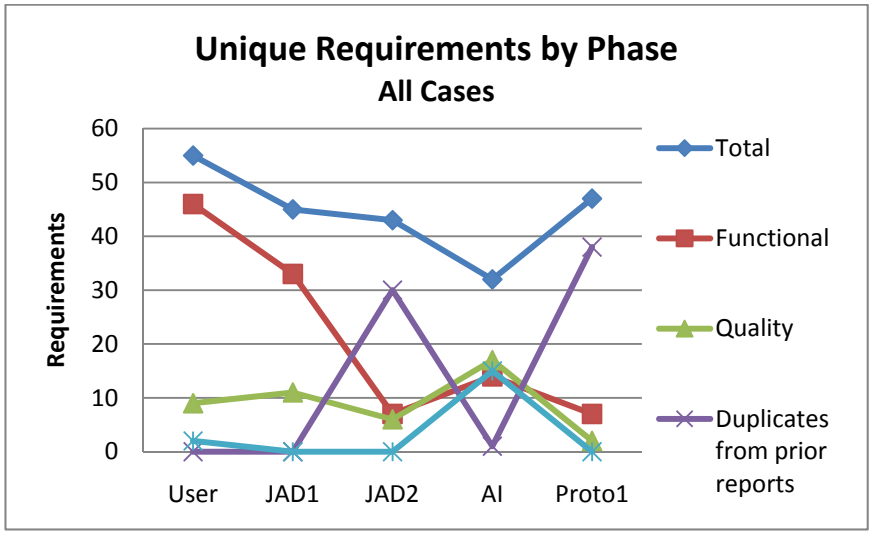

Figure 10: Cross- case comparison of unique requirements by phase (time in project).

Though the teams were able to identify future requirements during the Appreciative Inquiry session, the development teams, despite a few exceptions (e.g., Team 1's portfolio page), expressed reluctantance to suggest any additional requirements to their client for fear that it would mean additional work that they may not be able to complete prior to their project's end.

Participant Feedback

Participants indicated that they experienced a benefit from the Appreciative Inquiry process by providing a broader perspective of their project and customer. The development team members expressed commitment to their requirements and prototype as well as overall commitment to the project. Appreciative Inquiry feedback was solicited using the survey provided in Appendix B: Participant and Process Feedback Survey. Surveys (N=16 for all) were collected after the first JAD session (before Report 1 was finalized) and after the first prototype session (before Report 3 was finalized).

Perception of the team's effectiveness changed over time and was different for the teams who had no prior relationship (Figure 11). For those teams without a prior relationship (Team 1 and Team 3), perceptions of team effectiveness declined over time as much as 40%. (Team members in Team 2 had worked together on development projects in other courses.) Team effectiveness was measured using the survey provided in Appendix C: Team Effectiveness (Bushe & Coetzer, 1995). For the first measure 13 surveys were collected after the first Appreciative Inquiry session (after the first JAD session) and 15 surveys were collected after the second Appreciative Inquiry session (after the first prototype). The scores presented in Figure 11 are based on the average scores of all 33 items scored on a Likert scale from one to four.

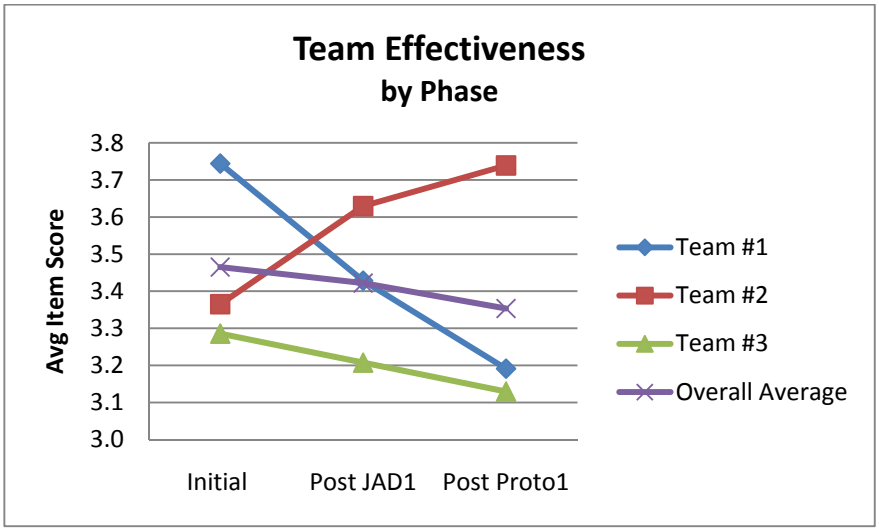

Figure 11: Cross-case comparison of team effectiveness.

Figure 12 shows participant stress using the survey provided in Appendix D: 10-item scale for Perceived Stress (Cohen, Kamarck, & Mermelstein, 1983) with 13 surveys collected initially and 15 collected following the first prototype

session. Perceived Stress was evaluated to determine if there was any correlation with team effectiveness or the requirements collected. The maximum stress for an item on this scale was 4 with a 5-point Likert scale of zero to four. The highest total score that can be achieved on the scale is 40. Overall, the stress of the teams increased nearly 51% over the period of the study. Stress increased over time as the project progressed, which may correlate with the more focused nature of the teams towards their projects as the project proceeded.

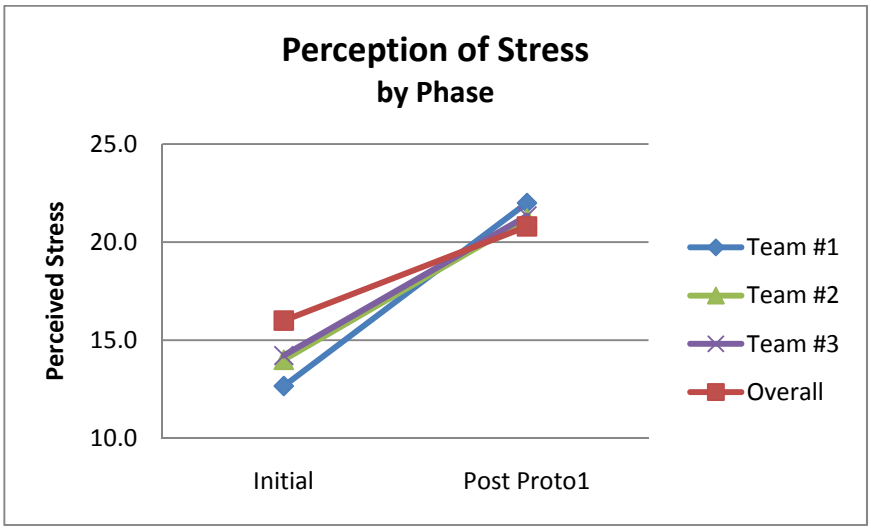

Figure 12: Cross-case comparison of Perceived Stress.

Finally, the deviation of Emotional Intelligence was measured within teams to see if there was any correlation with team feedback, requirement types, or team effectiveness. The survey is provided Appendix E: 33-item Emotional Intelligence Scale (Schutte, et al., 1998). The surveys were collected after the first prototype from 16 participants. The scores for the instrument range from 33 to 138 with the higher scores indicating higher Emotional Intelligence (Lenaghan,

Buda, & Eisner, 2007). The overall team results for standard deviation are presented in Figure 13. Team scores ranged from 114 to 128. The lowest personal score was 98. Team 2, with one of the highest Emotional Intelligence deviation scores, is also the team that showed an increase in team effectiveness scores (as shown in Figure 11). Also, Team 3, the team with the lowest deviation in Emotional Intelligence, had the lowest team effectiveness score.

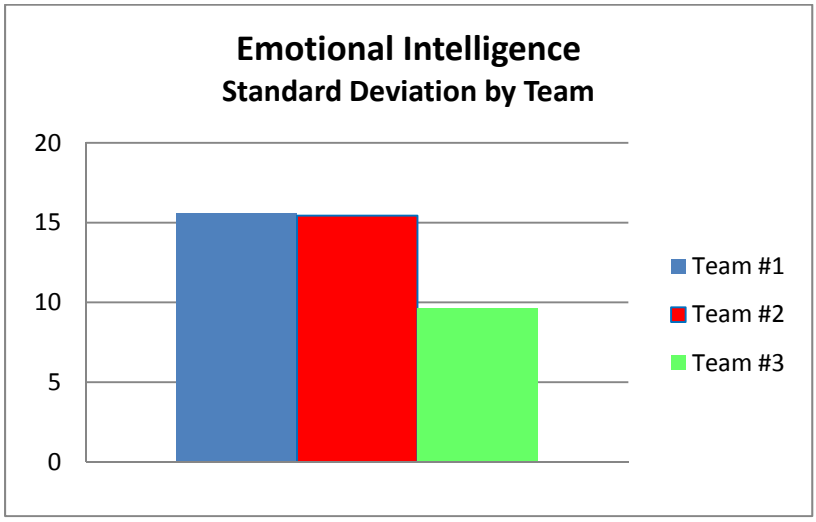

Figure 13: Cross-case comparison of Emotional Intelligence.

Process Results

Process results showed that development teams considered additional futuristic requirements and system potential early in the life of the project and it decreased towards the later phases of the project as shown in Figure 14. All teams reported considering more time into the future (measured months) when defining the requirements at the early stages of the project. However, the

number of future months considered steadily declined as the projects progressed.

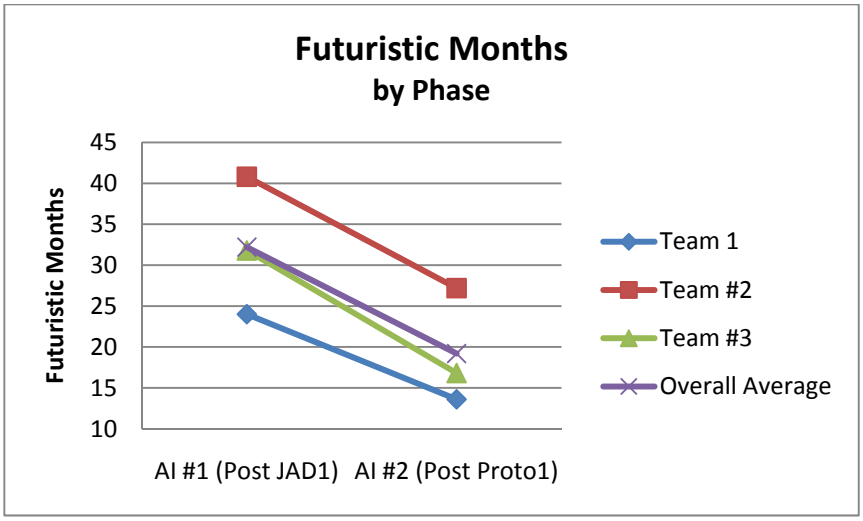

Figure 14: Cross-case comparison of future months considered.

Paradoxically, the teams' acknowledgement for Appreciative Inquiry was higher near the end of the project as compared to the beginning (see Figure 15) as measured by the participant feedback (as provided in Appendix B: Participant and Process Feedback Survey).

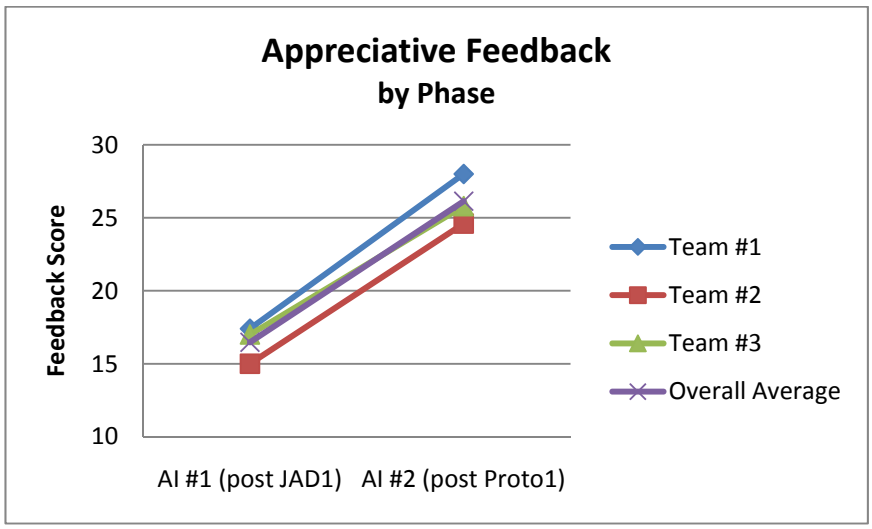

Figure 15: Cross-case comparison of Appreciative Inquiry feedback.

Lessons Learned

Development teams reported benefit from their Appreciative Inquiry sessions but this did not lead to more requirements in their documentation reports or the presented prototypes. Additionally, teams future-focus on requirements declined as the project progressed and tasks with deadlines became more imminent as expected. At this initial state of evaluating conditions suitable for Appreciative Inquiry with development teams, there appears to be possible correlation with team effectiveness and Emotional Intelligence using Pearson's Correlation Coefficient. Emotional Intelligence showed a very weak negative correlation to both stress measures, at the beginning and at the end ($r=-.60$, $p = .03$ and $r=-.55$, $p = .03$, respectively). Emotional intelligence also showed a weak correlation to the final measure of team effectiveness taken after Report 3 ($r=.61$, $p < .05$). However, if adjusted using the Bonferroni adjustment for three tests, which would require a significance level of $\alpha/3$ ($.05/3=.016$), the effects would not be considered significant. More studies are needed to further evaluate this relationship.

