SELF-DETERMINED GAMIFICATION IN AN ONLINE WEB PORTAL: EMPLOYEE PERFORMANCE AND PERCEPTIONS

By

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To my wife Courtney for her constant support, patience and understanding throughout the doctoral process

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and a student. My dissertation is complete because of their guidance and advice. It is also complete because they challenged me and pushed me to be at my best.

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LIST OF ABBREVIATIONS

Achievements	Digital awards for completing a task or series of tasks within a system.
Behavior Engineering Model	The behavior engineering model was developed by Gilbert (2007). The model evaluates the workplace environment and employee behavior to determine if sufficient supports and skills are present to optimize employee performance.
Game Elements	Aspects or characteristics of modern video games that are distinct enough to be repurposed in a gamification context.
Gamification	The use of game elements in non-game contexts, through a web interface, software application, or comparable system.
Mechanics Dynamics Aesthetics (MDA) Game Design Framework	The MDA Game Design Framework outlines best practices and approaches in game design. Specifically, the framework looks at intentionally designing games with a mind towards diverse characteristics of players, along with the overall user experience within a game.
Self-Determination Theory	Self-Determination Theory (SDT) is a motivational theory developed by Deci and Ryan (2000). The theory looks at extrinsic and intrinsic motivation on a continuum and advocates moving away from controlling and high-pressure forms of motivation. This can be achieved by taking into account equity, organizational goals, individual goals, and autonomy.
Web Portal	In the context of this study, a web portal is an online environment where employees engage with a variety of tools to complete and document completion of job responsibilities. All employee performance is tracked within the web portal.

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This study sought to address a problem of practice by incentivizing job requirements through the addition of achievements in an online web portal. To do this, a workplace analysis was conducted, along with a thorough review of relevant literature. The result was the creation of a framework for designing gamified systems entitled Self-Determined Gamification. Using this framework as a guide, an attempt was made to design achievements with Self-Determination Theory (SDT) in mind, paying particular attention to organizational goals, equity in attaining achievements, employee autonomy in interacting and engaging with the achievements, and individual goals. Design best practices were incorporated through the use of the MDA Design Framework in addition to drawing upon design considerations from the SAPS Reward System, the Four Player Types by Bartle, the Four Types of Fun by Lazzaro, the Five Levels of Mastery by Dreyfus and Dreyfus, and Flow Theory by Czikszentmihalyi. With the design of the system as a major focus of this research, determining the success of the design in aligning with SDT considerations was important and this was accomplished through the use of the Intrinsic Motivation Inventory (IMI) Survey within SDT. Additionally, looking at

performance indicators along with employee feedback about the achievements provided insight into the overall success of the design and future considerations.

The gamification implementation had positive results with staff reporting enjoying the achievements and the impact they had on improving work habits. Results from the IMI survey also indicated that the design of the achievements in the online web portal aligned with autonomous forms of motivation on the autonomy continuum within SDT. Analysis of performance metrics indicated improved performance across multiple performance indicators. This was particularly true in areas where employees had control in completing a job requirement and where employees had the opportunity to exceed performance expectations. The Self-Determined Gamification framework developed in this study provides both a model for designing gamification rooted in design best practices and relevant theory, and a method for evaluating that design.

CHAPTER 1
INTRODUCTION

Research Context

Video games have become increasingly pervasive within society and with the advent of video games on mobile devices and embedded within online social networks, this pervasiveness has begun to transcend demographic boundaries (Barab, Gresalfi, & Ingramp-Noble, 2010; McGonigal, 2011; Squire, 2006; Tobias, Fletcher, & Wind, 2014). Though video games were primarily seen as a source of entertainment, their popularity has led to an interest in repurposing the video game model within other contexts such as military training, education, and industry (Tobias et al., 2014). The use of video games and video game components in other contexts resulted in a number of strategies and a consistent theme throughout these various game-based strategies was a recognition that video games excel at engaging end users. As of 2011, it was estimated that more than 180 million people in the United States played video games for 13 hours or more per week (McGonigal, 2011; as cited in Tobias et al., 2014). With this level of engagement, researchers and designers are attempting to harness the motivational components within games. One of the game-based strategies that emerged through reviewing the literature is conceptualized under the umbrella term, gamification.

Gamification involves the use of game elements in non-game contexts. As an example, Chore Wars is an application designed to encourage users to complete household chores by awarding experience points and the ability to level up an avatar after completing specific user-defined, real-world tasks (McGonigal, 2011). In this case, the application is not a game, but instead represents a method of tracking the completion of chores. Game elements are incorporated in the form of points, avatars,

and leveling as a method of engaging users to participate in completing those chores. Chore Wars is one of many examples of a gamified system in the emerging field of gamification, representing a relatively new field of study with the majority of research taking place between 2013 and 2017. Much of the early research consisted of conference proceedings and is exploratory in nature (Hamari, Koivisto & Sarsa, 2014). In addition, many of these early studies found positive results regarding motivation, engagement and user satisfaction (Hamari et al., 2014). These early results are encouraging and indicate that the incorporation of game elements in a system has the potential to motivate end users. At the same time, as a new field of study, there is a need within the current body of literature to incorporate design best practices and relevant theory when designing gamified systems (Hamari et al., 2014). More recent research is beginning to see this transition take place (Nacke & Deterding, 2017). This dissertation builds on the efforts of existing gamification implementations in an attempt to identify the most appropriate theory and design best practices, resulting in the Self-Determined Gamification framework for the incorporation of game elements within a system. At the same time, this dissertation investigates a problem of practice within an online work environment and looks at the potential use of game elements based on the Self-Determined Gamification framework to address that problem of practice.

Professional Context

Techworks provides on-site technology support and strategic planning to the Housing Department at a major university. In total, Techworks supports approximately 8,200 residents and 500 employees within the department. Clients are spread out across approximately 30 buildings, with departmental staff occupying 19 office locations. Techworks also supports approximately 500 permanent technology

installations, in addition to the thousands of devices residents bring to campus. Specific examples of permanent technology installations supported within the halls include departmental desktop computers, digital signage, communal printers, HDTVs, and collaborative workstations. As the director of the Techworks program, the researcher oversees a staff of three full-time employees and 50 part-time college student employees. The part-time college student employees are comprised of 46 student techs who provide on-site technical support, and 4 senior techs who supervise and mentor a subsection of their peers. Techworks student employees go through a comprehensive training program and have access to training materials, documentation, and a variety of tools within an online web portal. Student employees live within the residence halls and help maintain technology within the halls. Student employees are organized into regions, and are responsible for supporting both personal technology brought by residents and the permanent department-owned technology installed within those regions.

Support of technology within the halls includes both proactive and reactive support. Proactive support is accomplished through weekly status checks of permanently installed technology, along with visiting each room on campus within a semester to check for any unreported technology issues. As an example, a proactive check of an HDTV in the halls would involve verifying functionality of HDMI and mini-Display cables used to connect a laptop to the screen, checking to ensure that the cable channels are clear, verifying the presence of appropriate signage, and physically cleaning the screen. Any issues with a proactive check of this kind are reported through the online web portal so they can be addressed before a client reports the issue.

Reactive support involves responding to client technology issues after they are reported. This support frequently includes helping clients set up devices to connect to the network or troubleshooting technology that is behaving irregularly. As part of the Techworks Service Level Agreement (SLA) with the Housing Department, student employees working for Techworks contact clients to schedule appointments within 24 hours of an issue being reported. Student employees put on two technology support events each week that rotate between the halls. Here, clients can get devices physically cleaned or report issues they are experiencing. Techworks student staff also provide technology for departmental events, consulting with clients about the event and setting up technology as needed. Supporting technology at departmental events typically includes setting up screens, projectors, speakers, or video game systems.

Problem of Practice

Within Techworks, student employees complete their work remotely and autonomously with minimal direct supervision and with communication often taking place asynchronously. Work is either completed or recorded in an online web portal and all progress in performing job requirements is tracked within the portal. Examples of student employee performance indicators completed within the web portal include posts to a technical forum and completion of assigned tasks such as updating the employee profile within the staff directory. Examples of student employee performance indicators that are recorded within the web portal include documenting reactive support tickets, documenting proactive equipment checklists, attendance at office shifts and attendance at required Techworks events. For each performance area tracked in the web portal, an example of both required performance and exemplary performance is identified and communicated to student employees. Exemplary performance is based on student

employee performance in previous semesters and represents the best example of employee performance seen within a respective category over time (Gilbert, 2007). As an example, Techworks organizes two mobile technology support sites each week that are rotated within the halls. Student employees are required to participate at one support site during each two-week interval, but can attend more than the required amount. Required performance is defined as attendance at seven events per semester, and exemplary performance is defined as attendance at ten events. Other performance indicators reflect the quality of work, such as the number of positive customer service survey responses a student employee receives. Specific details about each performance indicator are provided in Chapter 5.

The remote and unsupervised nature of the work required in Techworks creates unique challenges and student employee performance, in some cases, has become an issue. Here, the organization has historically seen a bell-curve of performance where most student employees meet the required performance expectations, a small number of student employees exceed those expectations, and certain student employees fail to meet the required performance indicators. Addressing the needs of student employees who fail to meet required performance indicators, where possible, in order to improve the overall customer experience is a primary concern within Techworks. Each year, Techworks management attempts to improve the workplace environment to better align with employee needs in an environment where student employees are unsupervised. Existing student employees who do not meet required performance indicators represent the first problem of practice within Techworks.

Within Techworks, all employees must be active full-time students in good academic standing. Good academic standing is defined as maintaining a 2.5 GPA or higher. In addition, student employees are required to be on-campus residents in order to work for Techworks. Due to the transient nature of a college campus, Techworks student staff rotate on a cyclical basis of every three to four years. Each year Techworks hires 10 to 15 new employees as veteran staff graduate or move off campus. Training new staff each year and preparing staff for their job responsibilities represents a secondary problem of practice within Techworks. A comprehensive training program has been developed over the course of Techworks's twenty-year history that involves face-to-face instruction, mentor pairings, and regular on-the-job feedback. All training materials are available online to employees within the web portal.

Open-ended survey responses and face-to-face interviews with student employees who have failed to meet performance expectations have indicated issues of motivation, feelings of disconnect, and a need for more structure within the Techworks environment. Over several years, multiple tools were developed within the online web portal in an attempt to address feelings of disconnect and in an effort to provide more structure. One example of a tool created to address these issues includes a reminders tool that automatically sends students a list of individual job requirements at the start of each week, along with due dates for those requirements. Another tool created provides students with an interactive, step-by-step checklist of what should be completed at each permanent technology installation during weekly proactive status checks. A technical forum provides student employees the opportunity to ask questions of all Techworks staff. Here veteran staff can mentor new employees asynchronously, and full-time

Techworks staff can help guide this process by offering expertise and pointing student staff to resources for troubleshooting issues. A new landing page within the online portal was developed, that gives students a seven day, rolling window of upcoming job requirements.

In addition to the training program and tools mentioned above, the evaluation process for all staff was adjusted to provide more timely feedback to employees. Each student employee is evaluated on a monthly basis based on their performance and both exemplary performance along with clear areas of improvement are communicated. Each student employee is also required to attend a face-to-face mid-semester assessment to review remaining job requirements and ensure staff understand expectations. A summative semester evaluation takes place after the completion of exams each semester. The summative evaluation incorporates feedback from student supervisors, employees, customers and full-time staff from the entire semester. Employees can view their prior monthly evaluations and summative semester evaluations within the web portal at any time.

Figures 1-1, 1-2, 1-3, and 1-4 show examples of some of the tools discussed above. Figure 1-1 represents an example of an automated weekly email a Techworks student employee might receive. Here, all job requirements for the next seven days are communicated to the student employee. Figure 1-2 shows the new web portal landing page. Here students can see job requirements for the next seven days or expand this view to see all job requirements for the entire semester. The landing page in Figure 1-2 also provides links to all tools within the web portal. Figure 1-3 represents an example of a proactive checklist a Techworks student employee may complete. Here, specific

instructions are provided to student employees and the interface allows employees to indicate whether each checklist item was performed successfully. Figure 1-4 shows the Techworks Technical Forum where student employees ask questions about technical issues. Within the technical forum, more experienced staff can provide guidance and additional resources to one another as student staff engage in the troubleshooting process.

From: [redacted]
Sent: Monday, October 5, 2015 9:02 AM
To: [redacted]
Subject: Reminders for the week of 10/05/2015 - 10/11/2015

Weekly Reminders

Hello [redacted]

Below you will see all reminders for the week 10/05/2015 - 10/11/2015

All Event Sign Ups	
#1	Middle TTU #4 on 10/05/2015 from 07:00 PM to 08:00 PM
#2	Office Shift Slot #145 on 10/06/2015 from 09:00 AM to 11:00 AM
#3	Fall 2015 October Staff Meeting on 10/07/2015 from 05:00 PM to 07:00 PM
#4	Office Shift Slot #153 on 10/08/2015 from 09:00 AM to 11:00 AM
#5	Southwest October Area Meeting on 10/08/2015 from 06:40 PM to 07:00 PM
#6	Office Shift Slot #157 on 10/09/2015 from 09:00 AM to 11:00 AM
#7	Office Shift Slot #158 on 10/09/2015 from 11:00 AM to 01:00 PM
#8	Office Shift Slot #159 on 10/09/2015 from 01:00 PM to 03:00 PM
#9	Office Shift Slot #160 on 10/09/2015 from 03:00 PM to 05:00 PM
Assigned Tasks Due	
#10	[redacted] Rounds - Full due on 10/09/2015

Figure 1-1. Example of automatic reminder email a Techworks student employee might receive each week.

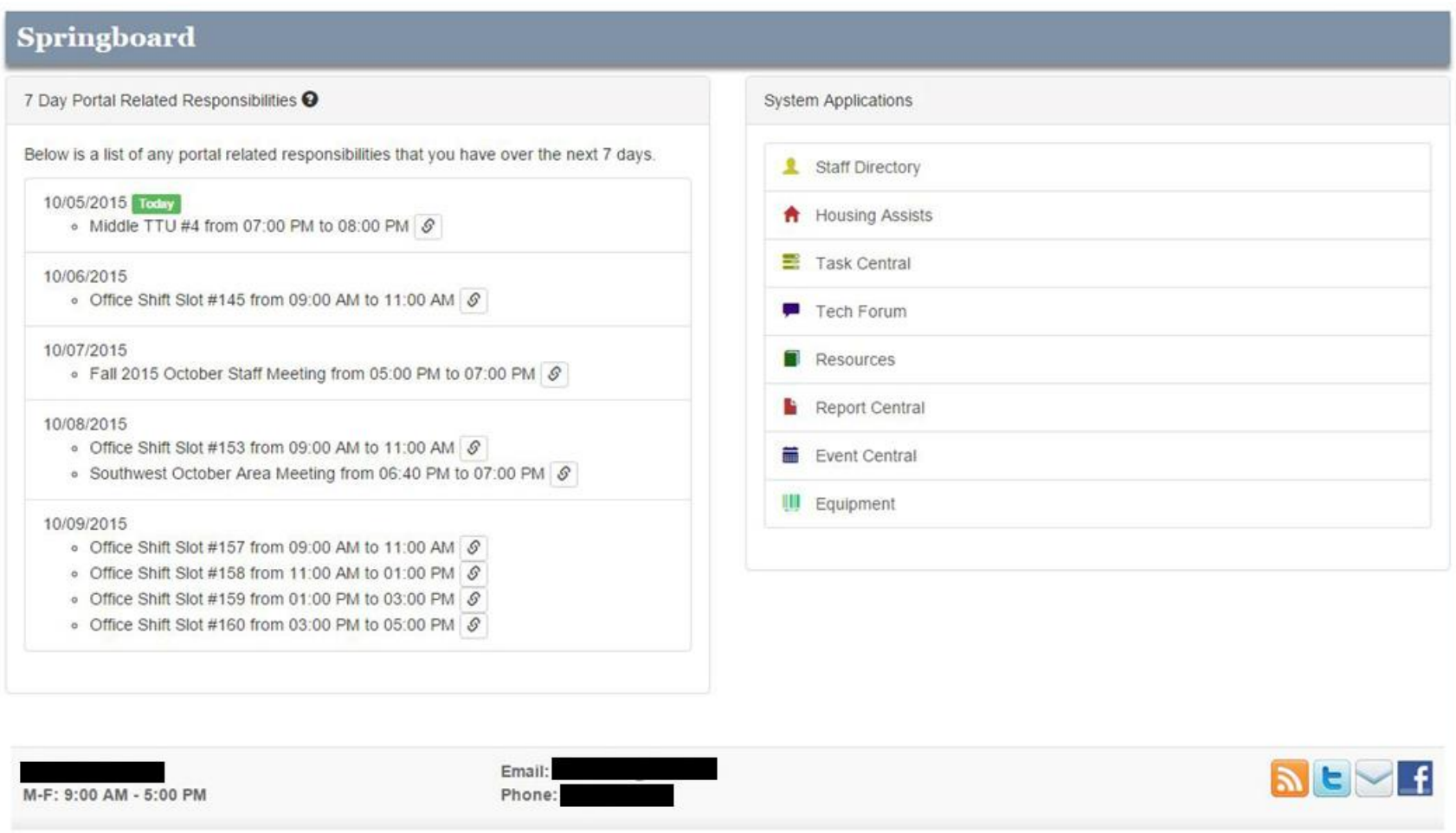

Figure 1-2. Techworks portal landing page providing a seven-day rolling window of requirements.

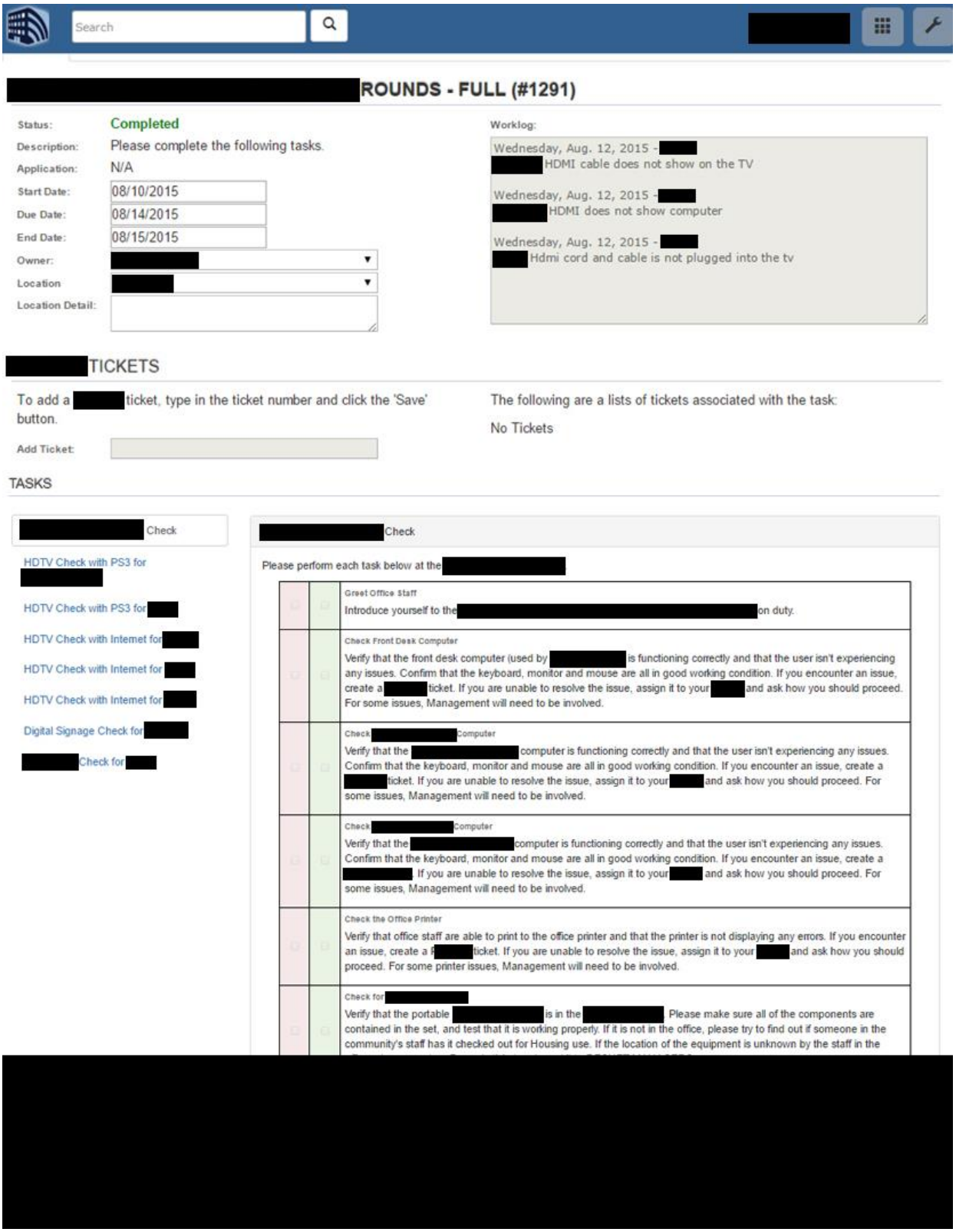

Figure 1-3. Proactive checklist tool within Techworks portal.

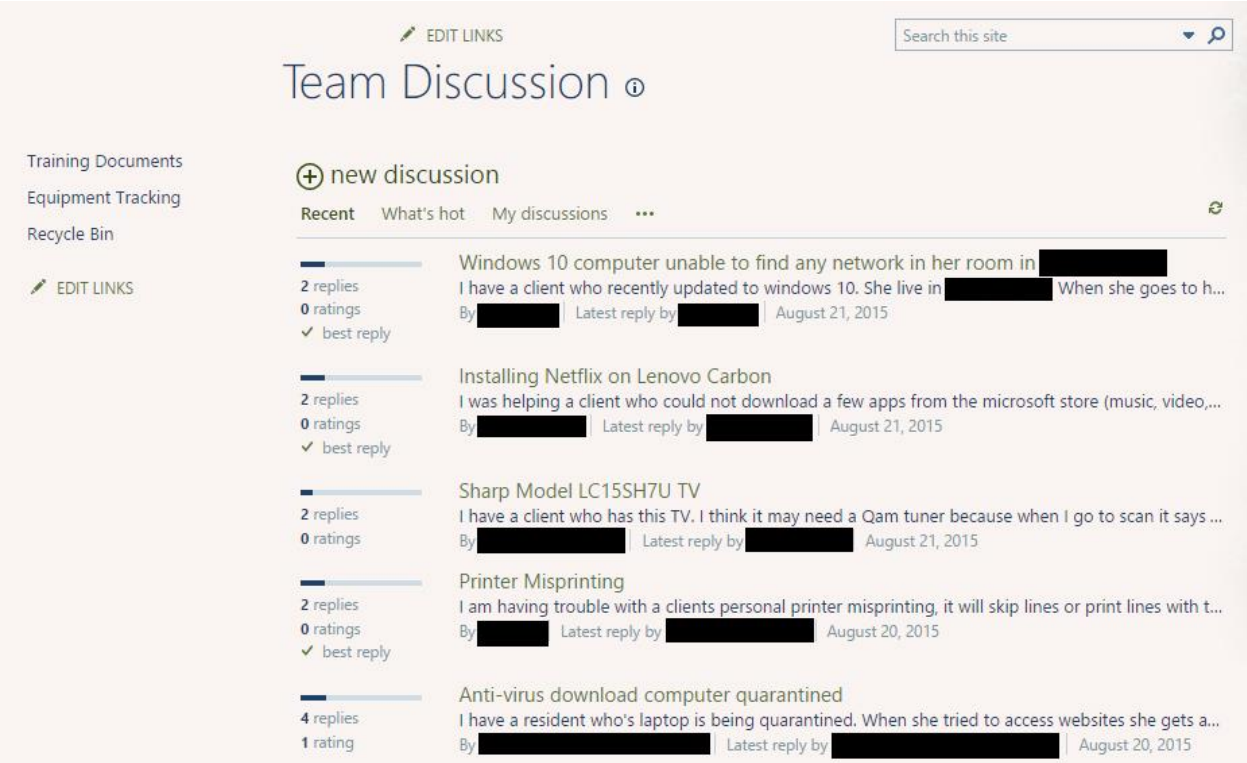

Figure 1-4. Technical forum within the online Techworks portal where student staff connect.

The changes discussed above resulted in more interaction between student employees and provided student employees with clearly communicated expectations on a regular basis. Feedback from student staff, regardless of prior performance, was positive and indicated increased feelings of connection to fellow employees and a more structured work environment. The number of students who completed minimum job requirements increased. Despite these positive results, student employee performance issues continued with a subset of students and Techworks management began looking for ways to better motivate all employees within the web portal, in order to improve job performance overall and encourage exemplary performance. An analysis of the online workplace environment, along with trending technology innovations, resulted in a decision in 2013 to investigate and eventually implement gamification elements within

the Techworks web portal in an effort to improve performance and increase employee motivation. The gamification layer was implemented in Spring of 2017. Leading up to this implementation, the goal of this dissertation was to (a) design gamification elements according to best practices in prior gamification research, (b) implement the gamification layer within the Techworks Portal, and (c) evaluate the impact of the gamification layer on overall employee performance. This context, along with the initial problem of practice, led to the following research questions:

Research Questions

1. How does a gamification implementation designed using the Self-Determined Gamification framework align with the motivation continuum within Self-Determination Theory?
2. How does the presence of a gamification layer in an online web portal impact college student employee perceptions of the online workplace environment?
3. Does college student employee performance change after the implementation of a gamification layer within an online web portal used to complete job requirements?

Key Terminology

Web portal: In the context of this study, a web portal is an online environment where employees engage with a variety of tools to complete and document completion of job responsibilities. All employee performance is tracked within the web portal.

Gamification: Gamification involves the incorporation of game elements within non-game contexts. The intent of incorporating game elements is to motivate and engage users.

Achievements: A specific game element, achievements represent digital awards for completing a task or series of tasks within a system and specifically within the Techworks Portal.

Self-Determination Theory: Self-Determination Theory is a motivational theory developed by Deci and Ryan (2000). The theory looks at extrinsic and intrinsic motivation on a continuum and advocates moving away from controlling and high-pressure forms of motivation. This can be achieved by taking into account equity, organizational goals, individual goals, and autonomy.

Identified and Integrated Regulation: Within Self-Determination Theory, Identified Regulation and Integrated Regulation represent less controlling forms of extrinsic motivation. Here, individuals begin to internalize organizational goals and values through properly designed extrinsic motivational structures.

MDA Game Design Framework: The MDA Game Design Framework outlines best practices and approaches in game design. Specifically, the framework looks at intentionally designing games with a mind towards diverse characteristics of players, along with the overall user experience within a game.

Behavior engineering model: The behavior engineering model was developed by Gilbert (2007). The model evaluates the workplace environment and employee behavior to determine if sufficient supports and skills are present to optimize employee performance.

Environmental supports: Within the behavior engineering model, environmental supports represent the aspects of a workplace setting that help improve employee performance. The focus of environmental supports is on the improvement of workplace settings.

Repertory of behavior: Within the behavior engineering model, an employee's repertory of behavior represents the skills and behavior that an employee possesses. This includes the training an employee receives.

Gamification Research

Gamification represents an exciting new field of research with great potential to motivate and engage end users. Early results indicate that incorporating certain game elements resulted in improved user perceptions of their experience, increased motivation and increased engagement (Cheong, Cheong & Filippou, 2013, Conaway & Garay, 2014; Frith, 2013; Gooch, Vasalou, Benton, & Khaled, 2016; Hamari, 2015). Where there are mixed results in the existing body of literature, the gamified treatment frequently increases motivation in a subset of the population, while having no impact on other users (Cruz & Penley, 2014; Giannetto, Chao & Fontana, 2013; Goehle, 2013; Osipov, Nikulchev, Volinsky & Prasikova, 2015). At the same time, Domínguez et al. (2013) found that while users self-report being more engaged and motivated, their performance on certain course components decline, while others improve. These primarily positive results are understandable given the early state of the research in this field. There is also a growing call in recent reviews of the existing body of literature for the incorporation of theory and game design best practices as the field of study matures (Dale, 2014; Hamari, Koivisto & Sarsa, 2014). As research around gamification matures, theory and design considerations are beginning to appear more frequently in gamification literature, but there is still little consensus (Nacke & Deterding, 2017). Early gamification studies have also focused on educational or commercial environments with few studies examining gamification within the workplace. Given the lack of formal studies examining gamification in workplace settings, the primarily positive results in

other fields where gamification has been studied, and the recognition of the potential use of gamification within the workplace, there is an opportunity to fill a gap in the literature (Bajdor & Dragolea, 2011; Bedard, 2015; Brownhill, 2013).

Purpose of Study

Given the lack of gamification studies in the workplace and the call for the incorporation of theory and game design best practices, this study was intended to synthesize and apply best practices in designing gamified systems. The study outlined and implemented a model for designing gamified systems that was cyclical and reflective with the intention of continuous system improvement. At the same time, this study explored the potential utility of specific game elements in improving the performance of college student employees who work in an unsupervised and autonomous environment.

Research Design

This study followed a three-phased research approach. Phase one of this study consisted of a review of existing research to identify both best practices in gamification design and the most appropriate theory when considering gamification implementations. In addition, phase one looked at workplace motivational studies and performance improvement literature to help inform the specific implementation of a gamification layer in a workplace setting. Phase one was the focus of Chapter 2 and resulted in a framework for the design of gamification.

Phase two of this study involved an analysis of the Techworks workplace environment looking at the gap in performance and environmental supports currently in place. In addition, phase two utilized researched best practices to design a gamification layer within the Techworks workplace that was grounded in appropriate theory and

design principles. Phase two was the focus of Chapter 3 and resulted in the design and implementation of the gamification layer in the Techworks Portal.

Phase three of this research involved the evaluation of the gamification design, an analysis of employee perceptions of the gamification implementation, and an evaluation of any changes in employee performance during the gamification implementation. This involved the collection and analysis of both quantitative and qualitative data, which were converged during a discussion of that data. Chapter 4 focused on the overall research design and provided additional context through the presentation of a conceptual framework that informed each of the three phases.

Limitations, Ethical Considerations and Bias

Due to convenience sampling, findings from this study may not generalize to the greater population. Despite this limitation, some recommendations were transferrable to similar populations in similar settings. This is consistent with current gamification research which is exploratory in nature. It is important to note that there were additional variables that may have impacted employee performance metrics. A number of ethical considerations related to workplace studies and this specific context were also addressed in the study.

Significance

This study was significant personally, within my professional practice, and within the field of gamification research. On a personal level this research addressed an area of professional and personal interest through the incorporation of game elements in a workplace setting. Gamification is increasingly used in a variety of contexts and I have been personally motivated through interacting with game elements both within games and in non-game contexts. I also hope to continue to study gamification beyond this

dissertation, and there is a great deal of potential for longitudinal studies in this context. This research may open up professional opportunities on a personal level and at a minimum, contributed to my own understanding of performance improvement and employee motivation as a supervisor.

Within my professional practice, this research helped address performance issues with employees who work in a remote, online environment with minimal direct supervision. Each year fulltime staff at Techworks attempt to improve the tools and resources provided to the student staff. While there will likely always be some areas for performance improvement in any organization, this research resulted in performance improvements within Techworks in several key areas, resulting in an improved service to our client population.

Several researchers have pointed to the potential application of gamification within workplace environments but there are few studies that have investigated this possibility (Bajdor & Dragolea, 2011; Bedard, 2015; Brownhill, 2013; Cardador, Northcraft, & Whicker, 2017; Perryer, Celestine, Scott-Ladd, & Leighton, 2016). This dissertation filled a gap in the existing literature by intentionally designing a gamified solution within a workplace setting. The intentionally designed nature of this solution should not be understated due to the need within the existing body of research for the incorporation of theory and best practices in gamification design. This research attempted to address this need by incorporating relevant theory and design principles in implementing a gamified solution. By using a formal design process, incorporating relevant theory, and aligning the gamification elements with organizational and individual goals, this study provided a framework for gamification design. A framework

of this kind could be used to guide future gamification design and implementation even outside the context of this study. Moreover, this study outlined a method of evaluating and continually improving gamification implementations.