Though duplicate requirements were identified, participants were not asked to classify whether a requirement was planned for the immediate project or a future release. This information would help determine whether the additional requirements identified with Appreciative Inquiry influenced the actual outcome of the project or the future of the project.

Since the purpose of this study was to focus on the development teams, customer satisfaction with the project team, the finalized requirements nor the implemented system were evaluated. Implementation disposition (current or future implementation) needs to be collected to determine if the Appreciative Inquiry influences current or future development. Customer feedback may help further inform the Appreciative Inquiry process to identify and clarify factors where Appreciative Inquiry can provide the most benefit.

Chapter 9 Project Team – Multiple Case Study (Study 5)

The goal of this multiple case study was to evaluate the optimization of Appreciative Inquiry with development project teams while being informed by the prior studies and to increase understanding of methods that can help developers improve results when eliciting requirements. Based on the prior studies it was expected that certain modifications to the Appreciative Inquiry process with development teams would improve their elicitation of requirements with more quality-based requirements, more futuristic requirements, and fewer duplicate requirements while considering team and customer feedback on attitudes and satisfaction. As with the prior studies, team effectiveness and emotional intelligence were also evaluated to identify any associations with eliciting requirements.

Participants

As with the prior two studies, study participants were members of student project teams within an undergraduate Computer Information Systems capstone course at California State Polytechnic University, Pomona. This study occurred during winter quarter 2010. The course uses an “Evolutionary Prototyping” methodology that assumes that the requirements are not known at the beginning of the project and evolve as the project progresses. As part of this course, students develop software for a customer that they have chosen from a list of projects submitted by customers to the course professor.

This study consisted of four individual case studies of student development teams assigned to the following projects:

Team 1: An online bank of test questions to support purchasers of an accounting text book.

Team 2: An automated process for consolidation of user access lists for a company's multiple computer systems in order to perform an annual Sarbanes Oxley compliance audit currently done manually.

Team 3: An ecommerce website for a clothing start-up company.

Team 4: An website for a start-up organization for youth and their parents participating in a privately-sponsored youth athletic program.

Each case study consisted of a team with six to seven developer members and their corresponding customer. All developer team-members were undergraduate students within three to six months of receiving their degree. Each project had one to three customers who were responsible for defining the requirements. All the customers have undergraduate degrees and one customer has a doctorate degree.

Project types varied in complexity and definition. Team 1's and Team 2's projects were concise and more defined. Conversely, Team 3 and Team 4 had projects for start-up undefined businesses with customers who presented projects with broad, vague and unspecific requirements. Table 9 provides an overview of the structure of the project teams.

Team	Team Size	Males	Females	Project Definition	Number of Customers
1	7	6	1	More Defined	1
2	7	6	1	More Defined	3
3	6	4	2	Less Defined	1
4	6	4	2	Less Defined	2
Total	***26***	***20***	***6***		***Females=5; Males=2***

Table 9: Project and team overview (Study 5)

Methodology and Procedures

A cross-case study was used to capture evolving changes among multiple development projects with respect in requirements, participant feedback, and team effectiveness within a given team as well as a comparison of all the teams. Data was captured at different project phases during the development cycle: the initial user requirements and after each joint application development (JAD) and prototype session with the customer. All requirements were captured regardless of when they were planned for a current or future implementation.

Table 10 presents an overview of the timing of the team activities, team documentation, researcher activity, and data collected for this multiple case study. Details are provided in subsequent sections.

	Initial	Measure #1	Measure #2	Measure #3	Measure #4	Measure #5	Measure #6
	1/5/10	1/7/10	1/22/10	2/5/10	2/19/10	3/5/10	3/18/10
Student team activity	Teams obtain overview of course.	Students meet customers, form teams, and obtain initial overview of requirements from customer.	First joint application development (JAD) session with teams and customer facilitated by researcher.	Second joint application development (JAD) session between teams and customers.	Presentation of first prototype to customer.	Presentation of second prototype to customer.	Final project presentation to customer.
Student team documents (output from activity)		Report 0	Report 1	Report 2	Report 3	Report 4	Finalized Report Customer feedback and team peer evaluations elicited by professor
Researcher Activity	Participant information and study consent. Provide overview of user requirements and Appreciative Inquiry. Perform Appreciative session with developer team about "effective teams" as the context. Measure emotional IQ, and obtain feedback on Appreciative Inquiry session.	Obtain copy of customer's initial request. Survey team for team effectiveness.	Facilitate 1st JAD session using Appreciative Inquiry with developers and customers and obtain feedback. Provide team members with synopsis of Appreciative session. Obtain copy of initial requirements (Report 1). Provide teams feedback with professor on Report 1. Survey team for team effectiveness. Obtain final Report 1.	Attend 2nd JAD session with developers and customers and obtain session feedback. Obtain copy of 2nd requirements (Report 2). Provide teams feedback with professor on draft Report 2. Survey team effectiveness. Obtain final Report 2.	Attend 1st Prototype session with developers and customers and obtain session feedback. Obtain copy of 3rd (Report 3). Provide teams feedback with professor on draft Report 3. Survey team effectiveness. Obtain final Report 3.	Attend 2nd Prototype session with developers and customers and obtain session feedback Obtain copy of finalized (4th) set of requirements (Report 4). Provide teams feedback with professor for Report 4. Survey team effectiveness. Obtain final Report 4.	Obtain copy of customer feedback and team peer-evaluations. Obtain feedback from teams and customers on requirements and process.
Study data collected	Emotional Intelligence. Feedback on initial Appreciative session.	Baseline measures for requirements perception of team effectiveness.	Set of requirements following 1st JAD session. Current perception of team effectiveness. Feedback on JAD#1 Appreciative process.	Set of requirements following 2nd JAD session. Current team effectiveness. Feedback on JAD#2 process.	Set of requirements following first prototype. Current perception of team effectiveness. Feedback on 1st Prototype session.	Final set of requirements. Final measures of team effectiveness. Feedback on 2nd Prototype session.	Anecdotal information from customer and team feedback. Anecdotal information from customer and team peer-evaluations to support study results.

Table 10: Overview of Study 5 measures and activities.

Participants

Basic participant information was collected from student members of the development teams as with Study 2, 3 and 4 (see Appendix A: Participant Information Survey). Emotional Intelligence scores were also collected from participants as with Study 4. (See Appendix E: 33-item Emotional Intelligence Scale (Schutte, et al., 1998).) Customers were not asked to complete the Participant Information survey. However, their gender was recorded by the researcher. Customers were included to rate their attitudes and satisfaction with the requirements during the development process. (See Appendix B: Participant and Process Feedback Survey.) Anecdotal evidence of developer and customer attitudes and feedback were obtained during JAD and prototype sessions. Additionally developer comments and attitudes were obtained during the Appreciative Inquiry Intervention sessions that occurred during the professor's biweekly feedback sessions. Email feedback was also solicited regarding the overall requirements process following the second prototype session once requirements were finalized. Additional anecdotal information was obtained from the professor's email communications, team email communications, final customer survey, team pear evaluations, and the final project presentation.

Requirements

This study was improved over the prior studies by collecting all requirements considered not just those implemented. In addition to the other requirement characteristics (functional, quality, unique, and futuristic), the disposition (current or future implementation) of the requirements was collected

to encourage teams to collect all requirements regardless of whether they were going to be implemented as part of the current project or implemented in the future. Identifying the disposition of requirements reflected the implementation timing of a given requirement as well as evaluated which phases produced certain disposition types. Additionally, it would help identify if Appreciative Inquiry played a role in identifying requirements with certain disposition (current or future). The disposition was documented in the development team reports based on negotiations between the development teams and their customers according to factors such as effort, priority, and confidence of the project team to implement the item at the time the requirement was identified.

Additionally, development teams were asked to estimate the effort required to implement the requirements: "major" for those requirements requiring more than ten hours of team effort and "minor" for those requirements requiring less than 10 hours. Effort was recorded to provide factors for the project team to use for evaluating the implementation of a requirement. This provided a method for the development teams to encourage the customers to consider all requirements, prioritize them, and make thoughtful decisions.

Requirements information was recorded in documented reports submitted to the professor throughout the course session in biweekly intervals described in Table 10. (See Appendix G: Sample Project Team Report.)

Appreciative Inquiry Interventions

Appreciative Inquiry was implemented throughout the course which included training, demonstrations and feedback based in Appreciative Inquiry's

principles of being focused in a positive and futuristic manner. Two initial Appreciative Inquiry sessions were performed with subsequent Appreciative Inquiry interventions to encourage and support the teams to explain and demonstrate the Appreciative Inquiry process to the project teams and their customers. Ongoing Appreciative Inquiry interventions and feedback were provided to the teams at regular intervals throughout the project.

The first Appreciative Inquiry session was with students prior to forming teams. The purpose of the initial Appreciative Inquiry session was to familiarize the students with Appreciative Inquiry as well as to facilitate a discussion about "effective teams" to help them with their pending team formation decisions. More importantly, the initial Appreciative Inquiry session included discussion of the importance of eliciting requirements, methods and questions for eliciting requirements (including Appreciative Inquiry), and different dispositions available to requirements (current and future). This Appreciative Inquiry session provided the teams with tools for putting their customers at ease and obtaining a variety of requirements (functional, quality, unique, and futuristic) including those that may not be implemented.

The second Appreciative Inquiry session was performed by the researcher as part of the development team's first JAD session with the customer. The development teams created the agenda for identifying requirements with their customer. The teams allocated the latter 15 minutes of the meeting for the researcher to apply the Appreciative Inquiry process to see if additional requirements could be identified. The collective outcome of the JAD session

formed the first formal set of requirements documented in Report 1. The purpose of having the researcher apply the Appreciative Inquiry process in this JAD session, as opposed to the development teams, was to provide a foundation in Appreciative Inquiry to the customers and development teams as well as determine if Appreciative Inquiry would build a foundation between the development teams and their customers that would carry-forward to future project phases. Additionally, it was applied to the latter part of the meeting to allow the customers and development teams time to address the immediate technical questions that were expected based on the prior case study results.

Subsequent interventions were performed biweekly throughout the course as part of the professor's regular feedback sessions that occurred the week following the submission of each report. The researcher participated in these feedback sessions using Action Research and Appreciative Inquiry methods to intercede with the development teams to stress the importance for obtaining requirements; emphasizing unique, quality-based, futuristic requirements, and the requirement's implementation disposition. During each intervention session, the current report draft and documented requirements were discussed as well as Appreciative Inquiry opportunities that could be applied to improve project success and customer satisfaction.

During all Appreciative Inquiry sessions, the teams were encouraged to recognize current versus future requirements and the teams and customers were encouraged to acknowledge and record all requirements. The importance of

understanding the customer's end-goals and vision were stressed during the Appreciative Inquiry sessions and interventions as well.

These particular milestones were chosen because they were identified previously as opportunities when requirements are still being solidified between the development teams and their customers. The course defines Report 4 as the finalized list of requirements.

Team Measures

As with the prior study, this study continued to evaluate team effectiveness at each Appreciative Inquiry intervention session. (See Appendix C: Team Effectiveness (Bushe & Coetzer, 1995).)

Case Study Results

Results showed Appreciative Inquiry continued to be effective but it showed minimal transference to the requirements elicitation reports documented by the development teams even though the development teams reports requirements and positive feedback during their Appreciative Inquiry session with the researcher. Requirements results for each case are presented in the subsequent subsection.

Requirements

Table 11 provides a summary of the unique requirements and their type for each team by project phase. There are slight variations due to the uniqueness of the projects and teams. In total, all four teams gathered more than 67% of their unique requirements in the first JAD session.

Team/ Requirement Type	JAD1	JAD2	Prototype 1	Prototype 2	Total
Team 1	**41**	**5**	**2**		**48**
Functional	20	2	2		24
Quality	21	3			24
Team 2	**28**	**10**	**12**	**11**	**61**
Functional	12	4	10	3	29
Quality	16	6	2	8	32
Team 3	**37**	**4**		**2**	**43**
Functional	19	2			21
Quality	18	2		2	22
Team 4	**16**	**4**	**4**	**5**	**29**
Functional	9	2	2	2	15
Quality	7	2	2	3	14
Overall Total	**122**	**23**	**18**	**18**	**181**

Table 11: Summary table of unique requirements and their type by team and project phase.

Team 1: This case provided a simple and well-defined project. The customer continually expressed the simplistic nature of the project and lack of need for a complex solution. The development team embraced Appreciative Inquiry by framing the questions in a positive manner for each requirements session. This enabled the team to amend the requirements for a project that otherwise would have remained with the initial list of requirements. For example, the team asked the customer what additional features he would like as opposed

to asking the customer what they wanted fixed or changed. Due to the team's openness for additional requirements, the customer was encouraged to identify requirements that improved the functionality and quality of the website. The ability to add and edit test questions as well as a forgotten password function were added to the requirements list and implemented. At the completion of the project, the development team stated that "*Appreciative Inquiry for our team helped us acknowledge all customer requirements and have a positive relationship with our client*".