Summary

Supervising a workplace environment where student workers work remotely with minimal supervision presents unique challenges. Over many years, an online web portal was developed which houses a variety of tools that help address many of these challenges though some performance and motivation issues persist. At the same time, gamification represents an exciting new field of study with the potential to motivate users within a system. As part of the continued improvement of the Techworks portal, a decision was made to implement a gamified achievement structure within the portal. This decision was intended to provide employees with more structure within the portal, provide clear expectations through incentivizing key job responsibilities, and increase employee performance with respect to the desired performance on the part of the employer. This study sought to incorporate best practices from gamification literature, workplace studies, and performance improvement literature. The intent was to design an achievement system within the portal that was rooted in Self-Determination Theory and the MDA Game Design Framework. Performance of current employees who use the achievement system was compared to past employee performance who used the same tools without a gamification layer. The gamification design was also assessed, along with an analysis of employee perceptions of the gamification implementation.

CHAPTER 2
LITERATURE REVIEW

Overview

In approaching the creation of a gamification layer within the Techworks Portal, a thorough evaluation of the existing gamification literature was needed. By examining gamification studies, themes emerged regarding design considerations and the incorporation of appropriate theory. In addition, a review of workplace motivational studies pointed to key considerations about the design of a gamification layer in a workplace context.

Gamification is a relatively new field of study. Of the 67 empirical studies reviewed in Chapter 2 dealing specifically with gamification, 24 were conference proceedings and 43 were peer-reviewed journal articles. Of these, 50 took place between 2013 and 2017, and only 17 studies were identified that took place between 2008 and 2012. 14 of these early studies were conference proceedings. Gamification research is primarily exploratory in nature at this stage, with some research designs using a quasi-experimental approach.

Key Terminology and Definitions Related to Gamification

Game-Based Learning and Serious Games

Much of the literature dealing with the application of video games or video game elements for motivational and engagement purposes involved a discussion of three main areas: game-based learning, serious games, and gamification. While the focus of Chapter 2 is gamification, it is important to distinguish between the various areas of study that deal with the use of video games and game elements in order to provide

clarity and avoid confusion. Additionally, defining specific game elements as they relate to gamification will help provide clarity throughout this discussion of the literature.

Game-based learning involves the creation of a video game environment that engages cognitive processes in the player with the purpose of teaching or instructing (Tobias et al., 2014). Frequently, game-based learning environments attempt to maintain the aspects of fun and engagement that are characteristic of video games (Barab, Gresalfi, & Arici, 2009; Barab et al., 2010). Within the literature, this is commonly referred to as play, a concept that will be discussed in greater depth later in Chapter 2. Serious games are distinguished from game-based learning in several areas. Serious games, sometimes referred to as alternate reality games, attempt to solve real-world problems by engaging users in a game environment (Kirkley, Tomblin, & Kirkley, 2005; McGonigal, 2011; Nacke, Drachen, & Goebel, 2010). In this sense, serious games encompass a broader category of games conceptually, and both game-based learning and gamification might fall into the category of serious games, depending on the nature and purpose of the respective system. Serious games frequently focus on the real-world problem, context and purpose of the game (Nacke et al., 2010).

Gamification

Gamification involves the application of features from video games in non-gaming environments. While this is not an entirely new concept, the flexibility and pervasiveness of modern technologies like the Internet, smart phones, and laptops, have resulted in a revision in the conceptual definition of the term (Deterding, Dixon, Khaled, & Nacke, 2011; Hamari, Koivisto, & Sarsa, 2014). Several definitions emerged in the literature in an attempt to provide clarity within the discourse. One definition

frequently referenced defines gamification as “the use of game design elements in non-game contexts” (Deterding et al. 2011, 10; as cited in Domínguez et al., 2013; Hakulinen, Auvinen, & Korhonen, 2013; Hamari et al., 2014). While this broad definition served the purpose of many researchers, another attempt to narrow the definition looked at gamification “as incorporating game elements into a non-gaming software application to increase user experience and engagement” (Domínguez et al., 2013, 381). Zichermann and Cunningham (2011) define gamification as “the process of game-thinking and game mechanics to engage users and solve problems” (xiv; as cited in Kim, 2015b). All of these definitions involve the use of game elements or mechanics outside of a traditional game environment. For the purpose of this dissertation, the following definition was used for gamification:

***Gamification*:** The use of game elements in non-game contexts, through a web interface, software application, or comparable system.

Game Elements

A variety of specific game elements were discussed in the literature, and it is useful to define some of the key game elements that emerged prior to discussing their use in empirical studies. It is important to note that these elements exist in modern video games and a gamification process attempts to repurpose these elements outside of video games. Some elements are not unique to games or gamified systems, but their conceptual definition within this context is worth noting. Game element selection focused on those that appeared in multiple sources, though additional elements were discussed in the literature. Excluded elements that appeared infrequently within the gamification literature include story/narrative, economies, and three-dimensional

environments (Chapman & Rich, 2017; Deterding et al., 2011; Hamari et al., 2014).

Common game elements within the literature include:

- **Achievements or trophies:** Digital awards for completing a task or series of tasks within a system (Chapman & Rich, 2017; Dale, 2014; Dickey, 2007; Hamari et al., 2014; Rapp, 2017; Sailer, Hense, Heinz, & Klevers, 2013; Seaborn & Fels, 2015; Zichermann & Cunningham, 2011).

- **Badges:** Similar to achievements in that they are frequently awarded for completing a task or series of tasks, badges are distinct in that they tend to have a degree of permanence and are frequently displayed on a nameplate or in some other manner to convey status (Chapman & Rich, 2017; Deterding et al., 2011; Hamari et al., 2014; Maan, 2013; Sailer et al, 2013; Seaborn & Fels, 2015; Zichermann & Cunningham, 2011).

- **Points:** A numeric measure that quantifies some action within a system. Often points are used to track progress within a gamified system (Chapman & Rich, 2017; Dickey, 2007; Hamari et al., 2014; Maan, 2013; Rapp, 2017; Sailer et al, 2013; Seaborn & Fels, 2015; Zichermann & Cunningham, 2011).

- **Levels:** Numeric benchmarks that convey expertise, skill or proficiency within a system. Typically, levels are obtained by accruing a predefined number of points or completing specific tasks (Chapman & Rich, 2017; Deterding et al., 2011; Dickey, 2007; Hamari et al., 2014; Maan, 2013; Rapp, 2017; Seaborn & Fels, 2015; Zichermann & Cunningham, 2011).

- **Progress bars:** Visual representations of a user's progress within a system (Chapman & Rich, 2017; Dale, 2014; Dickey, 2007; Hamari et al., 2014; Sailer et al, 2013; Seaborn & Fels, 2015).

- **Leaderboards:** A rank-order listing of users within a system based on some metric. Leaderboards are frequently used to foster a sense of competition within a gamified system (Chapman & Rich, 2017; Deterding et al., 2011; Hamari et al., 2014; Maan, 2013; Sailer et al, 2013; Seaborn & Fels, 2015; Zichermann & Cunningham, 2011).

- **Avatars:** Digital representations of self within a gamified system (Blohm & Leimeister, 2013; Chapman & Rich, 2017; Deterding et al., 2011; Sailer et al, 2013).

- **Quests:** A task or series of tasks that users undertake within a gamified system. Quests typically involve some form of narrative structure and are part of a larger progression model (Blohm & Leimeister, 2013; Chapman & Rich, 2017; Dale, 2014; Dickey, 2007; Rapp, 2017; Sailer et al, 2013; Zichermann & Cunningham, 2011).

- **Bosses:** Bosses within games represent particularly challenging obstacles. Within a gamified system, these obstacles represent challenging goals that will require effort to achieve (Chapman & Rich, 2017; Hamari et al., 2014; Zichermann & Cunningham, 2011).

- **Real-time feedback:** Within a gamified system, real-time feedback deals with the overall user experience. When certain benchmarks are reached within the system (a level, an achievement, etc.), real-time feedback is the indication to the user, typically through both audio and visual indicators, that the benchmark was achieved (Chapman & Rich, 2017; Deterding et al., 2011; Hamari et al., 2014; Zichermann & Cunningham, 2011).

- **Rules:** The rules govern the structure of the gamified application and define the processes within the system. The rules dictate how the user will interact with the various other game elements within the system (Chapman & Rich, 2017; Deterding et al., 2011; Maan, 2013; Zichermann & Cunningham, 2011).

Motivation and Engagement through Gamification

In reviewing the gamification literature, most studies looked at gamification as a way to motivate and engage end users. In the literature, this is variously referred to as incentive approach, incentive mechanisms, or incentive-centered design (Anderson et al., 2013; Deterding et al., 2011; Farzan & Brusilovsky, 2011). Frequently this manifested itself in the form of achievement points or badges that were awarded to users after completing some task within a system (Anderson et al., 2013).

In the case of StackOverflow, a popular question and answer site, a badge system was implemented that awarded users with badges based on activity on the site. This activity typically involved users asking questions, providing answers to questions and rating answers. Here, users were observed to increase activity rewarded by a badge, while the researchers noted no change in behavior surrounding activities that were not rewarded by a badge (Anderson et al., 2013; Grant & Betts, 2013). Interestingly, user activity was accelerated further when nearing the threshold for attaining the badge, indicating that users were paying attention to the badge system and

adjusting behavior in order to meet the requirements to attain a badge (Anderson et al., 2013; Grant & Betts, 2013). Anderson et al. (2013) also observed that providing users with multiple small incentives at progressively larger increments preserved the incentive structure over long periods of activity.

When adding a plug-in incorporating trophies as a reward system to the learner management system Blackboard, researchers observed a similar effect as users engaged in activities that awarded achievements (Domínguez et al., 2013). In addition to observing this pattern of behavior, Domínguez et al. (2013) had participants complete a questionnaire dealing with their experience using the site and motivation levels. Self-reported results from participants indicated higher motivation when using Blackboard and higher motivation towards learning with the achievement structure in place (Domínguez et al., 2013).

Another study with similar positive results added an incentive system to CourseAgent, a community-based course recommendation system. Users with access to the gamified incentives, within CourseAgent rated and recommended more courses within the system when compared to users who were not using the gamified approach (Farzan & Brusilovsky, 2011). Farzan and Brusilovsky (2011) conducted a second study which opened the gamified aspects of CourseAgent to all users and observed that those who actively participated in the gamified components contributed more to the site.

Similarly, in looking at the application Foursquare, Frith (2014) found that participants interacted and engaged with surroundings differently and participants reported increases in motivation and engagement due to the gamified application. Numerous additional studies focused on motivation and engagement with primarily

positive results (Çakıroğlu, Başıbüyük, Güler, Atabay, & Memiş, 2017; Cheong et al., 2013; Conaway & Garay, 2014; Cruz & Penley, 2014; De Schutter & Abeele, 2014; Denny, 2013; Giannetto et al., 2013; Hamari & Koivisto, 2013; Lieberoth, 2014; Su & Cheng, 2014). These primarily positive results surrounding motivational increases introduced by gamification are promising and it is clear that gamification has the potential to motivate.

Theories and Frameworks Used in Gamification Studies

In a meta-analysis of existing gamification literature, Hamari et al. (2014) point to the primarily positive results surrounding engagement, motivation, participation, and enjoyment in gamification studies. At the same time, Hamari et al. (2014) point to the need for the incorporation of theory and formal design frameworks in many gamification studies. This is understandable considering gamification is still a new field of study and early exploratory studies often lack a theoretical underpinning. The use of theory is becoming more prevalent in more recent gamification studies. In addition, several sources present potential theoretical or design frameworks when designing a gamified system, even if they did not conduct a formal study. The following section outlines the most relevant theory and design frameworks from empirical studies, literature reviews, and conceptual articles related to gamification and workplace motivation. Specifically, the following theories are discussed in greater detail in this section: Self-Determination Theory, the MDA Game Design Framework, Flow Theory, the Four Player Types, the Four Types of Fun, the Five Levels of Mastery, and the SAPS Reward System. The rationale behind the exclusion of certain theory from the literature is also explained at the end of this section. Each theory discussed below is relevant within the context of

gamification design. A synthesis of these theories is presented in a framework used to design a gamification implementation in Chapter 3.

Self Determination Theory

Developed by Deci and Ryan, Self Determination Theory (SDT) looks at motivation as a concept, specifically focusing on intrinsic and extrinsic motivation (Gagné & Deci, 2005; Ryan & Deci, 2000). The theory places motivation on an autonomy continuum with amotivation on one extreme. Amotivation is defined as a lack of motivation and is considered a state of apathy (Gagné & Deci, 2005; Ryan & Deci, 2000). SDT places intrinsic motivation on the other extreme of the continuum. Intrinsic motivation is a person's inherent interest in a task or activity (Gagné & Deci, 2005; Ryan & Deci, 2000). According to SDT, everything between these two extremes is extrinsic motivation since a person experiencing amotivation would need some external motivation in order to engage in an activity and a person who is intrinsically motivated would not need an external motivator to engage in the activity. SDT defines four distinct types of extrinsic motivation which vary in the degree to which the extrinsic motivator attempts to control the individual on the amotivation side of the continuum, or the degree to which the extrinsic motivator results in autonomous motivation on the intrinsic motivation side of the continuum (Gagné & Deci, 2005; Ryan & Deci, 2000). The four types of extrinsic motivation within SDT are External Regulation, Introjected Regulation, Identified Regulation, and Integrated Regulation. External regulation deals with highly controlling environments that often present an individual with rewards and punishments that place a great deal of pressure on the individual (Gagné & Deci, 2005; Ryan & Deci, 2000). Introjected regulation is similar to external regulation, but where the latter deals with reward and punishment as the motivation contingency, introjected regulation deals

with the person's self-worth being tied to performance as the motivation contingency. While not as controlling as external regulation, introjected regulation is still considered a controlling form of extrinsic motivation (Gagné & Deci, 2005; Ryan & Deci, 2000). Identified regulation involves extrinsic motivation where the importance of organizational goals, values and regulations are clearly defined for the individual, resulting in the individual feeling greater freedom and volition. With identified regulation, meeting both organizational and personal goals is the motivation contingency and we see a shift away from controlling forms of extrinsic motivation towards more autonomous motivation (Gagné & Deci, 2005; Ryan & Deci, 2000). Integrated regulation involves the individual fully internalizing the goals, values and regulations of the extrinsic motivation, making those goals central to the individual's identity. With integrated regulation there is coherence between the organizational goals, values and regulations and those of the individual, making this the motivation contingency (Gagné & Deci, 2005; Ryan & Deci, 2000). Due to the internalization of the organizational goals, integrated regulation is the only form of autonomous extrinsic motivation. Both integrated regulation and intrinsic motivation are autonomous forms of motivation, but they differ in that intrinsic motivation does not need an external motivation to elicit behavior (Gagné & Deci, 2005; Ryan & Deci, 2000).

SDT appeared in numerous workplace motivational studies discussed later in Chapter 2. The focus on extrinsic motivational structures and workplace autonomy made it an ideal candidate for this study, particularly given the autonomous nature of the workplace environment studied in this dissertation. In addition, Chapman and Rich (2017) point to SDT as a strong theoretical option for gamification design. Gamification

is an extrinsic motivational structure and SDT offered both design considerations and evaluation methods for aligning an intervention with the more autonomous forms of extrinsic motivation on the autonomy continuum.

MDA Game Design Framework

The MDA Game Design Framework looks at the mechanics, dynamics and aesthetics within a game (Deterding et al., 2011; Zichermann & Cunningham, 2011). The theory outlines best practices and approaches to game design, but was repurposed within gamified system design due to the similar considerations it identifies. Within the context of gamification, the mechanics phase represents the game elements defined above and the selection of those mechanics will be contingent upon a variety of factors (Deterding et al., 2011; Zichermann & Cunningham, 2011). The dynamics phase within the MDA framework looks at how users interact with the game elements (Deterding et al., 2011; Zichermann & Cunningham, 2011). The aesthetics phase within the MDA framework involves the user experience and how the interaction with game elements makes the user feel (Deterding et al., 2011; Zichermann & Cunningham, 2011).

When used in gamification design, the MDA Game Design Framework allows designers to appropriately select game elements within specific contexts. It also outlines considerations for addressing a variety of user characteristics through a cyclical process of review and revision. Within the context of this dissertation, the MDA Game Design Framework provided an overarching model for gamification design.

Flow Theory

Developed by Czikszentmihalyi, flow theory attempts to identify the optimal level of engagement within any activity (Czikszentmihalyi, 1989; Zichermann & Cunningham, 2011). When applied to video games or gamification, flow theory looks at the interplay

between the challenge of an activity and the ability of the player to perform the activity (Zichermann & Cunningham, 2011). Flow operates as the ideal level of difficulty within a system where it is not so difficult relative to a user's skill level that the activity induces anxiety, and it is not so easy relative to the user's skill level that the activity induces boredom (Czikszentmihalyi, 1989; Zichermann & Cunningham, 2011).

Flow theory is incorporated in gamification design in an effort to address the various skill levels users possess when performing a task or activity. Within the context of this dissertation, flow theory made particular sense when aligning game elements with a variety of user skill levels. Within the larger context of SDT and the MDA Game Design Framework, providing opportunities that accommodate a variety of user skill levels was particularly important.

Four Player Types

Bartle's four player types attempts to categorize different types of players within a video game environment (Bartle, 1996; Zichermann & Cunningham, 2011). The player type categories examine what motivates individuals to engage in activities within the game. The four player types are placed on an x/y axis with the x continuum examining the extent to which players are engaged in acting versus interacting and the y continuum examining whether that acting or interacting involves other players or the environment within the game (Bartle, 1996; Zichermann & Cunningham, 2011). The four types are killers, achievers, socializers and explorers. Killers represent the quadrant involving acting with other players. They are motivated by engaging with other players in competition and defeating others in that competition (Bartle, 1996; Zichermann & Cunningham, 2011). Achievers represent the quadrant involving acting with the environment. They are motivated by completing tasks or quests and meeting goals

within the game (Bartle, 1996; Zichermann & Cunningham, 2011). Socializers represent the quadrant involving interacting with other players. They are motivated by collaborating with others within the game (Bartle, 1996; Zichermann & Cunningham, 2011). Explorers represent the quadrant involving interacting with the game environment. They are motivated by immersing themselves in the game environment and exploring different aspects of the game (Bartle, 1996; Zichermann & Cunningham, 2011). The four player types are not mutually exclusive and players frequently exhibit characteristics of all four types.

Looking at different user characteristics within a game, including what motivates users to participate and engage with content, is an important component of any game design. When looking at gamification, many of the same user characteristics will exist. While Bartle's player types are not an exhaustive list of user motivations within game environments, they certainly serve to illustrate a variety of perspectives a user might bring to an activity. For this reason, Bartle's player types can help inform design decisions when building a gamified system.

Four Types of Fun

Developed by Lazzaro, the four types of fun look at emotion and fun within games (Lazzaro, 2004; Zichermann & Cunningham, 2011). Like Bartle's player types, the four types of fun are placed on an x/y axis with the x continuum tracking fun that exists in games versus life and the y continuum examining fun that is goal-oriented versus open-ended. The resulting four types of fun are hard fun, easy fun, people fun and serious fun (Lazzaro, 2004; Zichermann & Cunningham, 2011). Hard fun is goal-oriented fun within a game and results in feelings of personal triumph over a challenge. Easy fun is open-ended fun within a game and results in curiosity within the player.

People fun is goal-oriented fun within a game and the resulting emotion is amusement. Serious fun is open-ended fun within a game and results in relaxation and excitement (Lazzaro, 2004; Zichermann & Cunningham, 2011).

According to this theory, game designers should consider all four types of fun when designing games, and the creation of more emotions through the use of these four types of play results in a more captivating and engaging game experience. Within gamification design, providing opportunities for users to engage in different types of play will create a more well-rounded system with considerations for a broader user base.

Five Levels of Mastery

Developed by Dreyfus and Dreyfus, the five levels of mastery look at the different stages a user experiences when interacting with a system (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011). At the first level of mastery, a user is a novice who is completely new to the system (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011). Over time, a user moves into the second level of mastery and is considered a problem solver as they gain minimal experience within the system and possess more understanding than the novice (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011). At the third level of mastery, experts know the system in ways that are not obvious to the novice or problem solver and are beginning to understand the system (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011). Masters, the fourth level of mastery, truly understand the system and frequently identify with the system on a personal level due to the time spent engaging with the system (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011). At the fifth level of mastery, visionaries understand the system so well, they start to identify ways to improve the system (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011).

When designing any system, the five levels of mastery are important considerations due to the variety in user expertise. A well-designed system should be able to accommodate each level of mastery. Particularly when considering a game or gamification implementation, it is important to provide opportunities to users with each level of mastery to avoid a loss of interest by users at any level of mastery.

SAPS Reward System

The SAPS reward system looks at different types of extrinsic rewards in a tiered structure (Zichermann & Cunningham, 2011). The extrinsic rewards are arranged from most to least motivating and, in that order, include status, access, power, and stuff. Status, the most motivating extrinsic reward, conveys prestige upon the user (Zichermann & Cunningham, 2011). Access gives a user the ability to engage with content that another user cannot access (Zichermann & Cunningham, 2011). Power gives the user control over some aspect of a gamified system that other users do not have (Zichermann & Cunningham, 2011). Stuff, the least motivating reward, constitutes physical or tangible rewards (Zichermann & Cunningham, 2011).

In looking at potential game elements that could be used within a gamified system, each aligns with either status, access, power or stuff within the SAPS reward system. Selecting game elements that provide status or access within a system is worth considering, as this may result in greater motivation.

Excluded Theory

It is worth noting that additional theories emerged within the literature that were excluded from this literature review for a variety of reasons. Of particular note, two motivational theories appeared on multiple occasions within the literature. Goal Setting Theory explored many of the same aspects discussed in Self Determination Theory,

particularly when looking at how organizational and personal goals align with motivators (Farzan & Brusilovsky, 2011; Locke & Latham, 2002). ARCs motivational design also dealt with many of the same concepts SDT discussed (Huang, 2011; Keller, 1987). In both cases, Self Determination Theory aligned more closely with a gamification design process and additional motivational theories were excluded to avoid unnecessary redundancy. Cognitive Load Theory also appeared in several studies dealing with game-based learning and serious games, but was not as prevalent in the gamification literature (Ang, Zaphiris, & Mahmood, 2007; Ayres & Paas, 2007; Chandler & Sweller, 1991; Huang, 2011; Turan, Avinc, Kara, & Goktas, 2016). While cognitive load considerations are important, other theories within the dynamics phase of the MDA framework did a better job of capturing user experience considerations. Finally, two theories represent recent attempts to provide a gamification framework in educational settings. The Dynamic Model for Gamification of Learning (DMGL) has not gained much traction in the literature since its introduction in 2012 (Kim & Lee, 2012; Kim & Lee, 2013). The Theory of Gamified Learning, introduced in 2015, has also failed to gain traction in the literature (Landers, 2015). In both cases, the focus was specifically on the gamification of learning and due to the early stages of development, more established and tested theories within the literature were utilized.

Gamification Design and Findings

The theories that emerged within the gamification literature represent important considerations when designing a gamified system. Before discussing that theory within the context of the gamification design in this dissertation, it was worthwhile to also look at trends that emerged while reviewing the empirical studies related to gamification. In the following section, gamification literature is discussed as it relates to conceptual and

theoretical frameworks, system design, and research design. While many gamification studies yielded positive results, this section also looks at unintended negative results that took place in several studies where game elements were not properly aligned with the behavior they intended to motivate. All of these trends can help inform the design of gamification implementations both in the specific context of the Techworks Portal and more generally when designing a system incorporating game elements.

Conceptual Frameworks in Gamification Studies

Two gamification models have emerged within recent literature that focus specifically on gamification considerations within an educational environment and provide overarching theoretical frameworks. The Dynamic Model for Gamification of Learning (DMGL) builds on existing theories and attempts to incorporate various aspects of the MDA Game Design framework, ARCS motivational theory and key characteristics of learning games (Kim & Lee, 2012; Kim & Lee, 2013). Similarly, the Theory of Gamified Learning attempts to explain the relationship between instructional content, learning outcomes, learner characteristics, game elements and overall instructional effectiveness (Landers, 2015). Both models are very new and apply specifically to learning environments. The attempt to formalize a conceptual framework for the design of gamified systems will likely increase as researchers attempt to standardize around a specific framework or guide to gamification design.

With this in mind, several researchers have called for the incorporation of theory and design principles in future gamification research through a discussion of the limitations of existing literature (Blohm & Leimeister, 2013; Dale, 2014; Hamari & Eranti, 2011; Nicholson, 2015; Oprescu, Jones, & Katsikitis, 2014; Osipov, Volinsky, & Grishin, 2015; Sailer et al., 2013). Other sources have made an attempt to outline best practices

and theories that help guide the design and implementation of gamified solutions. Zichermann and Cunningham (2011) outline numerous theories and best practices in addition to a guide to implementing game elements within code in their book, *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. While not a formalized conceptual framework, they offer several theories and strategies to consider while designing a gamified system.

Many of the empirical studies that look at gamification did not include a conceptual framework or formal motivational theory in designing their system (Anderson et al., 2013; Attali & Arieli-Attali, 2014; Cheong et al., 2013; Cruz & Penley, 2014; Denny, 2013; Domínguez et al., 2011; Farzan & Brusilovsky, 2011; Farzan et al., 2008a; Farzan et al., 2008b; Fitz-Walter, Tjondronegoro, & Wyeth 2011; Giannetto et al., 2013; Goehle, 2013; Grant & Betts, 2013; Gustafsson & Bång, 2008; Hakulinen et al., 2013; Hamari, 2013; Hanus & Fox, 2015; Jung et al., 2010; Li et al., 2012; Lieberoth, 2014; Montala, Nummenmaa, Lucero, Boberg, & Korhonen, 2009; Osipov, Nikulchev, et al., 2015; Thom, Millen & DiMicco, 2012; Witt, Scheiner, & Robra-Bissantz 2011; Zuckerman & Gal-Oz, 2014). The absence of conceptual or theoretical frameworks is not surprising due to gamification being a new field of study, but it does point to a need for conceptual frameworks in future research. Without conceptual frameworks in place, often studies relied on users self-reporting their experience with the system or completing a survey of some form without reporting the validity of the assessment (Attali & Arieli-Attali, 2014; Cheong et al., 2013; Cruz & Penley, 2014; Denny, 2013; Domínguez et al., 2011; Frith, 2013; Goehle, 2013; Hamari & Koivisto, 2013; Jakobsson, 2011; Koivisto & Hamari, 2014; Li et al., 2012; Lieberoth, 2014).

Indirect measures of user behavior were informative and encouraging given the primarily positive results, but were insufficient on their own to establish a causal relationship. This speaks to the potential of a mixed methods approach in gamification research which could provide a more holistic view of a gamification implementation. Here, looking at self-reported data in addition to a validated form of assessment would help build a case for the treatment or the study as a whole.

The need to identify the most appropriate theory when designing a gamified system is clear within the literature and represents a natural progression as the field of study matures. Similarly, there is a need to incorporate a conceptual framework that is grounded in theory and outlines a clear research process. This dissertation sought to identify the most appropriate theory from the existing literature that could guide the design of gamification, while providing a conceptual framework that incorporated both self-reported user experiences and validated forms of assessment.

Gamification system design in empirical studies

Both IT system design and game design are characterized by iterative and cyclical review and revision. This is a critical component in the process of continuing to improve and adapt a system of this kind. One of the best examples in the gamification literature of this iterative process of system design is characterized by two studies conducted by Farzan et al. (2008a; 2008b). The researchers conducted an initial exploratory study which identified issues with the design of their gamified system (Farzan et al., 2008a). Specifically, they noted that the points and status used within the system did not dynamically adjust or decay over time. As a result, they noticed contributions decline over time after an initial spike in usage (Farzan et al., 2008a). In a follow-up study, the researchers addressed these design issues and conducted an

experiment to test the revised system (Farzan et al., 2008b). The follow-up study involved a larger sample population over a longer period of time and saw increased participation and user discussion over time. This is a wonderful example of the importance of continually monitoring a system of this type to address issues as users engage with a system.

Outside the above example, there were few instances of follow-up studies in the literature when potential issues were identified with the design of gamification. Instead, researchers frequently noted the problems within the design of the gamified solution but did not address the issue or conduct a follow-up study (Attali & Arieli-Attali, 2014; Cruz & Penley, 2014; De Schutter & Abeele, 2014; Farzan & Brusilovsky, 2011; Farzan et al., 2008a; Fitz-Walter et al., 2011; Hakulinen et al., 2013; Hanus & Fox, 2015; Montola et al., 2009; Osipov, Nikulchev, et al., 2015; Witt et al., 2011). The lack of follow-up studies is likely due to the early stage of research within this field, and we will likely see the number of studies of this kind increase over time.

In addition, a description of the design considerations when implementing a gamified solution would be beneficial to the field of study both to help guide researchers in designing future gamified systems and to provide context for any findings. Many gamification studies incorporated game elements in existing systems or built systems from the ground up, but did not reference specific design considerations or a formal design process (Attali & Arieli-Attali, 2014; Cheong et al., 2013; Cruz & Penley, 2014; Denny, 2013; Domínguez et al., 2011; Farzan & Brusilovsky, 2011; Fitz-Walter et al., 2011; Giannetto et al., 2013; Goehle, 2013; Gustafsson & Bång, 2008; Hakulinen et al., 2013; Hanus & Fox, 2015; Li et al., 2012; Lieberoth, 2014; Thom et al., 2012; Witt et al.,

2011; Zuckerman & Gal-Oz, 2014). As an example, Montola et al. (2009) describe adding achievements to a photo sharing service but do not describe the design process or reference aligning the achievements with desired behavior (Montola et al., 2009). This resulted in unintended user behavior discussed in more detail later in Chapter 2. Similarly, in a study that added game elements including achievements and badges to an open education platform for learning foreign language from native speakers, Osipov, Nikulchev, et al. (2015) used a large sample size of 8,000 users but did not describe how the system was designed. While results were positive, a discussion of game element alignment or articulation of system design considerations in building the gamified system would have helped provide context for the results.

Research designs in gamification studies

Due to the nature of implementing a gamified solution and testing that system within a specific context, many gamification studies were designed as case studies. Case studies are well-suited for testing theoretical frameworks or models in real-world situations using small sample populations (Creswell, 2013). As such, case study research is particularly appropriate when testing gamification implementations. In one case study, Cheong et al. (2013) used a gamified software tool for quizzes called Quick Quiz with a group of 76 college students ranging in age from 18 to 48. Participants reported increased engagement, happiness and enhanced learning effectiveness (Cheong et al., 2013). Conaway & Garay (2014) used voluntary convenience sampling to identify 189 participants who completed a questionnaire that focused on factors of gamification that attract customers to company websites. They identified several key factors that characterize successful gamification implementations with a focus on commercial businesses considering gamified solutions. Hakulinen et al. (2013) added

achievements to TRAKLA2, an online learning environment and used convenience sampling with a group of 281 computer science students taking Data Structures and Algorithims at Aalto University. The study found that achievements impacted student behavior, with students targeting activities that rewarded achievements and a small subset of students were particularly motivated to pursue them (Hakulinen et al., 2013). Small sample populations were present in several other gamification studies, which is typical of early research and case study research (Li, Grossman, & Fitzmaurice, 2012; Osipov, Nikulchev, et al., 2015; Su & Cheng, 2014; Witt et al., 2011). Case studies, particularly within a workplace or classroom setting, often relied on convenience sampling (Cruz & Penley, 2014; De Shutter & Abeele, 2014; Denny, 2013; Goehle, 2013; Jung, Schneider, & Valacich, 2010; Su & Cheng, 2014; Witt et al., 2011). While convenience sampling is discouraged in more experimental research designs, the use of convenience sampling in gamification research can provide information about the case population. This is particularly relevant in the context of this dissertation, which looked at a very specific population.