Team 2: This case provided detailed requirements since it was automating an existing manual process. Due to the highly-defined and complicated nature of the existing manual process presented by the customer, the development team experienced initial hesitancy considering future requirements. However, the team was subsequently influenced by the Appreciative Inquiry intervention sessions to anticipate needs beyond what was presented by the customer as shown by the steady increase in unique requirements during the second JAD session and prototype sessions. Appreciative Inquiry also relieved the fear experienced by the customer and development team for additional requirements with the ability to classify requirements for the current or future implementation.

Additionally, the customer was encouraged to think beyond the existing process during the Appreciative Inquiry session at the first JAD session when the customer mentioned the desire for a "single button" to run the entire process. Though the development team could not meet the project requirements with a

"single" button, the development team used the customer's vision of "buttons" for implementing the multi-stepped actions of the solution. The development team reported that the need for buttons was "always in the back of their minds." The development team was also able to think beyond the initial automation request of the customer and automate additional steps that were not originally requested. In this case, a simple quality-based "future" requirement provided an opportunity for the development team to improve customer satisfaction. During the final project presentation, the team reported that Appreciative Inquiry "*put them in the mindset that future requirements could be implemented*."

Team 2's initial membership was changed by the professor which impacted their initial team effectiveness and coordination but it did not impact their ability to effectively complete the assigned project.

Team 3: This case had the broadest project scope with the least definition of all the cases in this study since it was for a new business which lacked operational processes and detailed product definition. Consequently, the development team was initially overwhelmed by the project and lacked the confidence that it could be completed. In this case, Appreciative Inquiry had minimal impact for amending the initial set of requirements but it did provide the development team a means for controlling the classification of current requirements that they would implement versus those future requirements that would be part of a future development project. Appreciative Inquiry helped to develop the development team's understanding for the customer's future vision to develop an infrastructure that would allow for custom-made clothing though

the current implementation was limited to the immediate priority of ready-to-wear clothing. However, the classification of future requirements did not constrain the project team from considering the possibility for implementing future requirements when they were technically feasible within the project timeline. In this example, the customer requested background music for their website, a minor-effort quality-based "future" requirement, which the project team was able to implement as part of the current project. The simple implementation of this requirement immediately improved the customer and team relationship as evidenced by the customer's immediate response in complimenting the team. This also led to the customer's enhanced participation in the remainder of that particular prototype session. At the conclusion of the project, the development team stated that "*Appreciative Inquiry helped guide us in developing a product that the customer was satisfied with. By working closely with the customer in the decision making process, we were able to explore more options when creating the website, than we would have without it*."

Team 4: The project with this case was presented by the customer with a desired future vision as opposed to concrete decisive requirements. Appreciative Inquiry provided the opportunity for the customer to articulate the goals and vision for this project. During the first JAD session, the customer expressed the importance of building ongoing relationships with and between the youth participants. Consequently, the development team provided ongoing suggestions shown in the moderate addition of requirements during the JAD and prototype sessions. The enhanced collaboration and mutual understanding for

the vision resulted in the implementation of many requirements that were originally identified for a future implementation including a gallery of end-user submitted photos and artwork and an interface to Facebook. The implementation of these quality-based requirements enhanced the customer's project satisfaction as well as his trust in the development's team understanding of his vision. During the development team's final presentation, they reported that Appreciative Inquiry "*opened the lines of communication, which allowed us to determine what requirements were feasible during the development process and which could be postmarked for the future*."

Cross-Case Comparison

Since each case followed a replicated process, a cross-case comparison is made in an effort to substantiate and generalize the results. In addition to the requirements data discussed for each case above, each case-study embedded data collection of team effectiveness, perceived stress, Emotional Intelligence, future months considered, and Appreciative Inquiry feedback. The embedded data is compiled and compared across cases to provide an overall context and explanation for the requirements results of all cases. The subsections below present a comparison of all measures collected for all cases.

Requirements

Requirements were compared between teams and project phases to determine if any patterns emerged when eliciting requirements at certain project phases. The combined results of all teams showed that the first JAD session

produced the majority of requirements thus showing the importance of this phase in eliciting requirements. The total unique quality and functional requirements remained equal for both JAD sessions. However, in comparing requirement types at different project phases, unique functional requirements were 75% higher in the first JAD session as compared to other phases; and quality requirements were 74% higher in the second prototype session as compared to other phases. (See Figure 16.) As an explanation for these results, it was observed that the development teams and customers appeared to be more focused on core functional requirements during the first JAD session (the first official opportunity for customers to define their requirements) and the first prototype session (when the customers get their first view of a working model). Conversely, in the second prototype session, there is a rise in total unique quality requirements and decrease in unique functional requirements after customers have addressed core functional needs in the prior prototype session.

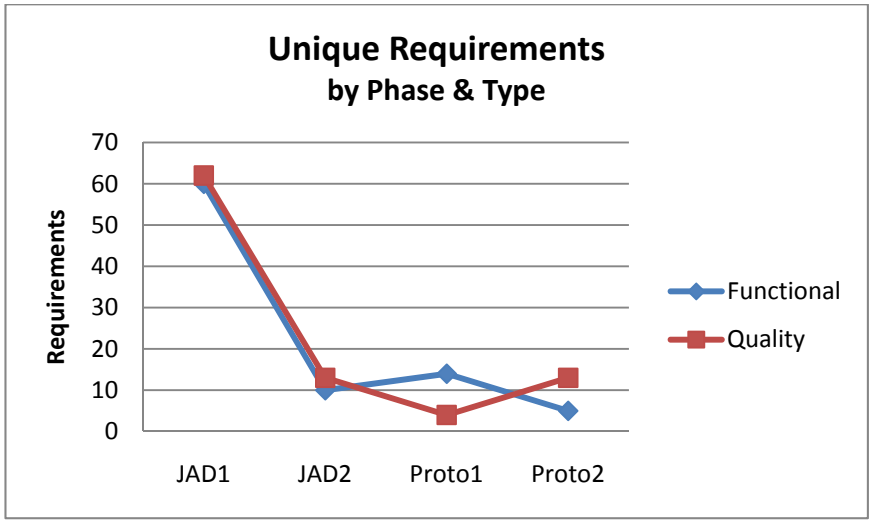

Figure 16: Cross-case comparison of total unique requirements by phase and type.

Figure 17 shows the difference between requirements identified as being implemented in the current project with those being recorded for a future implementation. A similar pattern can be seen for a higher number of functional requirements identified in the first JAD session and the first prototype session as compared to quality-based requirements. Unique current requirements were 221% higher than unique future requirements in the first JAD session (84 current requirements versus 38 future requirements).

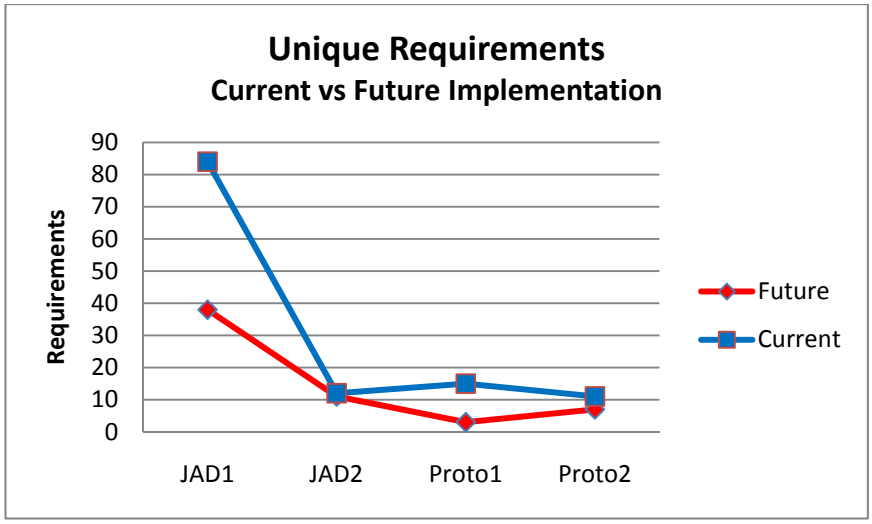

Figure 17: Cross-case comparison of current requirements versus those identified for a future implementation by project phase.

Similarly, Figure 18 shows how major requirements were 221% higher in the first JAD session as compared to minor requirements in the same project phase. Major requirements also increased in the first prototype, 260% more major requirements than minor requirements (13 major requirements and 5 minor requirements).

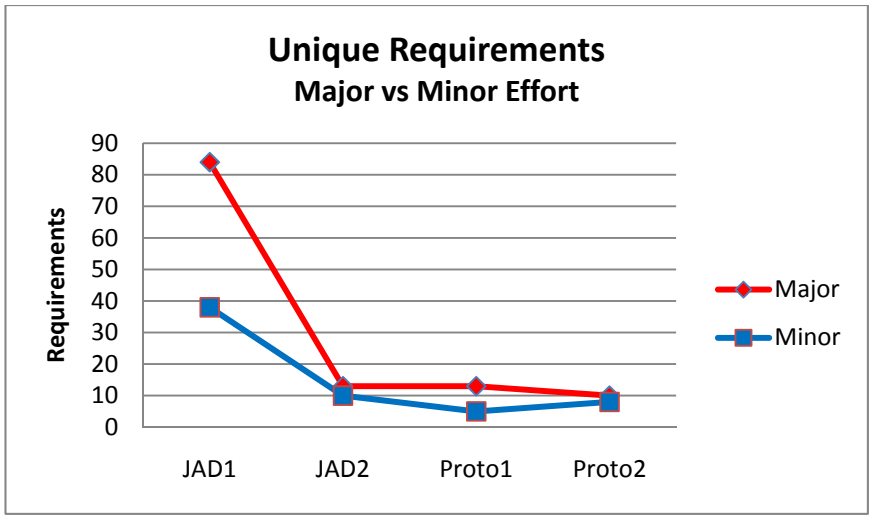

Figure 18: Cross-case comparison of major and minor unique requirements by phase.

Figure 19 shows a comparison of current and future requirements by type to determine if certain types of requirements were more likely to be identified for a current implementation or a future implementation. The results show that 53% of current requirements were functional as compared to 41% of the future requirements were functional. Conversely, the majority of future requirements, 60%, were quality-based. However, one cannot infer the importance or priority of the quality requirements identified for the current phase versus a future implementation since implementation decisions were not evaluated as part of this study. However, based on researcher observation, the implementation

disposition (current versus future) was evaluated based on the perceived benefit of the requirement as well as the implementation effort, course timeframe, resources and customer priority.

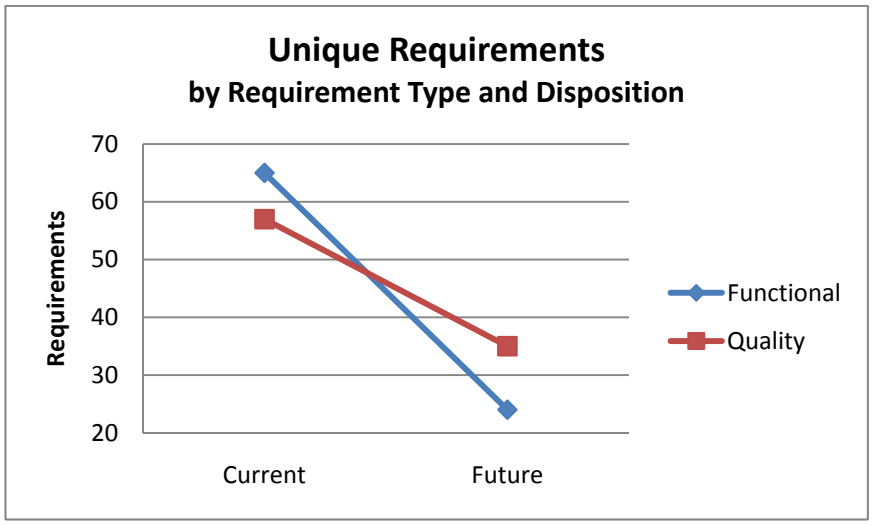

Figure 19: Cross-case comparison of requirement type based on expected implementation timing.

Figure 20 graphs the unique requirements for each team. The overall trend is repeated in each team with an overall decrease in unique requirements through the phases of the projects.

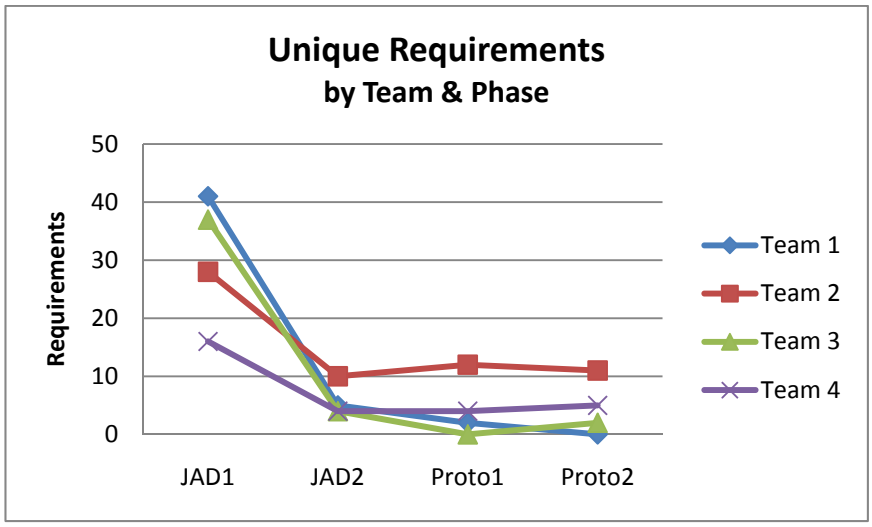

Figure 20: Cross-case comparison of unique requirements by team and phase.