Many of the studies within the gamification literature failed to sufficiently isolate the gamified system as a variable or did not include a control group (Cruz & Penley, 2014; De Shutter & Abeele, 2014; Fitz-Walter et al, 2011; Goehle, 2013). Witt et al. (2011), for example, conducted a questionnaire with 30 voluntary participants at an idea competition that incorporated points and leaderboards as game mechanics at the event. They found that users did not engage with the gamified components, though they did note that earning points was a positive experience for users overall. The researchers attribute the lack of engagement to the poor design of the leaderboards and point

system, which did not adjust to the individual viewing the website and were difficult to find (Witt et al., 2011).

Both internal and external validity concerns were present in a large portion of the existing empirical studies, calling into question the generalizability and/or transferability of many of the results. While many researchers explicitly addressed this in suggesting areas for future research, there are very few examples of follow-up studies or longitudinal studies in the gamification body of literature. Overall, the research designs in existing studies point to the importance of isolating gamification as a variable and, where possible, comparing non-gamified examples in the form of a control group.

Unintended results and design issues

As previously stated, much of the gamification research findings were positive regarding user motivation, engagement and participation. Where results were mixed, results tended to be primarily positive but with some negative results. In particular, several implementations of gamification resulted in the game element causing unintended user behavior, and the researchers frequently attributed this to design issues when implementing game elements. This was one of the most interesting trends in the gamification research and points to the importance of following a formal design process.

In using the incentive system within the course recommendation website CourseAgent, users found the motivational component to be rewarding on an individual basis and researchers saw an increase in the number of courses being recommended and rated (Farzan & Brusilovsky, 2011). At the same time, they noted that users exhibited a positive rating bias, since the system rewarded them personally for positive ratings (Farzan & Brusilovsky, 2011). This was a particularly telling design consideration

when implementing a system that incentivizes a specific behavior and the researchers noted that there may be a need to adjust the system to incentivize rating courses, rather than positively rating courses.

When using the smart phone app Orientation Passport, users reported being more engaged and researchers noted increased attendance and participation overall during orientation for new students in a university setting (Fitz-Walter et al., 2011). Users also reported that the gamified system was fun and added value to their orientation experience. At the same time, some users were found to stop using the application after receiving the associated achievements (Fitz-Walter et al., 2011). In one case, this resulted in students potentially missing required components of the orientation program since an achievement was rewarded for attending three events and students were required to attend six events as part of their campus orientation (Fitz-Walter et al., 2011). Some students in the Orientation Passport study also reported guessing at answers until they earned an achievement in a question-response portion of the gamified application, rather than actually learning the requisite information (Fitz-Walter et al., 2011). This unintended behavior points to the need to properly align game elements with the intended user behavior. Creating an achievement system that stops rewarding behavior or that fails to reflect the required behavior can result in users not meeting expectations.

In the online learning environment, TRAKLA2, researchers implemented an achievement system that resulted in statistically significant differences in user behavior when compared to a control group for certain achievements, while other achievements seemed to have no impact (Hakulinen et al., 2013). At the same time, researchers were

concerned that some students may have been less careful in assignment submissions due to badges being awarded for turning in assignments early (Hakulinen et al., 2013). This example points to the need to carefully observe user behavior in relation to gamification and the need for flexibility in making adjustments in future iterations.

In the photo sharing service, Nokia Image Space, researchers implemented an achievement system that resulted in friendly competition amongst users as they compared achievements (Montala et al., 2009). At the same time, some users felt that achievements that were awarded for posting a large number of photos encouraged quantity at the expense of quality and were thus potentially harmful to the community (Montala et al., 2009). This unintended usage pattern points to the need for some quality metric in addition to quantity in an implementation of this kind if at all possible.

All of the unintended usage patterns point to important design considerations when implementing achievements, badges, or other game elements. It is imperative that thorough research is conducted in order to align the behavior the achievements are intended to produce with the goals of the organization, community, or environment within which the game elements are being implemented. Thorough testing is also necessary with any system of this type. Most video games, software, and applications go through alpha and beta testing periods as part of the development cycle in order to find errors or potential exploits. User behavior is also tracked during this type of testing to verify that the game components are eliciting the intended results (Zichermann & Cunningham, 2011). As Squire (2006) noted when looking at video games as designed experiences, there is a need to study what participants are actually doing in games and not solely what game designers intended. With most video games, players will find ways

to exploit rules and structures within a game and any attempt to implement a gamified solution will need to be constantly monitored, reassessed, and adjusted accordingly (Zichermann & Cunningham, 2011).

Workplace and Performance Improvement Studies

A review of gamification studies was informative in identifying appropriate theory, design considerations, and research approaches when considering a gamification implementation. Many of the gamification studies looked at implementations in commercial applications or in educational settings and while some gamification studies occurred in the workplace, this was uncommon. Since this dissertation focused on a workplace environment, it was important to review literature concerning workplace motivation. In addition, this study sought to improve employee performance through gamification and a review of some performance improvement literature was warranted to guide the research design. The following section reviews relevant workplace motivation studies regarding Self Determination Theory and outlines two models to analyze a workplace environment that guide the research design of this dissertation. Aspects of these models were utilized in Chapter 3.

Workplace Motivational Studies

Several motivational studies within the workplace make use of Self Determination Theory (Baard, Deci, & Ryan, 2004; Deci, Connell, & Ryan, 1989; Deci et al., 2001; Ilardi, Leone, Kasser, & Ryan, 1993; Kasser, Davey & Ryan, 1992, Ryan & Connell, 1989). Given the nature of gamification as an extrinsic motivation tool, these studies were of particular interest in approaching this dissertation. Some motivational studies have found that extrinsic motivators can undermine intrinsic motivation (Eden, 1975; Deckop & Cirka, 2000; Shirom, Westman, & Melamed, 1999). Gagné and Deci (2005)

suggest that these studies may not have considered some extraneous variables and that these variables may have contributed to the findings. Specifically, the supportive and autonomous considerations that are laid out within SDT were not controlled within many studies of the effects of extrinsic motivation (Gagné & Deci, 2005). Several studies making use of SDT have found that extrinsic motivation within a workplace environment can bolster intrinsic motivation and lead to autonomous extrinsic motivation when those extrinsic motivators are seen as equitable and when the work environment is supportive of worker autonomy (Baard et al., 2004; Deci et al., 2001; Ilardi et al., 1993; Kasser et al., 1992). On the other hand, when extrinsic motivators and rewards are not seen as equitable, or when they are seen as controlling, resulting in high pressure work environments, extrinsic motivation tends to undermine intrinsic motivation and can sometimes demotivate employees (Baard et al., 2004; Deci et al., 2001; Ilardi et al., 1993; Kasser et al., 1992). Ryan and Deci (2000) also point to the importance of communicating organizational goals and allowing employees the opportunity to set personal goals within that context. Over time, this can lead to employees internalizing the organizational goals.

Though not utilizing SDT, Cordador et al. (2017) point to the potential application of gamification in a workplace setting and the importance of setting performance goals in that context. In particular, they note that gamification of a workplace environment gives employees better access to performance data resulting in more immediate feedback on how an individual is performing (Cordador et al., 2017). Cordador et al. (2017) suggest that gamification in a workplace setting will result in increased motivation for employees and increased effectiveness at work. Perryer et al. (2016)

make a similar claim regarding gamification in a workplace setting and suggest that SDT would be an appropriate theory to guide the design of a gamified workplace solution. They highlight the focus on personal and organizational objectives in SDT and the potential of gamification to support achieving those objectives (Perryer et al., 2016).

Within the context of gamification within a workplace setting, these findings suggest that a gamified solution that was guided by considerations laid out through Self Determination Theory, might help to better align game elements with the behavior they are intended to motivate. Specifically, these studies highlight the importance of employee autonomy when engaging with game elements and equity between employees regarding their ability to attain any gamified incentives. They also point to the importance of clearly defining the goals of the organization so that employees understand the value of their work and can set personal goals related to the overarching organizational goals. When designing a gamified solution, ensuring that these goals are clear is another important consideration.

Performance Improvement

Van Tiem, Moseley and Dessinger (2012) outline a human performance technology improvement model that focuses on a performance gap within a workplace setting. Here, the desired performance of employees, on the part of the employer, is compared to the actual performance of employees (Van Tiem et al., 2012). If a gap is identified, the cause of the performance gap is analyzed and an intervention is selected. After designing and implementing the intervention, it is evaluated in tandem with employee performance (Van Tiem et al., 2012). This model was particularly useful within the context of this dissertation, since it outlines a structured approach to evaluating a performance gap in a workplace setting and implementing a solution.

Aspects of this model were used to examine Techworks employee performance and are detailed in Chapter 3.

Gilbert (2007) lays out a behavior engineering model to evaluate both the workplace environment and the employee's repertory of behavior within a workplace setting. Environmental supports include providing relevant and frequent feedback about employee performance, descriptions of what performance is expected, and guides to achieving adequate performance (Gilbert, 2007). In addition, environmental supports include providing tools that are designed to match the need of both the organization and employees (Gilbert, 2007). Finally, environmental supports provide opportunities for professional development along with both monetary and non-monetary incentives for completing work (Gilbert, 2007). An employee's repertory of behavior involves the skills an employee possesses and includes the training an employee receives along with the alignment of that training with exemplary performance (Gilbert, 2007). The behavior engineering model is used to evaluate whether there are areas within either the workplace environment or employee skillsets that could be improved in order to improve overall performance. Gilbert (2007) also advocates defining and communicating exemplary performance based on historic performance that represents the best instance of performance on the part of an employee. The behavior engineering model was a valuable tool in analyzing the Techworks work environment. Like the human performance technology improvement model, this analysis is detailed in Chapter 3, and revealed a need for additional non-monetary incentives within the Techworks portal.

Literature Review Summary

A review of gamification and workplace literature revealed a number of trends that help guide the research in this dissertation. The positive results from gamification

studies point to clear potential in this field to motivate and engage users, and gamification represents an exciting incentive approach when designed properly. Three key areas emerged from the literature that this dissertation attempted to address. The review of literature points to a need for gamification studies to be grounded in appropriate theory, the need for more formal gamification design practices, and the need for gamification studies outside of educational and commercial applications.

Early gamification studies lacked grounding in theory, resulting in a more recent call for the incorporation of theoretical foundations in gamification research (Hamari et al., 2014; Kim & Lee, 2012; Kim & Lee, 2013; Landers, 2015). A number of relevant theories have emerged in recent literature both through conceptual articles offering recommendations and formal studies attempting to incorporate theory in gamification research. A review of gamification research also points to the need for more formal design practices when designing gamification implementations. This is seen through the lack of system design specifications provided in many articles and the resulting unintended usage patterns that emerged in several studies. Through utilizing a formal game design framework and incorporating relevant theory at each stage of the framework, this dissertation can help guide the design of gamified systems beyond the scope of the research in question.

Though there were some gamification studies that occurred in workplace settings, there were few concrete examples in this area. The positive results in educational and commercial settings point to a clear opportunity for additional research. With the potential of gamification to motivate, examining a workplace setting and the application of game elements to motivate employees is an exciting research area. It is,

however, important to incorporate models from workplace studies to help guide the design of the gamification implementation.

While there is great potential in the use of gamification to motivate, it is important to recognize that gamification is a trending topic and temper expectations (Ferrara, 2013; Hamari et al., 2014; Kalinauskas, 2014). Gartner's Hype Cycle is a graphic representation of the expectations and adoption cycle of an information technology solution (Ferrara, 2013). Generally, this cycle displays a new technology going through a sharp peak of initial interest, resulting in inflated expectations. This is followed by a period of disillusionment when the technology fails to meet the inflated expectations. In light of the realities of the technology solution, more reasonable expectations lead to a plateau within the graph where the new technology is used in production within the context of its limitations (Ferrara, 2013). In a discussion of gamification as it relates to Gartner's Hype Cycle, Ferrara (2013) discussed gamification as being at the apex of the cycle, with inflated expectations surrounding gamification. All of the findings within the empirical studies should be looked at critically, with this in mind. The importance of researching well-designed gamification implementations that are grounded in appropriate theory is even more important within this context.

As both the concept of gamification and the experiments attempting to study the concept mature, there is a need for solid design principles and best practices in designing gamified solutions for research purposes. At present, there are a variety of studies using Self Determination Theory to study motivation in the workplace, but few gamification studies grounded in this theory. Because gamification deals with extrinsic motivation and at present, the literature is lacking in theory, SDT is a strong candidate

to provide the theoretical underpinnings of gamified experiences. SDT provides a tested theoretical approach to classifying and evaluating extrinsic motivation. Careful design of the gamified system will also play a significant role in aligning game elements with what they intend to motivate within the system. The MDA Game Design Framework provides the cyclical and recursive design process that is needed when designing a system of this kind to optimize the user experience. In conjunction with numerous other theories that look at user characteristics and user motivation, SDT and MDA have the potential to reshape how gamified experiences are designed and how gamification research is conducted.

A synthesis of relevant theory and design best practices resulted in a gamification design framework used to guide the design of the gamification implementation within Techworks. Chapter 3 involves an analysis of the Techworks work environment and the design of a gamification layer using this framework. The specific theories discussed in this framework and their application in designing the gamification layer in the Techworks Portal are unpacked in greater detail in Chapter 3.

CHAPTER 3
WORKPLACE ANALYSIS AND GAMIFICATION DESIGN

The analysis of the Techworks work environment was based on two performance models discussed in Chapter 2: the Human Performance Technology Improvement Model developed by Van Tiem et al. (2012) and the Behavior Engineering Model developed by Gilbert (2007). The overarching design of the gamification within the Techworks Portal was guided by the Self-Determined Gamification Framework (Figure 3-1). Here, Self-Determination Theory (SDT) and the Mechanics Dynamics Aesthetics (MDA) Framework provide important considerations when designing an incentive system in a workplace setting using game elements. Within Chapter 3, the analysis of the Techworks work environment is examined in detail. In addition, each aspect of the Self-Determined Gamification Framework is presented as it pertained to the design within the Techworks Portal. After a discussion of considerations, the actual design is presented, as it occurred within the Techworks Development Portal as part of a standard design process prior to any new tool being implemented in the production environment. Specific achievements are also provided prior to a summary of the overall design process.

Techworks Workplace Analysis

Human Performance Technology Improvement Model

The Human Performance Technology Improvement Model developed by Van Tiem et al. (2012) presents an overarching analysis of employee performance that includes assessing the organization and workplace environment to identify the desired performance of employees and their actual performance. If a gap is identified, the cause of the performance gap is investigated resulting in the selection and design of an

intervention (Van Tiem, et al., 2012). The Intervention is then implemented and maintained. An important component of this model is a continuous process of evaluation at each stage within the process and recognition that the intervention represents a change to the workplace environment that needs to be managed. While the entire model was not used in this evaluation, elements of the model were incorporated in identifying a performance gap.

Using components of this model, an analysis of the online workplace environment within Techworks revealed a performance gap by comparing the desired performance of employees to their actual performance. Here, specific performance requirements were compared to actual performance in a number of key areas. These areas included positive and negative customer service survey responses, posts to a technical forum, reactive support ticket completion, ad-hoc support ticket completion, mobile support site support ticket completion, submission of performance feedback, completion of proactive checklists on equipment, completion of office shifts at the Techworks office, technology assistance at events within the residence halls, completion of monthly evaluations, completion of the overall semester evaluation, receipt of late notices, receipt of critical notices, and attendance at a variety of events.

Behavior Engineering Model

Initial student employee feedback pointed to a lack of connection, motivation and structure within a work environment where student employees complete job requirements remotely and autonomously within an online portal with minimal supervision. Although the decision was already made to implement the gamification layer, analyzing the online workplace environment at Techworks using the behavior engineering model was a useful exercise to identify potential areas for improvement.

Gilbert (2007) lays out a behavior engineering model to evaluate both the workplace environment and the employee's repertory of behavior.

Conducting an analysis of the Techworks organization and workplace environment revealed that while other environmental and individual supports were met, there were very few non-monetary incentives in the online environment at Techworks. Specifically, the Techworks environment provided employees with relevant and frequent feedback about performance, set clear expectations about performance including methods for meeting what Gilbert (2007) calls exemplary performance, and provided staff with clear guidelines and training to achieve both adequate and exemplary performance. Training was available throughout the year in the online portal and employees were strategically placed throughout the residence halls so that they had access to experienced staff with diverse skillsets. Techworks full-time staff created tools to meet the needs of student staff in completing their work and the tools were specifically designed to meet the needs of staff and the work being completed. Work took place according to student staff schedules and they were given flexibility in setting that schedule. Staff were strategically selected during the hiring process for their ability to perform the job, in addition to their ability to adapt to different situations. Financial compensation was high when calculated at an hourly rate and was performance-based. A variety of professional development opportunities were offered to staff throughout the year both within Techworks and as part of the overall IT community on campus. Staff recruitment was targeted to meet the needs of the organization and staff were routinely asked for feedback about ways to improve the organization, the workplace environment, and ways to improve employee motivation in the workplace. This analysis revealed that

non-monetary incentives were somewhat lacking in the organization, despite meeting other factors within the Behavior Engineering Model.

Analysis of Techworks Work Environment: Summary

The results of the performance gap analysis and the Behavior Engineering Model, when taken in tandem, suggested that the selected intervention, the incorporation of gamification elements in the online web portal, had the potential to incentivize work and increase motivation. With a need identified and the intervention selected, the gamification layer needed to be designed, developed and implemented within the online web portal (Van Tiem, et al., 2012). The design of the gamification layer is detailed in the remainder of Chapter 3.

Gamification Design Using the Self-Determined Gamification Framework

Self-Determined Gamification Framework

The review of relevant theory from gamification research resulted in a framework that was grounded in Self-Determination Theory (Figure 3-1) and that portrayed a gamification design process that sought to create autonomous user experiences. This framework was used to design the gamification implementation in the Techworks Portal. Based on the findings of this research, this framework also has the potential to guide the design of other gamified systems intended to motivate users.

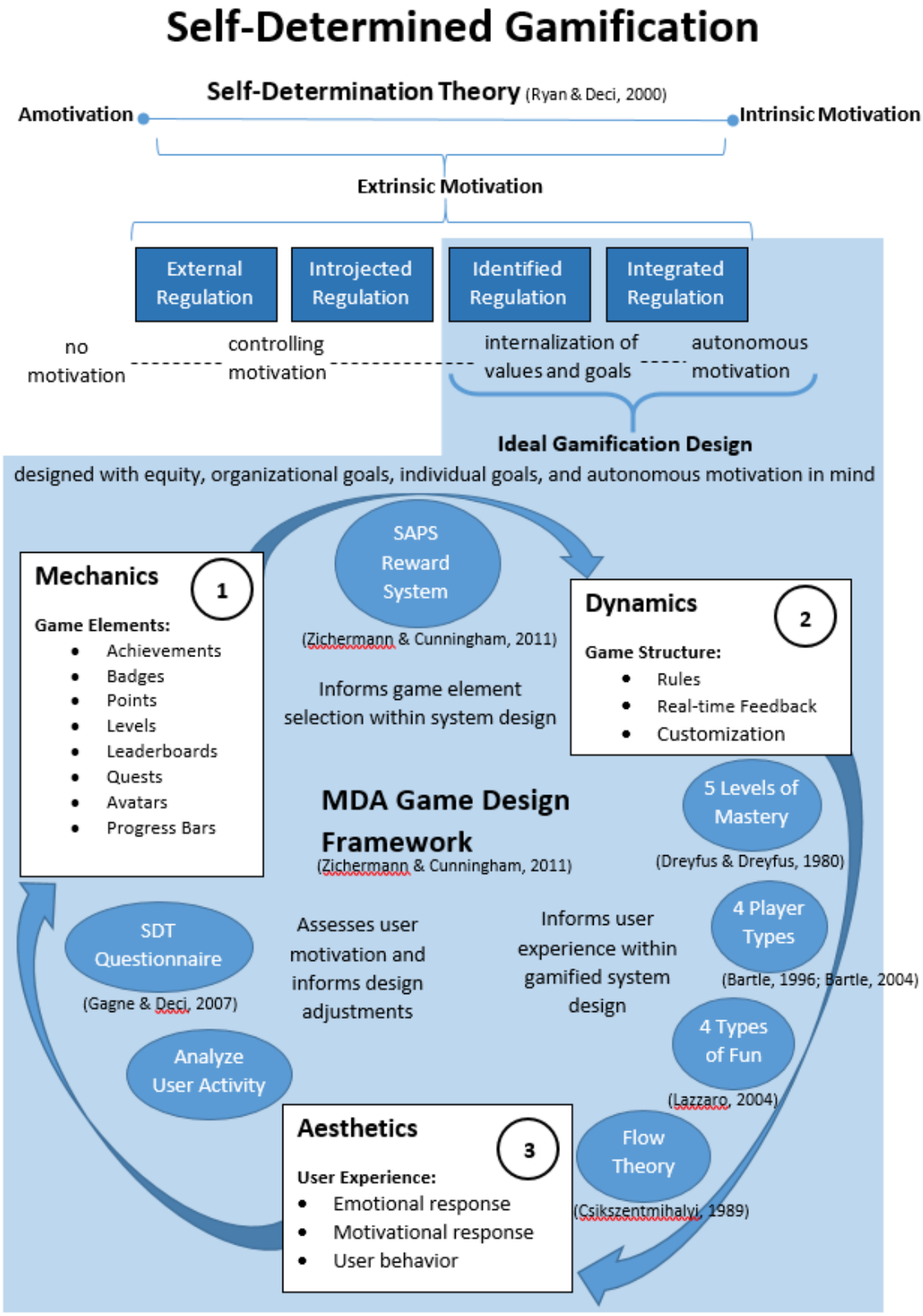

Figure 3-1. Self-determined gamification framework

Self-Determination Theory (SDT) Alignment

The overall design of the game elements within the Techworks Portal was rooted in Self-Determination Theory (SDT). By focusing on features highlighted in SDT, the hope was to design an incentive structure that did not result in a controlling or high-pressure work environment. To do this, SDT recommends designing motivational components or incentives that are closely tied to organizational goals (Gagné & Deci, 2005; Ryan & Deci, 2000). After aligning the extrinsic motivational components, in this case game elements, with organizational goals, SDT stresses the importance of allowing employees the ability to choose where they will focus their efforts when engaging in work (Gagné & Deci, 2005; Ryan & Deci, 2000). In addition, the game elements should be attainable to all employees, should they choose to pursue a specific area of work (Gagné & Deci, 2005; Ryan & Deci, 2000). Aligning the game elements with organizational goals and designing them so that employees can engage in autonomous work that is attainable to any employee presents employees with a work environment conducive to internalization of organizational goals. In the end, the hope is that employees begin to internalize the goals of the organization, resulting in the completion of meaningful work.

SDT alignment: organizational goals

Prior to selecting the specific game elements or designing the actual system, it was important to identify organizational goals. Within Techworks, four overarching goals guide practice when completing work: (a) enhancing the educational environment within the residence halls through technology, (b) enhancing the entertainment opportunities within the residence halls through technology, (c) providing quality customer service to every client through timely and reliable on-site technology support, and (d) supporting

fellow Techworks staff through timely communication, clear expectations, and mentoring. The four Techworks goals are also articulated in Appendix A. For Techworks student staff, these goals are accomplished through the completion of specific job requirements. These job requirements are discussed in greater detail in Chapter 5, but they include: customer service surveys received, technical forum posts, assigned reactive support tickets completed, ad-hoc reactive support tickets completed, mobile support site support tickets completed, performance feedback submissions, proactive equipment checklists completed, proactive hallsweeps completed, office shifts completed, event assists completed, monthly evaluations completed, late notices received, critical notices received, mobile support site events attended, area meetings attended, staff meetings attended, and portal logs by day. Each job requirement is mapped to a specific category and each category is mapped to one or more organizational goal. The Techworks job categories include: customer service, evaluations, events, support tickets, other support, tech forum, and general. The job category, job requirements and organizational goal are included in Appendix B.

SDT alignment: autonomy

For the job requirements listed above, some are strictly defined for staff to complete, while others are more flexible. As an example, staff must complete six office shifts each semester, but there is no required amount of technical forum posts. For most of the job requirements, staff are free to go above and beyond the minimum job requirement. For example, a staff member could complete as many office shifts as she would like, though she must complete the required six per semester. Exceptions include mandatory events, where there are a finite number of requirements with no opportunity to go above and beyond. Examples of this type of requirement include staff meetings

and regional area meetings. While it was important to clearly convey the minimum job requirement, it was also important in designing the gamification components to allow staff the freedom to pursue areas of interest beyond the required work. Within SDT, this is referred to as providing employees with autonomy and where possible, the gamification design allowed for employee autonomy when engaging in work (Gagné & Deci, 2005; Ryan & Deci, 2000).

SDT alignment: equity

Each employee within Techworks has the opportunity to complete each job requirement and to engage in work above and beyond the required amount. When looking at job requirements and considering gamification options, it was important that each staff member would be able to be successful in obtaining the gamified incentives. Within SDT, this is conceptualized under the term equity (Gagné & Deci, 2005; Ryan & Deci, 2000). Within the eventual achievement structure, detailed later, multiple achievements were identified within each job category and each is attainable by an employee during their tenure with the organization. To test this, it was confirmed that each achievement would have been earned by at least one past employee who exhibited exemplary work. It is important to note that the initial design of the achievements looked at all employees over time. Since most employees work an average of three years for Techworks, there were outliers that skewed the initial mapping of certain achievements. For example, an employee that worked for Techworks in both undergraduate and graduate school would have completed significantly more work over a five to seven-year period than an employee working for Techworks the average tenure. For this reason, outliers were removed when determining if a prior employee would have earned each achievement and

achievements were designed around employees who worked 3-4 years for the organization.

SDT alignment: individual goals

Within Techworks, each region sets goals for a semester at the outset of a semester. These goals are set without the involvement of full-time Techworks staff. In addition, staff meet once per semester with a supervisor to review goals and talk about progress. When selecting game elements and the eventual design of the gamification layer, it was important to review prior staff goals and ensure they were reflected in the system. In addition, it was important for game elements to be transparent so that staff could see what could specifically be obtained and set goals within the system. While staff may internalize organizational goals, it was important for them to be able to set their own goals in relation to the game elements.

MDA Game Design Framework

The MDA Game Design Framework presents an iterative and cyclical process to follow when designing games. Within the context of the SDT considerations already presented, the MDA Game Design Framework offers specific design considerations for a gamification environment. These considerations helped guide the process of selecting game elements, establishing the rules and parameters for the game elements within the overarching system, and designing the system with the end user experience in mind (Deterding et al., 2011; Zichermann & Cunningham, 2011). In the following sections, each of these aspects of designing the gamification layer is explored in greater detail.

MDA framework: mechanics – overview

Within the MDA Game Design Framework, the mechanics phase is focused on the selection of game elements within the context of gamification design (Deterding et

al., 2011; Zichermann & Cunningham, 2011). The review of literature revealed a number of possible game elements that could be incorporated in this study and several that were inappropriate for a workplace environment. Particularly within the context of SDT, leaderboards appeared to create high pressure environments where the focus becomes competition and this did not map well to the Techworks environment (Hanus & Fox, 2015). Similarly, obtaining points that allowed an employee to level created problems both from a design standpoint, in mapping job requirements to a point structure, and in creating a somewhat rigid and controlling work environment. Studies have also indicated that points and levels in a workplace setting can create issues relative to veteran employees who have had access to the system longer than new employees, in addition to a decline in participation over time (Farzan et al., 2008a).

MDA framework: mechanics – SAPS reward system

The SAPS Reward System also influenced the selection of game elements. Here, each game element was mapped to a specific reward structure and assessed within the context of the Techworks Portal. Within this context, it was difficult to provide employees with tangible rewards. It was also difficult to grant additional access or power to employees, though allowing staff to become forum moderators was a consideration at one point. Ultimately game element selection was tied to those elements that could offer status within the Techworks Portal. Not only was status the most motivating reward structure within SAPS, it also was the easiest to implement within the Techworks Portal (Zichermann & Cunningham, 2011).

MDA framework: mechanics – game element selection

Within the existing portal structure, and in the context of the job requirements mapped to specific organizational goals, it was determined that designing an

achievement system would provide employees an opportunity to engage with an incentive structure that would map well to the existing job requirements. This would also minimize development time since the achievements could be tied to existing job requirements as a reinforcement, rather than designing a new method of measuring work completed. Achievements could also be designed within the system to offer employees status, without the competitive aspects introduced by a leaderboard. Here, obtaining more difficult achievements could provide status, but all employees have the opportunity to attain those achievements. Though it would be decided later, progress bars were also incorporated to help visually display completion of different achievements within categories. By selecting a single primary game element in achievements, this also minimized the number of compounding variables a variety of game elements would have introduced.

MDA framework: dynamics – overview

Within the MDA Game Design Framework, Dynamics represents the design of the system along with how users will interact with the system. With the selection of achievements as the primary game element, this stage involved identifying potential achievements, identifying the specific requirements for obtaining the achievement, and ensuring that a variety of user characteristics were taken into consideration.

MDA framework: dynamics – five levels of mastery

Dreyfus and Dreyfus identified five levels of mastery to consider when designing a system of this type. These levels of mastery speak to user expertise when interfacing with a system (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011). As job requirements were mapped to achievements, it was important to accommodate each level of mastery. Simple achievements, such as an achievement earned for completing

your first support ticket would engage novice users, for example. Beyond achievements tied to specific job requirements, considering mastery levels pointed to additional achievements, such as earning an achievement for logging into the Techworks Portal 100 times, an achievement that might appeal to master users who were extremely familiar with the system. Each achievement is mapped to one of the five mastery levels in Appendix C, in the column ML labeled as N, PS, E, M, V to represent novices, problem solvers, experts, masters and visionaries respectively. These mastery levels were also used to identify how difficult an achievement was to attain, resulting in a corresponding color mapping in the aesthetics phase.

MDA framework: dynamics – four player types

Along with mastery levels, it was important to examine Bartle's player types when designing the achievements to ensure different interests were accommodated. Bartle identifies users who are variously motivated by competing with other users as killers, completing tasks within the system as achievers, collaborating with other users as socializers, and exploring different aspects of the system as explorers (Bartle, 1996; Zichermann & Cunningham, 2011). Each achievement was mapped to a specific player type under the column PT represented as K, A, S, and E in Appendix C.

MDA framework: dynamics – four types of fun

Lazzaro identified four types of fun categorized as hard fun, easy fun, people fun, and serious fun (Lazzaro, 2004; Zichermann & Cunningham, 2011). The types of fun represent the feelings and emotions users experience when engaging with each type of fun. Hard fun represents goal-oriented fun and is associated with triumphing over a challenge. Easy fun is open-ended and is associated with curiosity. People fun is goal-oriented and is associated with interacting and amusement. Serious fun is open-ended

and is associated with excitement. In designing achievements within the Techworks portal each achievement was mapped to a specific type of fun. This is displayed in Appendix C and each type of fun is labeled under the column F as H, E, P or S.

MDA framework: dynamics – flow theory

The final theory influencing the design of the achievements was Czikszentmihalyi's (1989) flow theory which looks at the optimal level of engagement within an activity. Here, it was important to stage achievements so that they would scale in difficulty (Czikszentmihalyi, 1989; Zichermann & Cunningham, 2011). Though early achievements are easy to obtain and more difficult achievements require staff to work for Techworks for multiple semesters, the achievements within the portal were designed so that staff should always have something they could strive for that is within their current skill level.

MDA framework: dynamics – achievement structure

The resulting achievement structure was comprised of 240 achievements, organized into categories and mapped to mastery levels, player types, and types of fun. In doing so, multiple user characteristics were considered and achievements could frequently be categorized as appealing to multiple player types. Though not formal job requirements, some additional achievements were created to accommodate different activities a user might engage in while working for Techworks and to create achievements to accommodate different user characteristics. This resulted in an additional category to those outlined in Appendix B, titled awards, to reflect the monthly and semester awards that are distributed at staff meetings. Staff are encouraged to both live in different regions and continue working for Techworks throughout their undergraduate and graduate school experience, resulting in the addition of

achievements related to where staff live and the number of semesters an employee works for Techworks as well. In addition, some achievements were created related to interfacing with the Techworks Portal, such as updating a user profile or logging into the system.