More or Less Defined Projects: In looking at individual team differences based on the uniqueness of each project and team composition, Team 1 and Team 2 were compared with Team 3 and Team 4. The former set of case studies had projects that were well-defined by their customer and the development teams consisted of 6 males and 1 female. The latter pair of case studies consisted of projects that were not well defined and the development teams consisted of 4 males and 2 females. In evaluating if these project or team composition differences influence the case study results, the gender composition of the team was not considered a direct factor since the project definition was provided by the customer and not the development team. Additionally, no statistical effect or correlation by gender was found.

To evaluate any impact of project definition further, the data was grouped into “More Defined Projects” (Team 1 and Team 2) and “Less Defined Projects” (Team 3 and Team 4). Figure 21 shows how more-defined projects have more unique requirements gathered. In each phase of the project, more-defined projects elicited a 30% higher number of requirements during the first JAD session and 51% additional requirements overall.

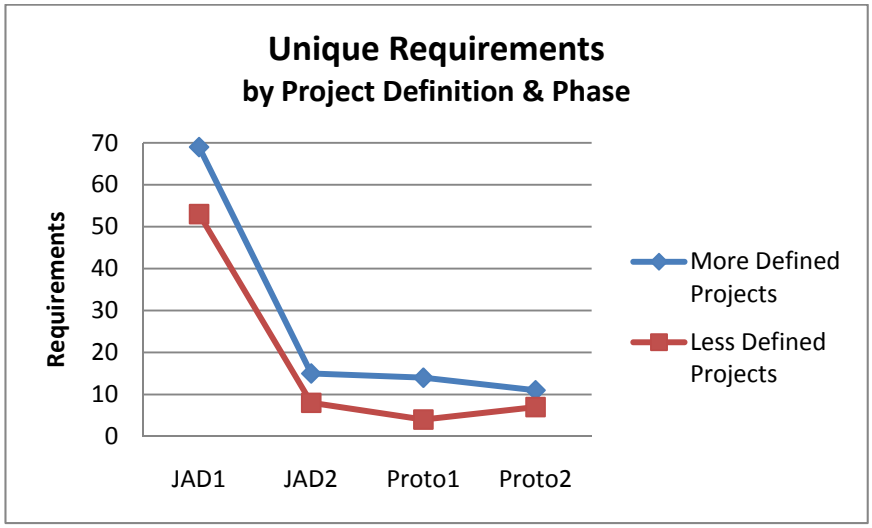

Figure 21: Cross-case comparison of requirements for projects with more and less definition by project phase.

Further evaluation of requirement differences between more-defined projects and less-defined projects also showed differences in the types of requirements gathered. More defined projects produced 60% more requirements overall which is consistent by type (60% functional, and 61% quality) as shown in Figure 22.

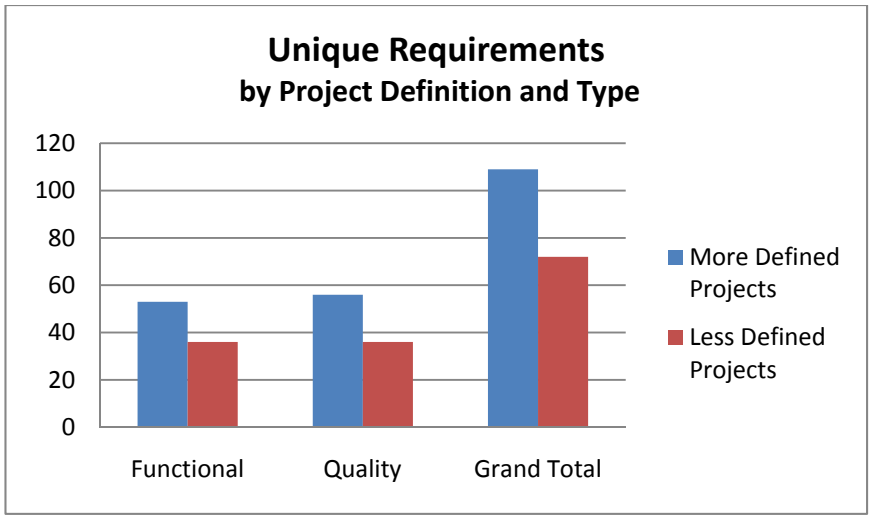

Figure 22: Cross-case comparison of requirement type by project definition.

A comparison of requirements implementation effort (major and minor) by project definition status (more-defined versus less-defined) is shown in Figure 23. More-defined projects produced more requirements regardless of effort: 55% more major requirements and 70% more minor requirements.

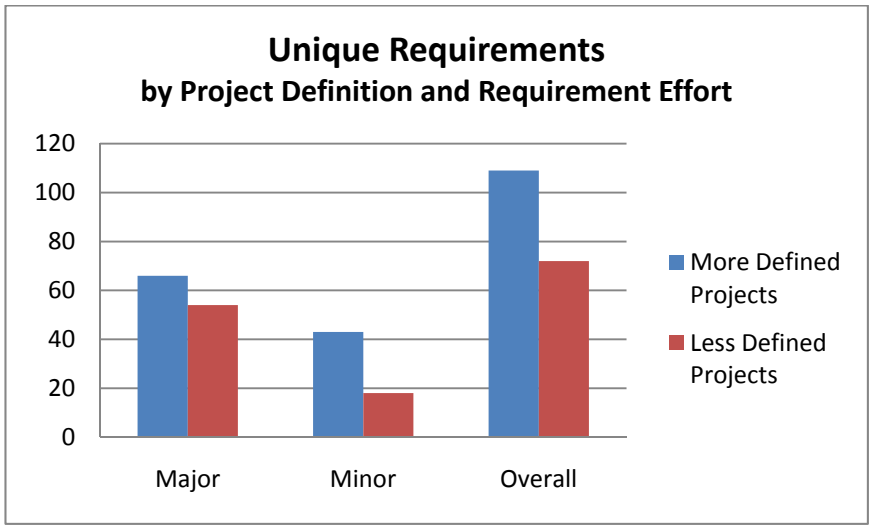

Figure 23: Cross-case comparison of unique requirements by expected implementation effort and project type.

Participant Feedback

Participant feedback was collected using the survey provided in Appendix B: Participant and Process Feedback Survey. It was used to evaluate, for each team and each project phase, changes in the positive outlook, commitment and future vision related to their requirements and/or prototype. Feedback was collected from the initial Appreciative Inquiry session with the development teams regarding successful development teams. Additionally, surveys were collected following each JAD and prototype session from each development team member and the customers. There were 26 team members and 7 customers. The

following numbers of surveys were collected from each session: 25 developers and 6 customers for JAD 1, 26 developers and 6 customers for JAD 2, 25 developers and 6 customers for Prototype 1, and 26 developers and 7 customers for Prototype 2. Survey results were totaled for all sections for each participant except for the number of months each participant projected into the future when identifying requirements, which were averaged.

Generally, every development team shows the same pattern with the highest feedback at the initial Appreciative Inquiry session, hitting a low point at the first prototype and a slight increase at the second prototype when requirements are finalized. Figure 24 shows the development team's initial feedback with a positive focus and positive outlook towards working with teams. Then adding the feedback from the requirements and prototype sessions, the scores lessen from that initial Appreciative Inquiry session now that project context and responsibility are added. In looking at the data from the JAD and prototype sessions, an overall trend is shown that decreases from the first JAD session to the lowest point at the first prototype session and then an increase at the last prototype session.

In presenting these results to the course professor, she stated that the decline in positive outlook and focus shown in Figure 24 is typical of projects teams: *"Once the work hits and the team looks at what it still needs to do, team members typically become discouraged. Then it picks up. The "dip" was less this quarter. No team came to say "we can never finish this". My guess for the*

reason would be that they felt they had more control over the requirements than they usually do."

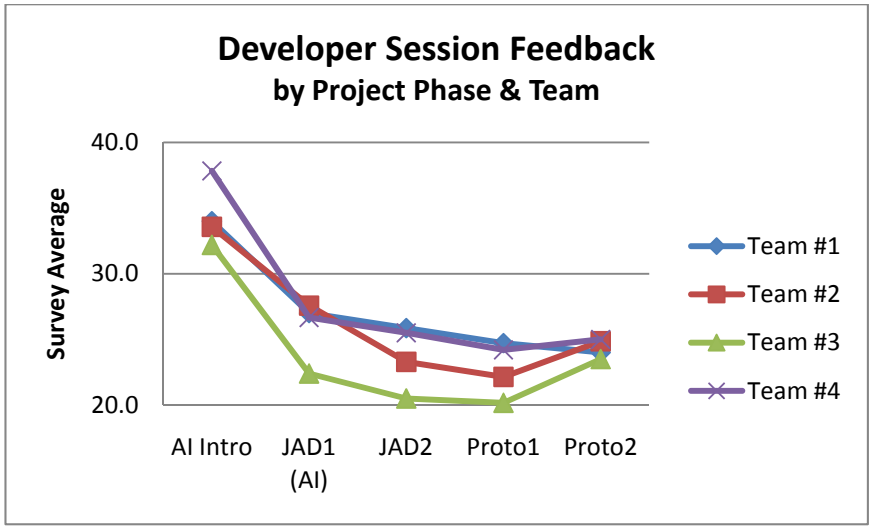

Figure 24: Cross-case comparison of session feedback by project phase and team.

Developers and customers have very different views of a project: developer feedback may be more or less positive based on how well they perceive their ability to meet the deliverables and deadlines; and the customer feedback may be more or less positive based on how well they perceive and/or observe their requirements being met by the development team. Because of the differences between developers and customers, the session feedback was separated for these two groups (see Figure 25). It is clear that a similar pattern emerges for both groups even with the small populations. Highly positive feedback was reported at the start of the project, decreased at the first prototype, and increased at the second prototype. With this small sample (N=6), customers showed slightly higher positive feedback in the first JAD session while the developers are slightly more positive in the second prototype. As reported by the

professor, the development teams become more positive as they near the end of the project when requirements are finalized and they can anticipate the project completion.

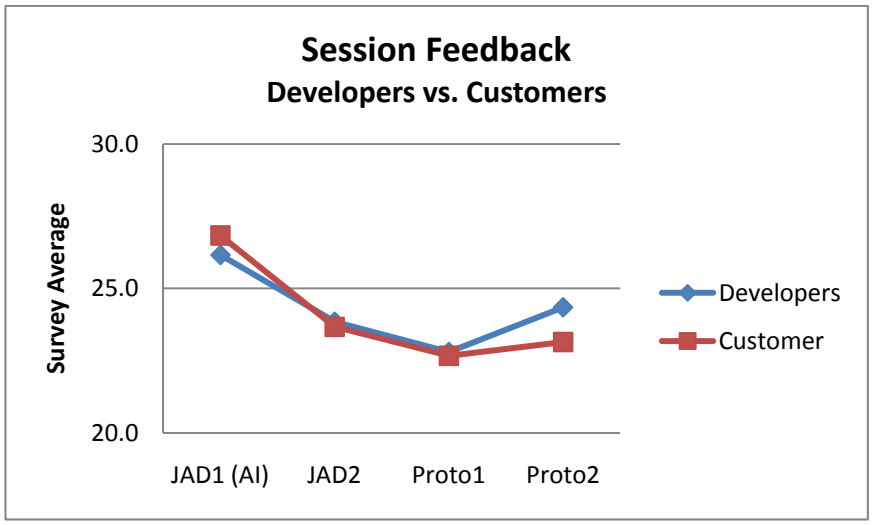

Figure 25: Cross-case comparison of JAD and prototype session feedback between developers and customers.

Despite the differences seen with requirements and project definition, project definition did not have a statistically significant effect (p=.076) on the feedback from the first JAD session based on the one-way ANOVA presented in Table 12. Based on researcher observation and the defined process of the course, the first JAD session is the team's first opportunity to understand the extent and definition of the project (or lack thereof) from the customer. No other significant effect from project definition was seen from the requirement session feedback.

		Sum of Squares	df	Mean Square	F	Significance
JAD1 Feedback	Between Groups	25.135	1	25.135	3.386	>.05
	Within Groups	215.252	29	7.422		
	Total	240.387	30			

Table 12: One-way ANOVA of the effect of project definition on JAD 1 session feedback.

Team membership is shown to have an effect on requirements session feedback. Table 13 shows the one-way ANOVA effect of team membership on the session feedback. Statistically significant effects are shown on session feedback: from the first JAD session ($F(3,27)=4.653$, $p=.010$), from the second JAD session ($F(3,28)=10.706$, $p<.001$), and from the first prototype session ($F(2,27)=5.294$, $p=.005$). It was noted that there was no significance effect of team membership on feedback from the second prototype session, when requirements are finalized and the project is nearing completion. This could indicate that team members feel less obligated to align their feedback as the project nears completion.

		Sum of Squares	Df	Mean Square	F	Significance
JAD 1 feedback	Between Groups	81.930	3	27.310	4.653	.010
	Within Groups	158.457	27	5.869		
	Total	240.387	30			
JAD 2 feedback	Between Groups	127.618	3	42.539	10.706	.000
	Within Groups	111.257	28	3.973		
	Total	238.875	31			
Prototype 1 feedback	Between Groups	110.150	3	36.717	5.294	.005
	Within Groups	187.270	27	6.936		
	Total	297.419	30			
Prototype 2 feedback	Between Groups	26.401	3	8.800	.921	>.05
	Within Groups	277.114	29	9.556		
	Total	303.515	32			

Table 13: One-way ANOVA of the effect of team membership on session feedback.

Team Effectiveness: Consistent with the previous study, team effectiveness was measured to evaluate whether it had an influence on the success of teams to elicit requirements or participant feedback. The first team effectiveness survey was collected immediately following the formation of the teams. Subsequent surveys were collected at the conclusion of the professor's

report feedback session with each development team. Of the 26 total participants, 26 surveys were collected from each measurement point except for 25 surveys collected at the last feedback session when a participant was not present. As shown in Figure 26, team effectiveness improved for each team from the first survey point to the final survey.

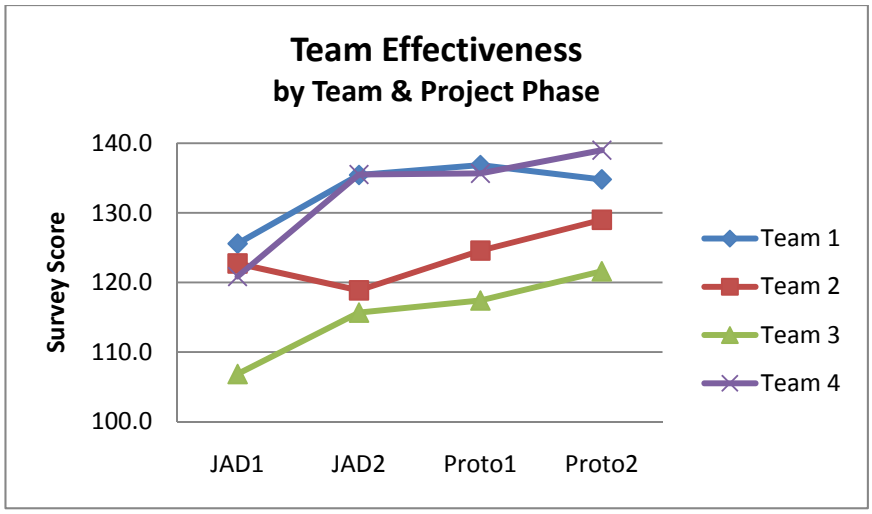

Figure 26: Cross-case comparison of team effectiveness by team and project phase.

Significance of the Second JAD Session: In reviewing the requirement's results and the team effectiveness results, the second JAD session appears to be a key phase in the development process. The Pearson correlation coefficient was calculated to determine any other relationship between measures of the second JAD session with measures from subsequent sessions. Because 4 correlations were evaluated, the alpha level indicating statistical significance was adjusted with a Bonferroni adjustment (.05/4=.0125) requiring a probability smaller than .0125 to indicate significance. As shown in Figure 27, the following correlation can be considered significant:

1. Team effectiveness from the second JAD session is also positively correlated to the session feedback from that same session (r=.80, p< .01) showing a relationship between JAD 2's team effectiveness and the requirements session feedback.
2. Team effectiveness of the second JAD session is positively correlated to the team effectiveness from the first and second prototypes (r=.82, p<.01; and r=.79 p<.01, respectively).

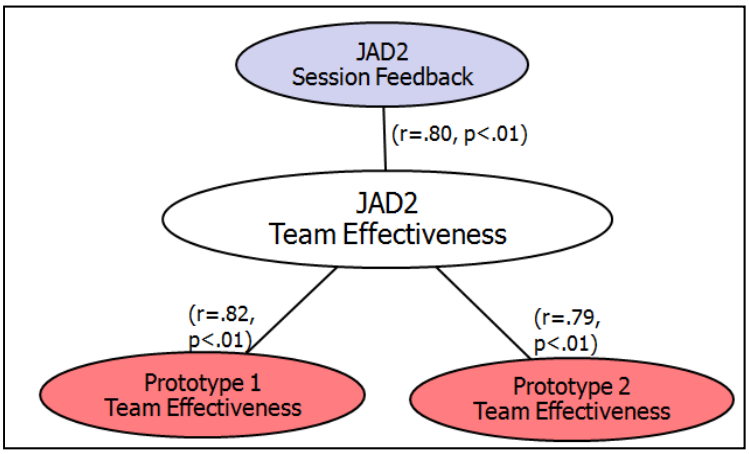

Figure 27: Cross-case Pearson correlation coefficient between measures of JAD 2 with measures from subsequent prototype sessions.

Team Membership: A one-way ANOVA was used to evaluate whether team effectiveness was related to team membership. Specifically, the goal was to determine if the concept of being assigned to a team influences team effectiveness. As shown in Table 14, the one-way ANOVA analysis shows that team membership did have an effect on the team effectiveness measures with the exception of the first team effectiveness measure taken right after teams were formed.

		Sum of Squares	Df	Mean Square	F	Significance
Initial Team Effectiveness	Between Groups	1303.344	3	434.448	1.142	>.05
	Within Groups	8372.810	22	380.582		
	Total	9676.154	25			
JAD 2 Team Effectiveness	Between Groups	2178.582	3	726.194	3.832	.024
	Within Groups	4169.571	22	189.526		
	Total	6348.154	25			
Prototype 1 Team Effectiveness	Between Groups	1606.147	3	535.382	2.972	.054
	Within Groups	3963.238	22	180.147		
	Total	5569.385	25			
Prototype 2 Team Effectiveness	Between Groups	1111.833	3	370.611	2.523	>.05
	Within Groups	3084.167	21	146.865		
	Total	4196.000	24			

Table 14: One-way ANOVA of the effects of team membership on team effectiveness.

Emotional Intelligence: As with the prior study, Emotional Intelligence was measured to determine if there is any relationship between Emotional Intelligence with team effectiveness or the requirements elicitation process. The survey is provided in Appendix E: 33-item Emotional Intelligence Scale (Schutte, et al., 1998). Of the 26 team members, 25 completed the survey. One survey was eliminated since it presented outlier scores when compared to all the other surveys. The scores for the instrument range from 33 to 138 with the higher

scores indicating higher emotional intelligence (Lenaghan, et al., 2007). The results in Table 15 show that Team 1 had the lowest score of all four teams with the other three teams having similar higher scores. Team 2 had the lowest individual team member score.

As shown in Table 15, the standard deviations of Emotional Intelligence scores shows that Team #1 had the least dispersion of Emotional Intelligence scores among its members, and Team #2 and Team #4 had the widest dispersion of scores. Low dispersion indicates a team's similar level of Emotional Intelligence. Those teams with a higher dispersion could indicate a team with a broader diversity of Emotional Intelligence.

Team	**EIQ Average**	**EIQ StdDev**	**EIQ Minimum**	**EIQ Maximum**
Team 1	114.6	8.4	103	124
Team 2	120.0	19.3	92	144
Team 3	121.0	13.5	109	142
Team 4	126.2	19.3	100	141
Overall Avg	**119.9**	**15.2**	**92**	**144**

Table 15: Cross-case comparison of Emotional Intelligence.

The Pearson correlation coefficient was calculated to determine if Emotional Intelligence had a relationship to a team's ability to elicit requirements or to their process feedback. One could anticipate that teams with higher Emotional Intelligence averages or lower standard deviations would do better with "getting in the head" of the customer or be more effective in teams.

No significant correlation was found between Emotional Intelligence and team effectiveness (N=26) or gender. However, there was a moderate correlation ($r=.72$, $p < .01$) between Emotional Intelligence and the requirements

session feedback from the second prototype when requirements are finalized. If adjusted using the Bonferroni adjustment for the Emotional Intelligence and the five feedback session tests (.05/5=.01), the moderate correlation would still be significant between Emotional Intelligence and the requirements session feedback from the second prototype. However, strong conclusions cannot be made due to the small number of participants (N=24).

Future Vision: For each JAD and prototype session, the customers and development team members were asked to provide feedback on the session using the survey in Appendix B: Participant and Process Feedback Survey. In addition to feedback on the requirements session, the surveys ask how far into the future the participant projected when identifying requirements. Participants could either report their response in years or months but all responses were converted to months and averaged by team. Most development teams projected into the future in considering system requirements early in the life of the project and not as much towards the project end, as shown in Figure 28.

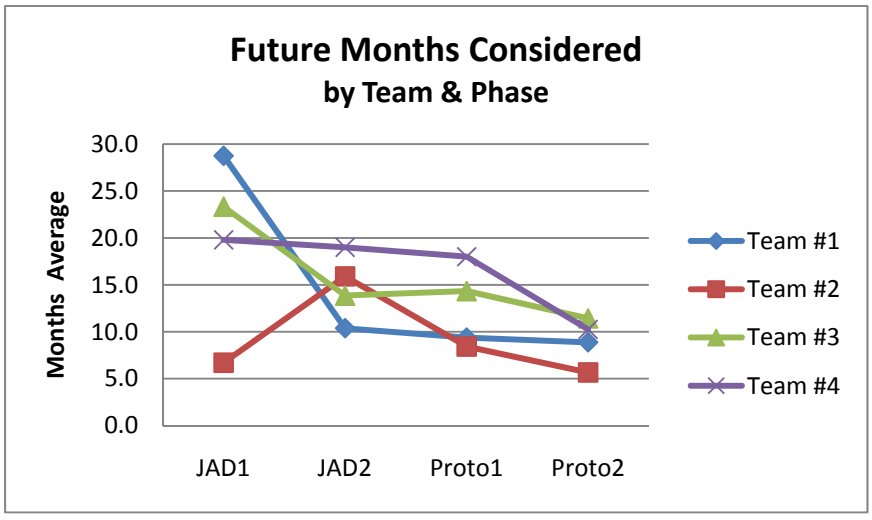

Figure 28: Cross-case comparison of future months considered by team and project phase.

Gender differences were evaluated to see if there continued to be a trend with females projecting more months into the feature. As was the case with the previous study, there were gender differences in the future months projected as shown in Figure 29. Women out-projected men by 39% more months in the first JAD session, 35% additional months for the second JAD session, 71% for the first prototype session, and then 51% for the second prototype session.

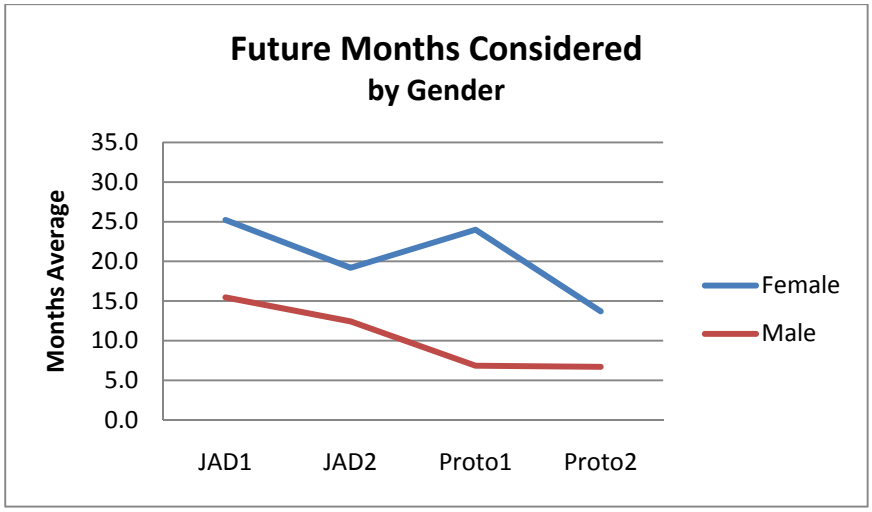

Figure 29: Cross-case comparison of future months projected by gender.

Table 16 shows the descriptive statistics for gender correlated with future months projected which further demonstrates females projecting more months into the future than males.

	Gender	N	Mean	Std. Deviation
JAD 1 Months Projected	Female	9	25.22	22.281
	Male	20	15.45	15.883
JAD 2 Months Projected	Female	10	19.20	21.689
	Male	21	12.43	14.158
Prototype 1 Months Projected	Female	9	24.00	21.424
	Male	19	6.84	6.817
Prototype 2 Months Projected	Female	10	14.90	18.823
	Male	22	6.68	6.841

Table 16: Cross-case descriptive statistics for gender correlated with future months projected.

However, prototype 2 had the only statistically significant correlation with gender and future months projected, as measured by the Pearson correlation coefficient shown in Table 17. With a Bonferroni adjustment (.05/5 tests), the correlation with gender and future months projected during the second prototype session remains significant.

		JAD 1 Months Projected	JAD 2 Months Projected	Prototype 1 Months Projected	Prototype 2 Months Projected
Gender	Pearson Correlation	-.252	-.191	-.534**	-.316
	Sig. (2-tailed)	>.05	>.05	.003	>.05
	N	29	31	28	32

Table 17: Cross-case Pearson correlation coefficients for gender with future months projected.