When considering different levels of mastery, 40 achievements were associated with novice employees, 43 with problem solving employees, 62 with expert employees, 66 with master employees, and 29 with visionary employees. Here, the achievements that would require the most time working with Techworks along with the level of experience required with the program helped map achievements to mastery levels. When looking at player types, where there was significant overlap, 157 achievements were identified as potential areas of competition that could appeal to the killer player type, 228 were associated with completion of tasks that might appeal to the achiever player type, 95 were associated with collaboration and helping others which could appeal to the social player type, and 119 were associated with either exploring the Techworks Portal or the physical residence hall spaces, which might appeal to the explorer player type. When looking at the types of fun associated with each achievement or corresponding requirement, 77 aligned with the open-ended curiosity associated with easy fun, 23 aligned with the open-ended relaxation and excitement associated with serious fun, 55 aligned with the goal-oriented social amusement associated with people fun, and 85 aligned with the goal-oriented triumph over a challenge associated with hard fun.

The achievements identified correlate with specific job requirements over time and were mapped to organizational goals. In defining these achievements, a Techworks

staff member's full tenure of potential employment was considered. It was important to include achievements that appealed to multiple user characteristics including easy, moderate and difficult challenges. More difficult achievements were defined based on what Gilbert (2007) refers to as exemplary performance, by looking at the best examples of employee performance in prior semesters for each job requirement. Again, outliers were removed from this assessment, when looking at achievements that map to an employee's entire tenure with the organization, when they worked longer than the 3-4 years of the average employee. The full list of achievements is presented in Appendix C along with a key for abbreviations presented in Appendix D.

MDA framework: aesthetics – overview

Within the MDA Game Design Framework, Aesthetics represents the overall user experience within the system. Here, the design of the gamification layer focused on the look and feel of the system. The Techworks Portal was modularly designed so that different tools and interfaces have different user-group permissions, and data from each tool can be accessed and processed by other tools within the portal. The reminder tool discussed in greater detail in Chapter 1, for example, draws on all the other tools in the portal to alert staff to upcoming job requirements. In order to tie each reminder notification to a job requirement, this tool needed to be linked to each corresponding data point. Following this model, a gamification layer was designed that drew upon existing data and notified staff when they reached the threshold to attain an achievement. The portal itself is coded in PHP and uses an on-click notification system to notify users they received an achievement after taking an action within the system. In addition, upon logging into the portal, a script was created to check for any achievements earned since the last time the user logged in. This is necessary due to

the data for support tickets coming from an external system. Because most achievements build on one another, the check is not processor-intensive, as the system only checks a user's status against the next requirement. In addition, some achievements can only be received after a semester is finalized within the Techworks Portal. These achievements are automatically processed upon transitioning to the next semester.

MDA framework: aesthetics – user experience design

In designing the user experience, a variety of existing games were examined that provide an achievement structure. The intent was to replicate core functionality of existing achievement systems within games. In addition, recommendations laid out by Zicherman and Cunningham (2011) in designing the user experience were followed. Of particular note, the importance of real-time feedback when a user receives an achievement was an important consideration. In addition, allowing users to see future achievements that were not yet attained was identified as an important feature.

After multiple design iterations, a version of the gamification layer was tested within the development portal. The development portal is not available to student staff and is used only for testing purposes. A final version was implemented prior to the Spring 2017 semester. After three months of use, the achievement structure was assessed for its alignment with the motivation continuum within SDT by using a vetted SDT questionnaire. In addition, student employee perceptions of the achievement structure were assessed through open-ended survey questions. Similar surveys are used with staff each time a new tool is implemented in the Techworks Portal.

Techworks Portal Gamification

The resulting gamification layer within the Techworks Portal integrated seamlessly with the existing tools within the portal. Upon logging in, a new notification icon in the upper right section of the portal notifies users if they have any unseen achievements. By clicking this icon, users can see a list of recently received achievements or visit the achievements page, where they can navigate existing achievements. Note that staff are not required to view these notifications and can ignore them if they do not wish to see the achievement interface. The notification icon can be seen in Figure 3-2.

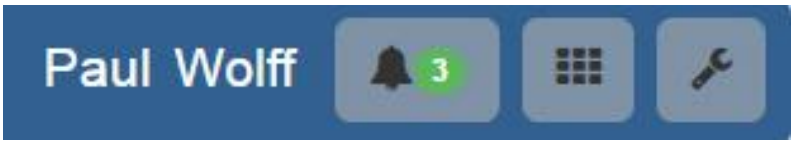

Figure 3-2. Techworks portal screenshot – notification icon

After navigating to the achievement central page, an employee has options to view different achievements according to category. Each category section indicates the number of achievements an employee has earned that have not been viewed. An overall summary page allows employees to see all recent achievements earned. Categories include those listed in Appendix A with the addition of the awards category and include: general, support tickets, awards, customer service, tech forum, events, evaluations, and other support. Employees have the option to show all achievements, or they can toggle between achievements they have completed or those that are incomplete. If an employee views a page with unseen achievements, the notification number will dynamically adjust, or an employee has the option to mark all achievements as read. These options can be seen in Figure 3-3.

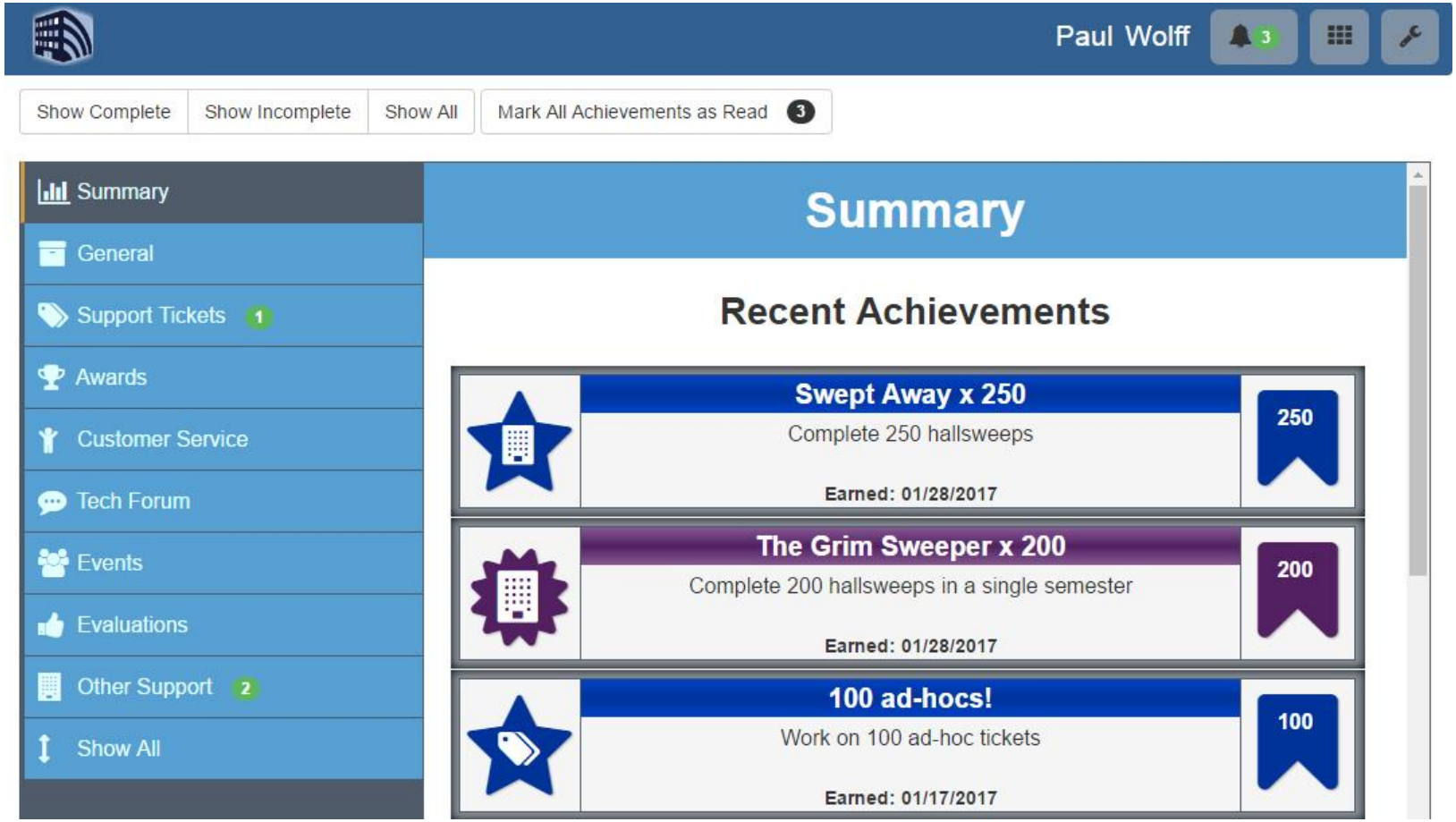

Figure 3-3. Techworks portal screenshot – viewing options

Each achievement consists of an image which signifies the achievement category, a title for the achievement, a description of the achievement requirement or threshold, either a banner with an associative count (e.g. the number 10 for completing 10 reactive support tickets) or an icon for achievements without a count structure (e.g. the Retire My Jersey Achievement in which a student employee receives any combination of Tech of the Semester, Rookie of the Semester or Senior Tech of the Semester during their time at Techworks), and one of five colors corresponding to the presumed rarity of obtaining the achievement. The presumed rarity was determined by the level of mastery associated with the achievement in question. Rarity was defined as uncommon, common, rare, epic, and legendary and the corresponding colors are grey, green, blue, purple, and orange respectively. The rarity and color display is consistent with numerous video games on the market, in an effort to present staff with a format they might be familiar with already. Each rarity is also associated with a different background icon. All iconography was identified using the open source icons available through Font Awesome (http://fontawesome.io/icons/). A sample of icons according to rarity can be seen in Figure 3-4.

As stated previously, users can expand and collapse each category and can look at different achievements associated with different job requirements. As an example, within the Other Support category, a user could look at achievements associated with Housing Assists. Here a user could see both achievements they had earned and achievements to strive for. Achievements that have not yet been earned are slightly opaque to indicate they are not in the user's set of achievements. This can be seen in

Figure 3-5. Again, users can toggle whether they want to see incomplete achievements within the interface.

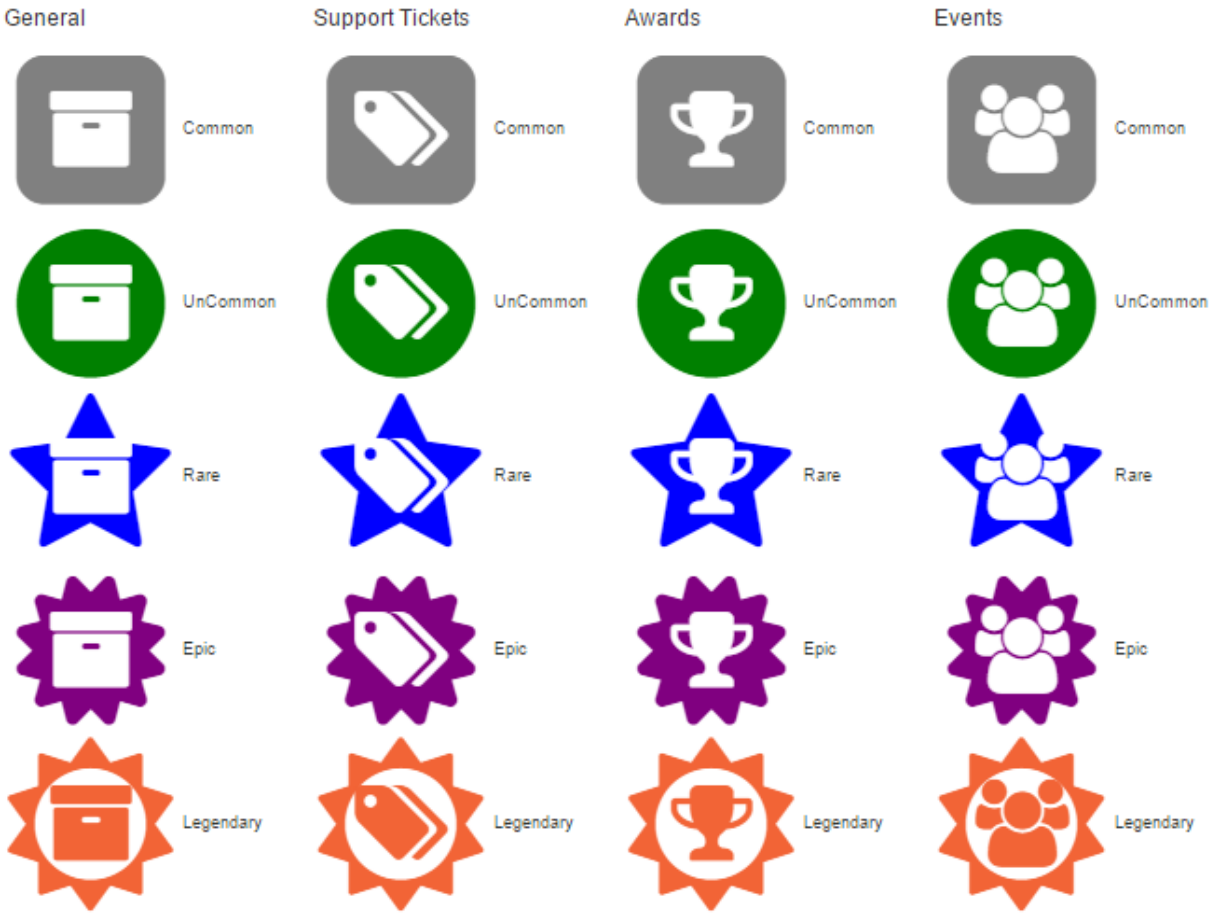

Figure 3-4. Techworks development portal screenshot – rarity and iconography

Figure 3-5. Techworks portal screenshot – complete and incomplete achievements

On the summary page, an employee can view progress bars related to each achievement category. Here they can see how many achievements they have completed overall, and how many are left to complete. This same view is replicated for each achievement category. A graphical progress bar dynamically fills as staff earn achievements in the portal. A sample progress bar can be seen in Figure 3-6. Progress bars were developed using the open-source options available through Twitter Bootstrap (http://getbootstrap.com/components/#progress).