To further explore any possible effects from gender, Table 18 shows a one-way ANOVA showing the main effect of gender on the future months projected for each JAD and prototype session. Gender showed a statistically

significant influence on the months projected in the first prototype session, F(1,26), p=.003. However, no significant influence from gender was noted on the second prototype session, F(1,30), P>.05.

		Sum of Squares	df	Mean Square	F	Significance
JAD 1 Months Projected	Between Groups	592.736	1	592.736	1.826	>.05
	Within Groups	8764.506	27	324.611		
	Total	9357.241	28			
JAD 2 Months Projected	Between Groups	310.612	1	310.612	1.093	>.05
	Within Groups	8242.743	29	284.233		
	Total	8553.355	30			
Prototype 1 Months Projected	Between Groups	1797.902	1	1797.902	10.368	.003
	Within Groups	4508.526	26	173.405		
	Total	6306.429	27			
Prototype 2 Months Projected	Between Groups	464.327	1	464.327	3.339	>.05
	Within Groups	4171.673	30	139.056		
	Total	4636.000	31			

Table 18: A one-way ANOVA results showing the effect of gender on the future months projected for each JAD and prototype session.

Again, strong conclusions cannot be made due to lack of consistent statistical significance and the small sample size of 22 men and 11 women (customers and developers combined). However, the results from this study are consistent with the general trend shown in the prior studies. Future studies would need to expand the sample size to make more definitive conclusions regarding the effect of gender on future months projected during requirements analysis.

As mentioned previously, there are inherent differences in expectations between developers and customers. Even though this study has a small number of participants, the effect of role was evaluated with future months projected to identify any possibilities for future studies. The customers out-projected the

development teams at the first JAD session and the first prototype session. Interestingly, as shown in Figure 30, the development teams show a linear decline while the customers demonstrate a higher consideration for the future during the initial JAD session and when they view the first prototype. The professor indicates that non-technical customers frequently increase their requirements once they see possibilities beyond their initial vision for the project in their first conversation with the development teams (JAD1) and when they see a “tangible” representation of their vision (first prototype).

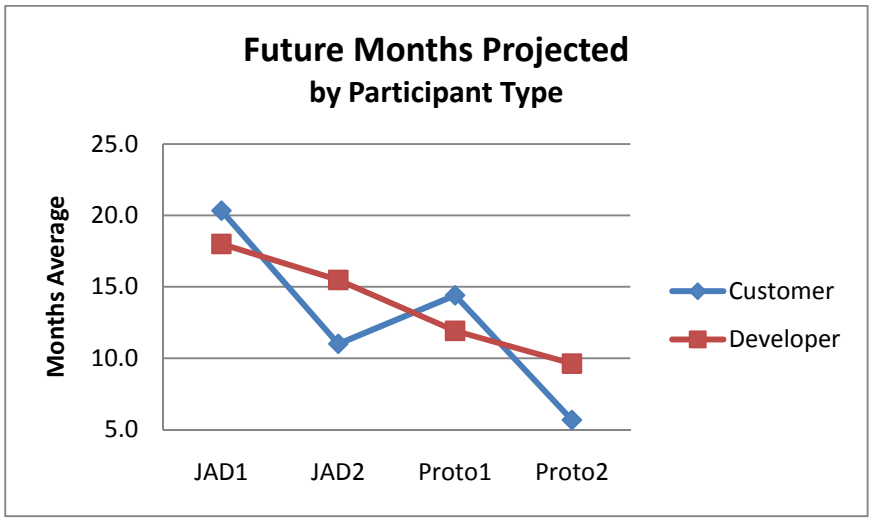

Figure 30: Cross-case comparison of future months considered by participant type.

As discussed previously, projects that are more and less defined introduce differences in requirements gathered (quantity and type). Future months projected by participants was evaluated to determine if it was influenced by differences in project definition.

Figure 31 shows a graph comparison of future months projected based on project type (defined and undefined). The teams working on undefined projects

anticipate further into the future. The gap narrows at the second JAD session but increases again once the first prototype is developed.

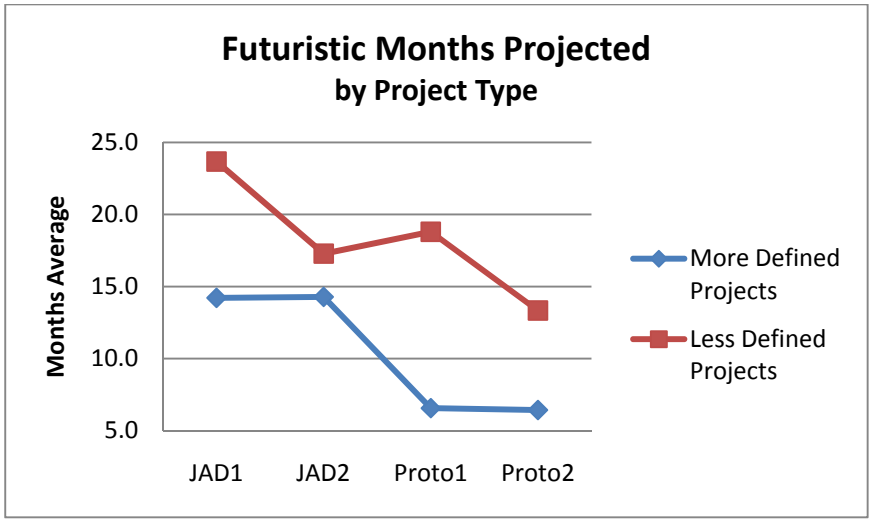

Figure 31: Cross-case comparison of future months projected by project type.

Anecdotal Feedback

Anecdotal feedback was compiled by the researcher via research survey comments, comments made in requirements sessions (JAD or prototype), professor feedback sessions, course project documentation, and professor feedback documentation. Anecdotal feedback from the professor, teams and customers substantiated that Appreciative Inquiry provided a positive influence on attitudes as well as a consideration for future requirements. The initial Appreciative Inquiry session at the first JAD session and the ongoing Appreciative Inquiry interventions improved requirements-elicitation. All teams acknowledged that they were able to implement at least one requirement originally classified as “future” in their current implementation which pleased, and

in some cases, pleasantly surprised the customer. Development teams reported that they experienced a benefit from the Appreciative Inquiry process by being provided with a broader perspective on their project and the customer.

Development teams initially showed reluctance to record all requirements reporting that it would increase the project tasks beyond what they could accomplish. Based on researcher observation and anecdotal participant feedback, the ongoing Appreciative Inquiry interventions and the ongoing progress of the projects reduced the development team and customer reluctance to record all requirements as they gained an improved common understanding that they were not expected to implement everything. Development teams reported modifying their questions to the customer to be more open-ended and goal-oriented.

The implementation disposition of a requirement (current or future implementation) became key to the decisions made by customers and the development team. During JAD and prototype sessions, the researcher observed customers and development teams making joint decisions for changing the disposition of the requirements (current to future and vice versa) based on various factors such as the course deadline, effort, team technical skills, and customer priority. The “future” list provided development teams an opportunity to compile a more complete list of requirements without requiring an obligation to implement them. In those cases where a future requirement could be implemented, customer satisfaction and development team confidence was improved. For example, music was added to the e-commerce clothier site which

was originally a future requirement. However, once demonstrated to the customer, customer expressed immediate enthusiasm that subsequently carried over into the remaining prototype demonstration. The customer's enthusiasm was expressed with immediate and ongoing positive and thankful statements as well as engaged body language.

Based on experiences such as these in comparison to prior course development teams, the professor reported that these development teams achieved better results because of Appreciative Inquiry as evidenced by project success with meeting customer requirements and the positive attitudes of the development teams. In prior courses, it is common for development teams to approach the professor with a lack of confidence for completing the assigned development project. In this class session using Appreciative Inquiry, no team approached the professor with a lack of confidence for completing the project even though the projects were of equal complexity to prior courses.

Lessons Learned

Appreciative Inquiry was successful when explained and demonstrated to development teams and their customers. It helped obtain additional requirements. Despite an increase in duplicate requirements, Appreciative Inquiry solicited requirements that were value-added for the customer and key to improving project success, customer satisfaction, and developer confidence.

Identifying the implementation disposition of requirements improved success for recording requirements, as well as developer and customer communications. As stated by the professor, prior project teams were reluctant

to record requirements since it implied the pressure to implement them all. By agreeing with the customer on the implementation timeframe for a given requirement, the reluctance from the development teams improved while providing a means for documenting (and acknowledging) the customer's short and long-term vision and requirements. The "future" list also provided an unforeseen benefit by giving the development team an opportunity and control to implement additional (and value-added) requirements as time and feasibility allowed without the sense of obligation for implementing all identified requirements.

Though this study captured disposition of when a requirement was thought to be implemented (current or future) and the effort for implementing it (major and minor) for all requirements, changes to a requirement's effort, disposition and the related reasons were not documented. Anecdotally recorded, requirements in this study changed disposition from current to future implementation (and vice versa) due to decisions by customers and developers based on a variety of factors including effort, priority, and feasibility Requirements also changed effort from minor to major and vice versa. For example, the e-commerce clothing site's requirement to display the size chart changed from a minor current requirement to a major future requirement once the team became more familiar with the complexity of custom-made clothing orders and the customer was still in the process of defining the business details. The Appreciative Inquiry interventions showed value for emphasizing the benefits and importance of requirements, and

their associated disposition and effort to developers and customers to help with these ongoing project decisions.

Differences in project phases were also noticed during this study. The first JAD session was used as the opportunity to solicit requirements and therefore obtained the most requirements. The second JAD session was used to clarify previously acquired requirements and amend the existing list as evidenced by the fewer number of unique requirements added during this phase. The first prototype was used to refine the details of requirements and may result in a slight increase in functional requirements as customers get their first few of the vision. During the second prototype, the teams and customers were focused on further requirements refinement and negotiating a finalized requirements list which results in additional quality requirements.

Regardless of the requirements elicitation method, developers stated that the success of obtaining requirements is also dependent on the customer's ability to make decisions, and the developer's' ability to offer options and manage customer expectations and decisions. Some customers are much needier and indecisive than others and therefore appear to limit the development teams' ability to solicit requirements. As expected, less defined projects were less constrained with projecting into the future. However, surprisingly, projects that started with more definition were more successful with adding more unique requirements.

Chapter 10 Discussion

The purpose of the requirements elicitation process is to obtain a set of user requirements that is complete and accurately reflects the needs and expectations of the system being developed. A variety of requirements are needed to develop a holistic solution that meets the customer requirements and is technically feasible. Requirements should include those that define functionality, describe quality and non-functional expectations, and consider future goals.

Effective communication during the requirements elicitation process provides the foundation and opportunity for the developers and customers to jointly create a unified vision of the goals and solution, which influences mutual commitment, trust, and confidence. Customers' trust in the development team is influenced by their sense of whether the development team understands their problems and goals. One customer stated it best: "It's very important to inform the team and remind them that the project they are doing is very critical and important for the client's business. So, as a result, the team would always be on top of their project and verify with the client that all requirements have been satisfied."

The case studies were executed as Action Research to fulfill a dual purpose: 1) improve knowledge on optimal user requirements gathering and 2) develop and optimize a process for such user requirements. The first study was a case study to learn whether Appreciative Inquiry could be applicable to soliciting user requirements. With positive results from the initial case study, a

controlled experiment was performed to see if the results could be duplicated. Though the requirements results were duplicated, the controlled experiment process using a fictitious context proved to be a distraction. Future studies were improved to evaluate whether Appreciative Inquiry could be used with real project teams using real scenarios to improve the participants' ability to "relate" to the project context. The fourth study continued the Appreciative Inquiry process with refinements and added additional measures including team effectiveness, stress, and emotional intelligence to evaluate a variety of relationships with the development team. However, the results of the Appreciative Inquiry sessions with the development teams did not transfer to requirements documented by the team.

In the final study, additional measures were included for the disposition and effort associated with the requirements. Additionally, Appreciative Inquiry was demonstrated to the customers and development teams along with ongoing researcher intervention to encourage positive forward-looking requirements. This study showed an increase in future requirements documented by the development teams. Despite small case study populations, there were consistent indications that Appreciative Inquiry could be more effective with women in considering the future for requirements, and with more-defined projects with producing additional requirements.

Results were not conclusive for the relationship between the Appreciative Inquiry process and Emotional Intelligence, team effectiveness, and gender. However, team effectiveness did show some affect on the participants' project

outlook and commitment. Team effectiveness remained consistent once the teams stabilized. It was also related to the team membership.

In all of the case studies, survey results showed that Appreciative Inquiry solicited additional and different user requirements as compared to traditional brainstorming eliciting techniques. In initial studies, Appreciative Inquiry produced more requirements that were quality-based and forward-looking while not duplicating requirements found using other traditional brainstorming or direct questioning techniques. Later case studies with actual development projects showed a higher rate of duplicate requirements but they also showed an increase in additional unique quality and future requirements with a broader vision. Appreciative Inquiry was also successful with eliciting more requirements after other traditional elicitation techniques were exhausted. Developer teams reported that Appreciative Inquiry encouraged them to consider all requirements and improved their understanding of the current and future requirements.

Although the positive aspect of Appreciative Inquiry should not be understated, the benefit of a future vision was consistently reported by all team members and customers as providing value in identifying requirements. Participant feedback stated that Appreciative Inquiry was more effective than their existing brainstorming methods for providing a foundation for communication between developers, users, and/or customers by improving developer understanding of the customer's current and future needs.

The process of communicating future requirements also provided an opportunity for the project teams to create a shared understand of current and

future visions, goals and expectations. Trust is improved with the customer in gaining a better idea about the ultimate vision of the customer. Obtaining future requirements provided the project teams insight into long-term goals allowing for a more holistic design. Customers also provided a sense of personal goals and long-term vision when identifying future requirements.

Appreciative Inquiry is not presented as a panacea for soliciting requirements. It is not meant as a method to replace current user requirement elicitation methods but to augment them by allowing a different perspective and set of questions to obtain another aspect of users' wants and needs for a proposed system. As evidenced in the last two case studies, developers have the potential to apply Appreciative Inquiry. This provides an opportunity for future studies to further define project types, users, project phases, and/or development methodologies where Appreciative Inquiry can be applied by development teams to achieve the greatest opportunity to impact requirements obtained and, consequently project success.

Regardless of the requirements elicitation technique there are other factors that affected success: decisiveness and the degree that the project is defined. Team members and customers consistently reported that requirements cannot be confirmed when the customer does not know exactly what is needed and does not know the capabilities and commitment level of the team members. Additionally, a developer's incomplete or inaccurate interpretation of the customers' requirements also limits confirmation of requirements in the early phases of the project. An incomplete set of communication techniques can

produce incomplete information about the capabilities of the team and the technology as well as have a negative impact on the requirements elicitation process. Customers often lack clarity for what it is they really want and, unfortunately, contribute to the development team's inaccurate interpretation of the requirements.

The effectiveness of any requirements elicitation technique is influenced by the degree that a project is initially defined and understood by the customer and user. However, the degree that a project is defined and understood by the customer/user did not limit the benefits of Appreciative Inquiry. Projects that were more defined by their customers derived more benefit from Appreciative Inquiry with additional requirements of all types. However, customers with less-defined projects were more successful at considering the future in defining their requirements.

Action Research was used to introduce Appreciative Inquiry to the study participants with different results. In the fourth study, the researcher interacted indirectly with the project through the development team outside of the defined class and project meetings. In the fifth study, the researcher interacted directly within the defined class and project meetings and provided information, training and demonstrations of Appreciative Inquiry throughout the project. The direct and ongoing intervention by the researcher produced improved documented requirements. Figure 32 includes a comparison of these different interventions by the researcher. Direct intervention also shows an increase in the average

number of requirements produced at the first JAD session and a slight increase in the average functional requirements produced from the first prototype (Proto1).

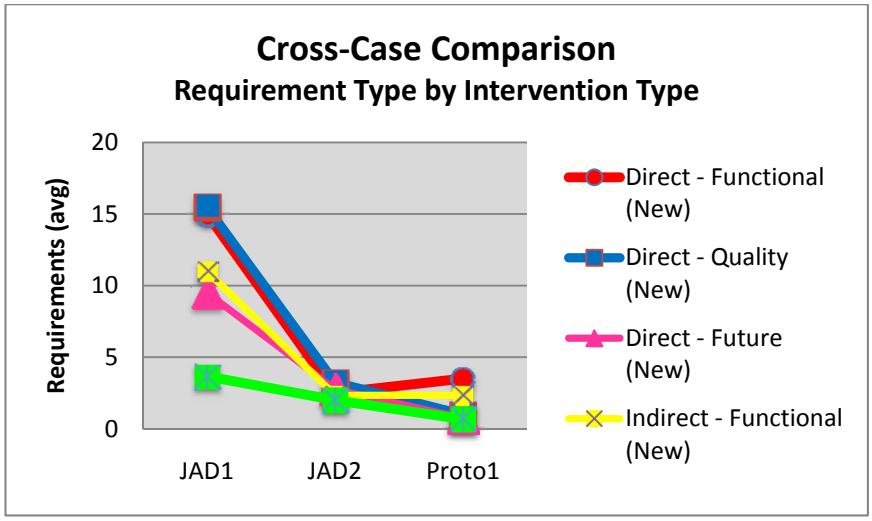

Figure 32: Cross-case comparison of requirements type based on interaction type by project phase including data from prior study.

Direct intervention with the project teams increased the formal documentation of functional, quality, and future requirements despite an increase in duplicated requirements. See Figure 33.

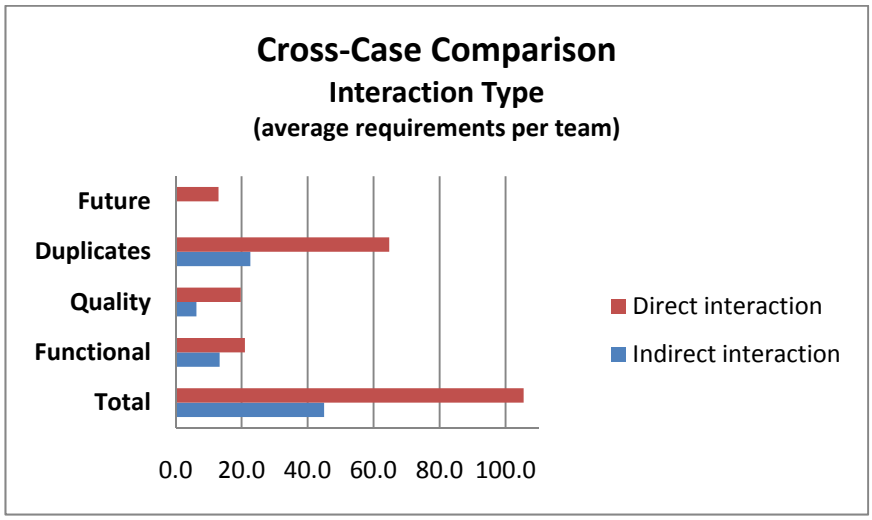

Figure 33: Cross-case comparison of requirements based on interaction type including data from prior study.

Chapter 11 Conclusions

Customers and team members made multiple suggestions for improving requirements elicitations by developing a set of the “right” questions, defining requirements clearly and in simple (non-technical) terms, and repeatedly reviewing the requirements together in detail to ensure a common and accurate understanding of the user’s requirements.

Development teams reported that planned questions and Appreciative Inquiry based questions helped extract customer's requirements *“out of their heads.”* Questions framed using Appreciative Inquiry can help development teams understand what the customer values in the desired system, as well as in their working relationships. Developers reported that Appreciative Inquiry provided focus for developing their questions and getting better answers the more they used it.

Appreciative Inquiry was especially effective in identifying future and quality-based requirements. Developers reported that Appreciative Inquiry brought about additional requirements the client did not even realize they had. They also reported that Appreciative Inquiry opened their minds about non-technical requirements such as personal goals and fulfillments which they admitted were not otherwise considered. Consequently, development teams reported that Appreciative Inquiry increased the level of achievement and confidence for their project.

Dissertation Contributions: Applications for Practitioners

This study provides many lessons that can be applied by professional developers and other practitioners in industry and academia.

Professional Developers

Anecdotal feedback from this study indicates that professional developers may experience more or less effectiveness with different eliciting techniques at different project phases:

- 37% of team members reported a specific project phase where Appreciative Inquiry would be useful even though all team members said that Appreciative Inquiry helped them identify all kinds of requirements.
- 44% of those team members who reported the use of Appreciative Inquiry in a project phase noted that Appreciative Inquiry would be useful for "amending" requirements after requirements are initially collected and clarified.
- 36% of those team members who reported the use of Appreciative Inquiry in a project phase noted that Appreciative Inquiry would be useful for clarifying requirements after the initial collection.

Regardless of the phase or elicitation technique, it is important to provide ongoing interventions stressing the importance of a future and positive (non-problematic) vision and encouraging that all requirements are documented and classified in terms of their effort and whether they are for the current or future implementation.

It is anticipated that the results obtained in this study through ongoing interventions with the project team can be replicated by any project team member with a similar facilitator role trained in Appreciative Inquiry. However, the roles of project management, business analyst, or lead developer are especially suited to provide ongoing interventions based on their typical job function to facilitate teams and projects to successful completion. However, the extent of success for applying Appreciative Inquiry may be dependent on the facilitator's personal characteristics including verbal communication skills and group perception of their objectivity and vested interest in their project.

Academia

Based on the results of this study, the professor reports that she intends to modify her course requirements to include aspects of Appreciative Inquiry which has the potential of affecting the education of 100 new information technology professionals per year. The professor plans to implement the following specific course changes:

- *"In the initial class meeting with all the students, before teams are formed and projects chosen, students introduce themselves, describe their strengths, and indicate their preference for a particular type of project. Students will now also describe a previous project experience that was particularly satisfying, which may help them in their team formation.*
- *In their initial JAD sessions with customers, the students will ask the customers to describe their 'dream' solutions for their particular projects. This initial dream statement appeared important in guiding some of these*

teams toward their final solutions either consciously or unconsciously, and opened both the customers and students up to a larger view of the project.

- *At each meeting with the customer, one team member records requirements, continuing open issues and decisions. These notes are recapitulated by the note taker at the end of the meeting, and sent to the customer, professor and team members after the meeting. Recording not only new requirements, but all changes to the requirements (removal, changes from current to future, etc.) was an important by-product of this study that helped the students feel more in control of the project. These students struggle to manage customer expectations, and are sometimes afraid to say 'no' and other times afraid of the extra work if they say 'yes.' Because the students in this study could record future requirements or change current requirements to 'future', they felt more willing to track all the requirements and produced a more accurate view of the project as it evolved through time."*

The "Right" Questions

As indicated in prior studies, there is value in developing a communication framework for developers to use for eliciting requirements. Asking the "right" questions is part of that framework. When the customer is unclear about what he/she wants, the "right" questions can obtain more accurate and complete requirements. The "right" questions also provide an opportunity for developers to understand how the customer wants to work with them, and what the customer values in working relationships as well as identifying the requirements.

Questions based in Appreciative Inquiry can help the developers build trust with the customer and get a better idea about the ultimate vision of the customer.

Unfortunately, there is no set of questions that will be "one size fits all." However, the principle of Appreciative Inquiry can be applied in a variety of contexts and situations as demonstrated in its organizational change management background as well as the case studies performed as part of this study. Below are five general steps and questions for applying Appreciative Inquiry for eliciting user requirements:

1. Set the tone with a positive theme (Appreciative Theme). This theme should define the positive outcomes, based on the context, that are expected. Below is a sample them for an e-commerce project:

   "*When e-commerce companies are successful, their customers realize their vision and goals; the company and their employees are successful at producing desired results and achieving their goals, and their customers obtain their personal goals through meeting current and future needs."*

2. Give the participants a guideline to separate the technology being used from the goals of the project. Project teams can be constrained in identifying requirements because of a perception that something cannot be done. In freeing the developers and customers away from "how" the project will be done and to "what" needs to be done, they are more open minded to state their true needs. A sample statement is below:

   "Technology is a tool that facilitates the achievement of this vision and goals. It frees people from processes and methods. It greatly

improves the success of companies, their customers, and their business partners as well as supports successful relationships between the company, their customers, business partners and the community. It supports creativity, enables quality and produces desired results."

3. Initiate a conversation of past successes related to the topic: team successes, development projects, etc. This reminds the participants of how they work best and past successes they want to repeat. A sample is provided below:

   "Appreciate what worked well. Describe what worked well with prior projects and endeavors. Features? Team dynamics? Relationships? Opportunities? What would you want to carry over to other projects? What was valued and worked well?"

4. Initiate a conversation to describe an ideal solution if there were no constraints (time, money, resources, and technology). Describe the ideal solution in the future – "when our kids have kids." Encourage the participants to keep stretching with ideas even if it sounds impossible. Make it fun and "out of the box". A sample statement related to an e-commerce website is below:

   "If you had no constraints (time, money, resources, technology), what could be possible looking forward for your ecommerce clothing website? Looking forward, what is your ideal website considering your past successes and other sites that you have seen? Describe what your vision of the future is. What would work well in the future for clothing ecommerce sites? What are the characteristics of clothing ecommerce sites for the far future … when your kids have kids? How do you expect your grand kids to order clothing?"

5. Apply the information, insight and concepts gained about the long term vision and the “ideal” solution described to create and/or modify requirements. Do not let people off-the-hook for making their ideas “real” in some fashion. It is possible. A sample statement is below:

   “Define what changes you would make to the current requirements considering the future we discussed?”

Study Limitations

The progression of studies attempted to inform and address its own limitations along the way: The second case study was an improvement to the first by trying to create a controlled experiment to replicate the positive results from the initial case study; the third case study removed the fictitious scenario from the second study and applied the Appreciative Inquiry process to actual project teams; the fourth study of multiple cases cross-compared results and included measures for team effectiveness and Emotional Intelligence to evaluate any correlation with personal factors that would improve the application of Appreciative Inquiry by developers; and the fifth study of multiple cases expanded the prior studies by including measures for the requirements implementation disposition as well as the projected effort to identify additional decision factors influencing results. However, at the conclusion of this progressive collection of studies, limitations still remain.

Studies were done with inexperienced system development project teams working with projects in unfamiliar project contexts. No comparison was made with experienced, professional system developers in familiar contexts. Results

may differ with more experienced teams who may (or may not) have familiarity with the project context and/or a familiar set of “right” questions they already use.

Though there were a few process-oriented projects in this study (e.g., the consolidation of user access lists), user-interface projects represented the majority of system development projects considered in these studies. Appreciative Inquiry was not evaluated for other types of projects such as infrastructure projects (e.g., database or server migration projects).

The study population in these studies was not large enough, nor under fully controlled conditions, to conclusively determine personal factors that influence Appreciative Inquiry’s effectiveness including gender, team effectiveness, etc. Caution is needed, however, since larger, controlled studies are not considered “real” by participants resulting in inconclusive results with the application of the process (as shown in Study 2).

Different system development methodologies were not evaluated. Not all methodologies (e.g., waterfall) may be amiable to the Appreciative Inquiry-style or Action Research due to their prescriptive and sequential processes.

Future Studies

The results of these studies to-date can be expanded to fine-tune the guidelines for development teams to apply Appreciative Inquiry to further improve project success. Specifically, additional research can be done by increasing the understanding for factors related to different project types, project phases, requirements eliciting methodologies, requirements decision factors, team composition and effectiveness, and participant factors.

Additional studies are needed with projects of different types and methodologies to understand how Appreciative Inquiry can be implemented and affect their results. Of particular interest would be development projects for technical infrastructure where the user is an information systems professional since they may be the most skeptical to use non-prescriptive requirements elicitation methods.

Factors and tasks need to be identified that can successfully influence the development project results, as early as possible, as well as in later phases. Since the first JAD session identifies the majority of the requirements, early success with team effectiveness and a positive relationship with the customer are critical especially with undefined projects. However, correlations with the first JAD session in this study were not conclusive to identify those factors. Additionally, other phases can be evaluated to determine if some requirements elicitation techniques may be more or less effective at certain phases of the project.

Additional evaluation of attributes that change for requirements is needed throughout the project life cycle such as the implementation disposition that was seen during this study. The final study anecdotally identified that requirements change from current to future implementation, and vice-versa, based on conversations and decisions between the customer and developer. Future studies are needed to further define those decisions and related factors, and trace the modification of those factors during the project life cycle. Improved understanding of various requirements factors and their decisions would be

expected to improve project and team success just as understanding the disposition of a requirement improved projects and teams in the fifth study.

Further evaluation is needed to define the correlation of team effectiveness and other personal factors, such as gender and Emotional Intelligence, with the requirements elicitation process and Appreciative Inquiry. The results of this study were not conclusive but there were indications that there is a relationship that should continue to be evaluated. Larger populations and/or more collective studies will continue to help improve this understanding. Additionally, specific modifications to Appreciative Inquiry and the overall requirements elicitation process should be identified that can help ineffective project teams whether due to a lack of team effectiveness, indecisiveness, etc.

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Chapter 13 Appendix

Appendix A: Participant Information Survey

Participant Information

1. Project Role: Technical Team Member? User/Company Representative
2. Gender: Male? Female?
3. Highest degree completed: High school? Bachelors? Masters? Doctorate?
4. I have participated in a software development project (check all that apply): a developer? to provide user requirements? in another role (e.g., project manager)?
5. Personal computer ability and expertise. (A scale of 1 to 5 was used with 1 as "need a lot of help using a computer" and 5 being "use a computer with no help from others.")
6. I have a professional technical certification in an IS-related discipline (e.g., GISP, ICCP, CCNP, CISSP): Yes? No?

Figure 34: Participant Information Survey

Appendix B: Participant and Process Feedback Survey

TEAM FOCUS
1. My team was focused with more providing opportunities and possibilities with a positive outlook as opposed to fixing problems
PROJECT FEEDBACK[1]
2. I am satisfied with our current prototype and/or identified requirements.
3. I am confident that the current prototype and/or identified requirements will satisfy the client.
APPRECIATIVE SESSION
4. The Appreciative session was effective in identifying requirements.
5. The Appreciative session was effective in identifying additional/new requirements that the team/client would not have otherwise identified.
6. The Appreciative session was effective in identifying different types of requirements that the team/client would not have otherwise identified.
7. I feel confident that I can apply Appreciative techniques in a JAD session with a client.
8. I considered the future when identifying requirements
9. I considered _____ months or years (select one) into the future when identifying requirements.
10. What is your overall feedback regarding the project's current requirements and/or prototype?
11. What is your overall feedback regarding the use of Appreciative Inquiry for identifying requirements?

Table 19: Participant and Process Feedback Survey

Appendix C: Team Effectiveness (Bushe & Coetzer, 1995)

COHESION[1]
1. I feel part of my team
2. I look forward to being with my team
3. I really want to belong to this team
4. If I could, I would leave this team(reversed)
CONFLICT MANAGEMENT[1]
5. I feel energized and ready to get down to work after a conflict
6. Generally I feel I will benefit from conflict on the project team
7. I feel angry towards team members after a conflict(reversed)
DECISION-MAKING[1]
8. The contribution of every group member is listened to and considered
9. We like to consider a lot of different ideas before making a decision
10. We appreciate and build on our individual differences
11. What I want from this team fits with what others want from this team
12. The personal objectives of team members are incompatible, we work at cross purposes(reversed)
PARTICIPATION [1]
13. I feel free to say whatever I think in this team
14. All members participate equally in the team
15. One or two people dominate our team's discussions(reversed)
16. People are open in expressing their thoughts and feelings
CONFIDENCE IN TEAM'S ABILITY[1]
17. We waste time in our meetings(reversed)
18. We coordinate our efforts well
19. I trust other members to do what they say they will do
20. Each member feels equally responsible for the team's work
21. After a team meeting I feel discouraged (reversed)
22. I am confident about this team's ability to excel
23. The people in this team are competent and capable
24. I am confident that this team will succeed at meeting the requirements
25. I am afraid the group will not succeed(reversed)
26. Our meetings are chaotic(reversed)
SATISFACTION WITH MEMBERSHIP[1]
27. Being a member of this team will be personally satisfying
28. I would chose this team to work with on similar tasks in the future
29. Being a member of this team will be a positive experience
SATISFACTION WITH TEAM PERFORMANCE[1]
30. I expect to be satisfied with the final project of this team
31. We will do an excellent job on our case presentation
TRUST
32. I expect that others will put in the time and effort necessary to complete a satisfactory final project.
33. I accept the decisions of the team
34. I believe that my team members have the necessary knowledge and expertise to complete a satisfactory final project.

Table 20: Team Effectiveness survey adapted from Bushe (Bushe et al. 1995)

Appendix D: 10-item scale for Perceived Stress (Cohen, Kamarck, & Mermelstein, 1983)

1. In the last month how often have you been upset because of something that happened
2. In the last month how often have you felt that you were unable to control the important things in your life?
3. In the last month how often have you felt nervous and "stressed"?
4. In the last month how often have you felt confident about your ability to handle your personal problems?[1]
5. In the last month how often have you felt that things were going your way? [1]
6. In the last month how often have you found that you could not cope with all the things that you had to do?
7. In the last month how often have you been able to control irritations in your life? [1]
8. In the last month how often have you felt that you were on top of things? [1]
9. In the last month how often have you been angered because of things that were outside of your control?
10. In the last month how often have you felt difficulties were piling up so high that you could not overcome them?

Table 21: 10-item scale for Perceived Stress (Cohen et al. 1983)

Appendix E: 33-item Emotional Intelligence Scale (Schutte, et al., 1998)

1. I know when to speak about my personal problems to others
2. When I am faced with obstacles, I remember times I faced similar obstacles and overcame them
3. I expect that I will do well on most things I try
4. Other people find it easy to confide in me
5. I find it hard to understand the non-verbal messages of other people*
6. Some of the major events of my life have led me to re-evaluate what is important and not important
7. When my mood changes, I see new possibilities
8. Emotions are one of the things that make my life worth living
9. I am aware of my emotions as I experience them
10. I expect good things to happen
11. I like to share my emotions with others
12. When I experience a positive emotion, I know how to make it last
13. I arrange events others enjoy
14. I seek out activities that make me happy
15. I am aware of the non-verbal messages I send to others
16. I present myself in a way that makes a good impression on others
17. When I am in a positive mood, solving problems is easy for me
18. By looking at their facial expressions, I recognize the emotions people are experiencing
19. I know why my emotions change
20. When I am in a positive mood, I am able to come up with new ideas
21. I have control over my emotions
22. I easily recognize my emotions as I experience them
23. I motivate myself by imagining a good outcome to tasks I take on
24. I compliment others when they have done something well
25. I am aware of the non-verbal messages other people send
26. When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself
27. When I feel a change in emotions, I tend to come up with new ideas
28. When I am faced with a challenge, I give up because I believe I will fail*
29. I know what other people are feeling just by looking at them
30. I help other people feel better when they are down
31. I use good moods to help myself keep trying in the face of obstacles
32. I can tell how people are feeling by listening to the tone of their voice
33. It is difficult for me to understand why people feel the way they do*

Table 22: 33-item Emotional Intelligence Scale (Schutte, et al., 1998)

Appendix F: Traditional Direct Brainstorming Questions

Traditional Questions
What is the goal for our online community? What do we want to accomplish? What benefits do we want to provide?
Who are our target audience/users in our online community?
Are there any other audiences/users of our online community?
What useful features do we want available in our online community
What tasks do we want to provide in our online community?
What types of users do we want available in our online community?
What rules or protocols do we want in our online community?
What security do we want in our online community?
What expectations do we have for the availability & reliability of our online community? What would be the critical times for availability?
Do we have any back-up or contingency requirements?
Are there any compliance or regulatory requirements that we should be aware of?
Is there any related marketing or communication that we want related to our online community?
What training should we provide or is expected for our online community?
Do we have a tag-line for our online community? Do we want to declare an “identity” for our online community?

Table 23: Traditional Direct Brainstorming Questions

Appendix G: Sample Project Team Report

All project team reports contained similar content. Figure 35 shows a sample of a Table of Contents from a project team report. Figure 36 shows a sample of the requirements matrix required for all reports in Study 4. Figure 37: Sample Project Requirements Matrix (Study 5).Figure 37 shows a sample requirements matrix required for all reports in Study 5.

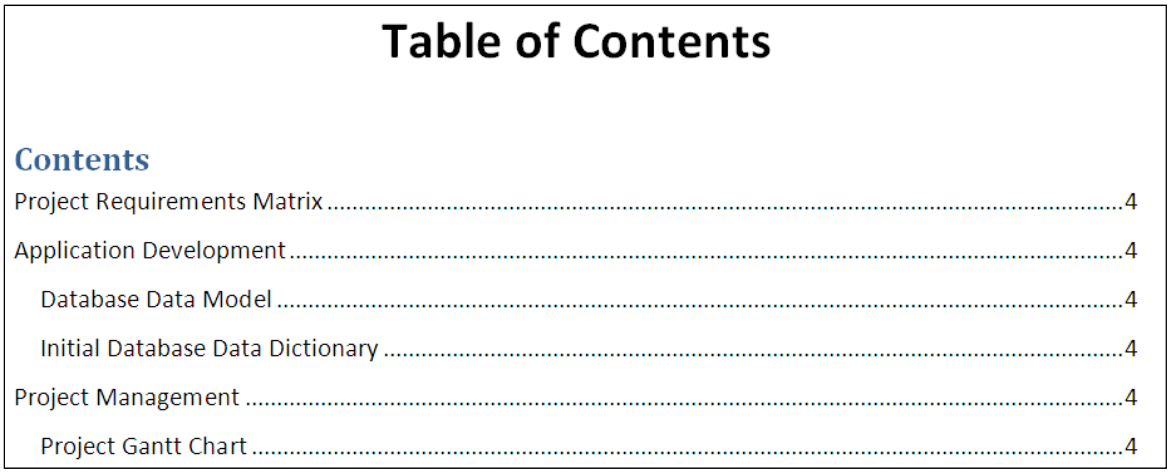

Table of Contents

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Figure 35: Sample Project Team Report - Table of Contents

Project Requirements Matrix

Requirement Number	Requirement	Description	Module	Implemented Yes/No
1	Design relational database	Create a data model based on data in Excel sheets and implement design that provides data integrity	Database	Yes
2	Input test records into tables	Inputted some data from the Excel sheets to test query results	Database	Yes
3	Design professional web Interface	Skeleton design of the website with some basic features	Web	In Progress
4	Connect web interface to database	Allow querying the database from the website	Web	In Progress
5	Create contact page	Adding detail to the website so customers could contact the administrator	Web	In Progress
6	Create about page	Adding detail to the website so customers can learn history/purpose	Web	In Progress
7	Use related images for website	Placing relevant images on the site for aesthetics/visual references	Web	No

Figure 36: Sample Project Requirements Matrix (Study 4).

Requirements Matrix:

Req. #	Requirement	Module Name	Implementation Effort Major/Minor* (<10 hour/>=10 hours)	Disposition Current/Future	Implemented Yes/No
1	Register Domain Name and register for a hosting plan	Hosting	Minor	Current	Y
2	Design test bank database	Database	Major	Current	Y
3	Create questions, chapters, diagrams and users table	Database	Minor	Current	Y
4	Show users	Administrative Panel	Minor	Current	Y
5	Modify user accounts	Administrative Panel	Major	Current	Y
6	Input new questions	Administrative Panel	Major	Future	Y
7	Add questions to exam	Administrative Panel	Major	Future	Y
	Test questions entry	Administrative	Major	Future	N

Figure 37: Sample Project Requirements Matrix (Study 5).