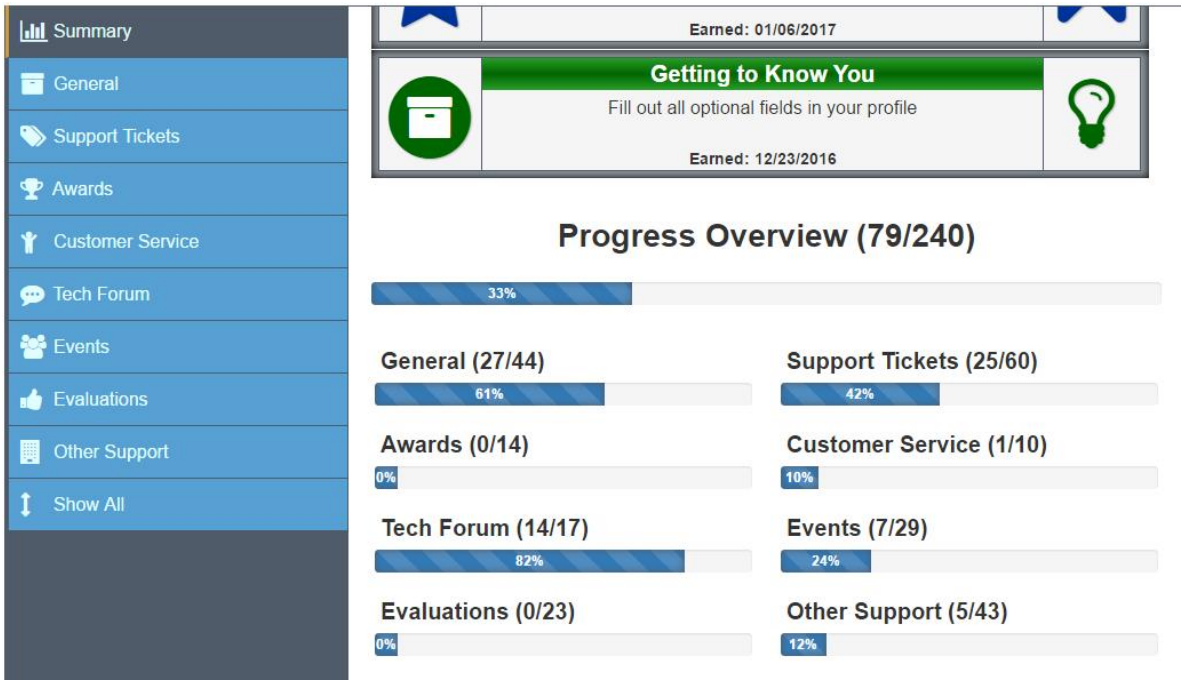

Figure 3-6. Techworks portal screenshot – achievement progress bars

In testing this system, multiple users were replicated or spoofed within the Techworks Portal development environment. User achievements earned were compared to the database of user data tracking completion of job requirements to confirm that each user received appropriate achievements. This data was adjusted to test functionality of all achievements, along with the dynamic aspects of the system such as the notification number adjusting and the progress bars adjusting.

Summary

The design of the gamification layer within the Techworks Portal involved an attempt to identify an incentive mechanism that was aligned with SDT and followed best practices outlined through the MDA Game Design Framework. Multiple theories were utilized in considering different user characteristics and this in combination with an analysis of organizational goals and job requirements, led to the decision to implement the specific game element of achievements within the Techworks Portal. In total, 240 achievements were identified that map to organizational goals and a variety of user characteristics. In addition, a user interface was designed to allow student employees to interact with the incentive structure. By following best practices for designing a system of this kind, and utilizing relevant theory, it was hoped that the achievement structure would align with more autonomous forms of motivation within the SDT autonomy continuum. Assessing this alignment to determine the fidelity of the design, along with user perceptions of the system as it relates to their work was a major focus of this dissertation and is explored in greater detail in Chapter 4.

CHAPTER 4
METHODOLOGY

A three-phased approach was used to explore the use of gamification incentives in a workplace setting and their potential to improve employee performance. The overarching research design is the primary focus of Chapter 4. First, a conceptual framework is presented that informed each of the three phases in this study. Second, the research design is provided including research participants, data collection methods, and data analysis methods. Chapter 4 concludes with a discussion of rigor, potential limitations, and ethical considerations. Three research questions guided the study.

Research Questions

- How does a gamification implementation designed using the Self-Determined Gamification framework align with the motivation continuum within Self-Determination Theory?
- How does the presence of a gamification layer in an online web portal impact college student employee perceptions of the online workplace environment?
- Does college student employee performance change after the implementation of a gamification layer within an online web portal used to complete job requirements?

Conceptual Framework

The Workplace Gamification conceptual framework presented in Figure 4-1 guided the three-phased research design in this study. Phase one of the research involved the analysis and review of research and current literature to identify best practices in designing gamification in addition to an approach to analyze employee performance. Phase two of the research involved an analysis of the workplace environment based on performance management literature. This analysis pointed to a gap in performance and an absence of non-monetary incentives within the Techworks

work environment. Phase two also involved the design of a gamification application layer within the Techworks Portal following the Self-Determined Gamification Framework. Phase three of this research involved the evaluation of the gamification design, analysis of employee performance, and evaluation of employee perceptions about the gamification implementation.

The fidelity of the design was assessed using a vetted SDT questionnaire to determine the extent to which the gamification elements align with the motivation continuum within SDT. In addition, this phase involved the comparison of retrospective performance data with the performance data gathered during the gamification implementation. Summative performance data totals for the entire staff were used in this comparison.

Research Design

The overarching three-phased research approach outlined in the conceptual framework above involved research analysis to identify best practices in the literature, workplace analysis to identify performance gaps and environmental supports, the design of the gamification layer, the implementation of the gamification layer, and evaluation of the gamification implementation. The evaluation of the implementation occurred after three months of use and involved the collection of both quantitative and qualitative data, the analysis of that data and the convergence of the data in a discussion of results. In the following sections information is detailed about participants, data collection, data analysis, rigor, limitations, ethical considerations, and bias.

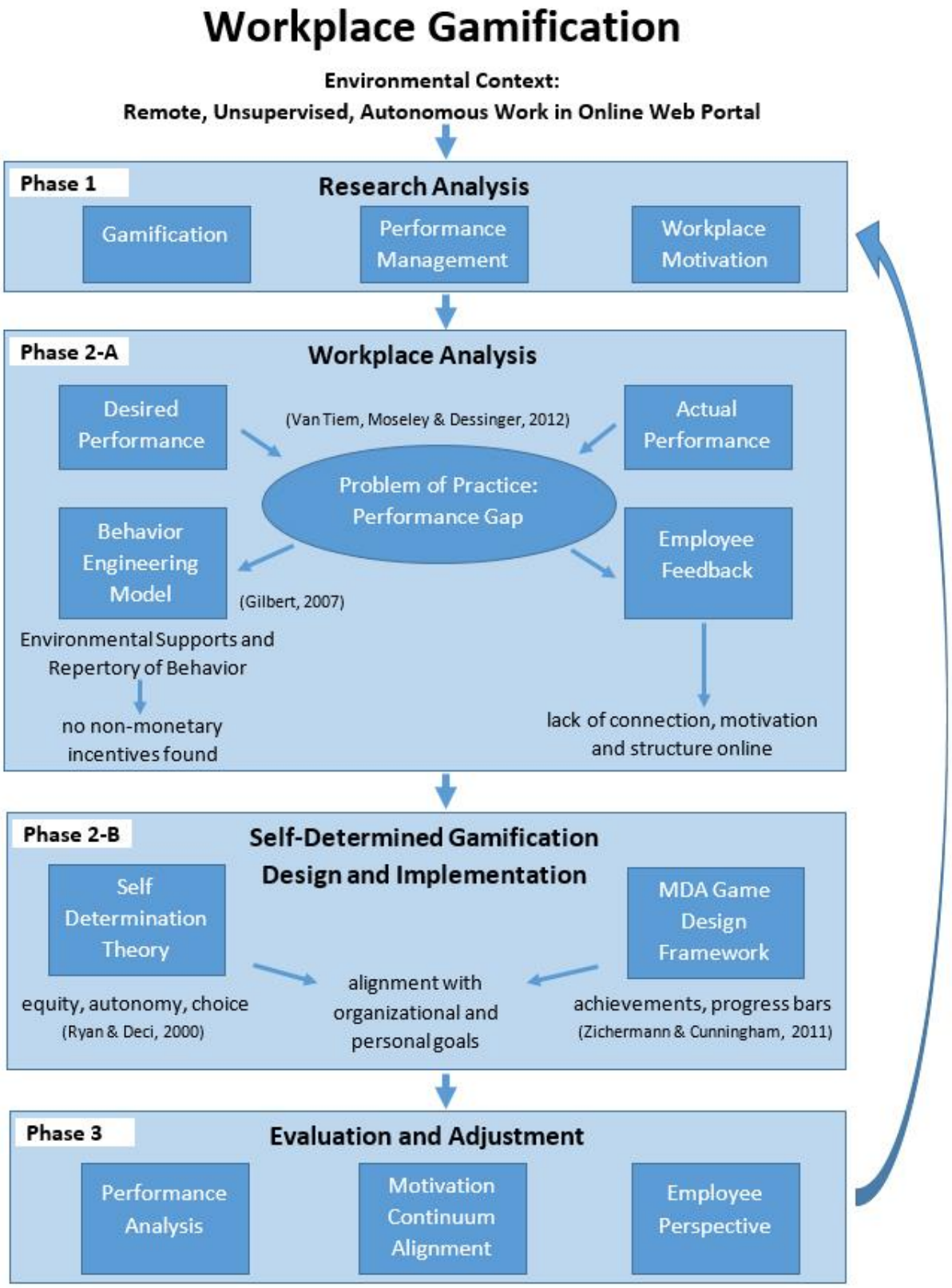

Figure 4-1. Conceptual framework – workplace gamification

Participants

Convenience sampling was necessary due to the study taking place in an actual work setting, however participants could choose whether or not to interact with the gamified aspects of the portal. Participants in this study were part-time student staff known as Student Techs. Student Techs in the study lived and worked in the residence halls at a major university and provided on-site technical support to residents and full-time Housing Department staff. Participants worked independently and their work often occurred outside of normal business hours without management supervision. All Student Techs in the study were students at the university in good academic standing. Participants were fluent English speakers and were comfortable with the use of computers, web-based instructional materials, and web-based tools. Student staff received one week of intensive training prior to the start of the Fall semester. This training program was designed to prepare staff for the majority of work they were asked to complete while working for Techworks and included comprehensive training on the Techworks Portal, completion of job responsibilities, and expectations regarding job responsibilities. For some, this is the only training they received prior to troubleshooting client technical problems. As a result, staff were selected for their technical knowledge and analytical troubleshooting skills. Student staff also received monthly training at staff meetings and had access to all training materials online through the Techworks Portal. All participants worked for Techworks for at least one full semester prior to the study taking place.

Techworks staff demographics vary from semester to semester. Specific demographic information is provided below for each of the retrospective summative data sets used in this study, in addition to the current staff population. Specific

semesters are broken into subsections below. A summative table displaying this information follows in Table 4-1.

2017 (Current Staff)*:* The Spring 2017 Techworks student staff was composed of 43 individuals ranging in age from 18 to 27. The staff was 35% new employees (n=15) who began working in August 2016. The remaining 65% (n=28) were returning staff who had worked for Techworks in at least one previous semester.

2016: The Spring 2016 Techworks student staff was composed of 46 individuals ranging in age from 18 to 25. The staff was 43% new employees (n=20) who began working in August 2015. The remaining 57% (n=26) were returning staff who had worked for Techworks in at least one previous semester.

2015: The Spring 2015 Techworks student staff was composed of 48 individuals ranging in age from 18 to 24. The staff was 48% new employees (n=23) who began working in August 2014. The remaining 52% (n=25) were returning staff who had worked for Techworks in at least one previous semester.

Table 4-1. Techworks staff demographics over time.

Year	Total staff	New employee	Returning employee
2017	43	15 (35%)	28 (65%)
2016	46	20 (43%)	26 (57%)
2015	48	23 (48%)	25 (52%)

Data Collection

Data collection involved two primary data sources detailed below. Results of a Self-Determination survey helped determine the fidelity of the design by assessing achievements as they relate to the autonomy continuum within Self-Determination

Theory. The survey also included open-ended questions to help identify employee perceptions regarding the gamification implementation. Finally, performance data during the gamification implementation was gathered and compared to retrospective performance data gathered prior to the gamification implementation. Each data source is explained in greater detail below.

Data collection: self-determination survey

The fidelity of the design was assessed using the SDT Intrinsic Motivation Indicator (IMI) survey. The survey was issued to all participants after the gamified portal was in use for three months in April of 2017. Participants received an email with a link to the survey, hosted in the Qualtrics Research Suite, a survey tool available through a license agreement with the University of Florida at Gainesville. In total, 15 individuals submitted feedback out of the 43 staff members representing a 34.88% response rate. The IMI survey consists of 22 items with Likert responses on a 7-point scale. The 22 items are mapped to four subscales listed as interest-enjoyment, perceived competence, perceived choice, and pressure-tension (Deci & Ryan, n.d.). The four subscales align with autonomous extrinsic and intrinsic motivation on the autonomy continuum within SDT and helped determine the extent to which the gamification implementation aligns with more autonomous motivation on the autonomy continuum. Different versions of the IMI survey have been found to be both reliable and valid within different settings (Deci & Ryan, n.d.). McAuley, Duncan and Tammen (1989) conducted a study to specifically test the validity and reliability of the IMI. Using Cronbach's alpha, McAuley et al, (1989) reported the following alpha coefficients indicating reliability for each of the four sub-scales in parentheses: "interest-enjoyment (α = .78); perceived competence (α =.80); effort (α =.84); and pressure-tension (α =.68)" (p. 51). They also

reported the overall internal consistency of the survey with an alpha coefficient of α =.85 (McAuley et al., 1989). The researchers utilized a chi-square goodness-of-fit test and confirmed the factor structure of the IMI survey (McAuley et al., 1989). The standard 22-item version of the IMI is provided in Appendix E. Deci and Ryan (n.d.) also note that items on the IMI can be modified to address specific activities being studied without impacting validity or reliability. The modified version used in this study is provided in Appendix F. Based on the results of these surveys, specific achievements, the interface within the portal, or any other aspect of the gamification implementation can be adjusted to better align with more intrinsic motivation along the autonomy continuum in future design iterations. Though beyond the scope of this dissertation, the continued improvement of this system will allow for the potential of more longitudinal studies in this environment.

Three open-ended survey questions were appended to the Self-Determination Survey. Open-ended responses from participants explored employee perceptions about the gamification elements in relation to their work. This data was free text with no word-count limitation to allow employees to leave as much feedback as they would like. Specifically, student employees were asked about their perceptions of the addition of achievements and progress bars within the portal, whether they felt the achievements impacted their performance, and how the system could be improved further. This is consistent with prior semester surveys used to gather student employee feedback about web portal improvements that followed a similar format. Typically, after adding a new feature or tool to the web portal, staff are asked to provide feedback after a semester of use. Data will be gathered continuously over future semesters in a process of continual

improvement, however the focus of this dissertation study was data from the first three months of use in order to evaluate the design and initial impact. The specific open-ended survey questions are detailed below.

- Please provide any feedback regarding the achievements added to the Techworks web portal this semester.
- If any of the achievements impacted the work you completed in the Techworks web portal this semester, please describe how. If possible, please provide examples.
- What changes would you make to the achievements to improve this feature in future semesters?

Data collection: performance data

In addition to design considerations and employee perceptions, this study also sought to evaluate the initial impact of the intervention on employee performance. After the gamification implementation and three months of use, performance data from previous semesters was compared to current performance data. Here, overall performance in a number of key categories was compared to performance in previous semesters, when the web portal did not contain game elements. Retrospective data from all student employees from previous semesters was compared to current staff totals. Retrospective performance data was already collected over several years. This data was primarily numeric ratio data about employee performance and participation within the online portal. Examples of data collected include the number of reactive tickets completed, proactive technology checks completed, and positive customer service survey responses received. Current comparative data about employee performance for these same indicators was collected within the online web portal during the semester the gamification components were in use. This data set was summative in nature and included totals for all staff, rather than individual metrics. These summative

totals included students who met communicated performance expectations, exceeded those expectations, or failed to meet expectations. A more detailed description of each employee performance indicator is provided in Chapter 5 but a list of indicators is included below.

Specific performance indicators

- Positive customer service surveys received
- Negative customer service surveys received
- Technical forum posts
- Assigned reactive support tickets
- Ad-hoc reactive support tickets
- Mobile support site reactive support tickets
- Performance feedback submissions
- Proactive equipment checklists completed
- Proactive hall-sweeps completed
- Office shifts completed
- Event assists completed
- Monthly evaluations completed
- Late notices received
- Critical notices received
- Mobile support site events attended
- Area meetings attended
- Staff meetings attended
- Portal logs by day

Data collection: research journal

According to Creswell (2013), an important component of qualitative research is reflexivity. This allows the researcher to better situate themselves contextually within the study and provides additional insight into the researcher's role. Because this study incorporates qualitative data, and because the study focuses on the design of a gamified system, keeping a journal to track design considerations in addition to thoughts around the implementation may provide valuable context for both the current study and future implementations. With this in mind, a research journal was kept during the study that tracked design considerations, events, and thoughts about the implementation that

occurred throughout the study. In total, 34 journal entries were recorded between November of 2016 and March of 2017. Of these, fourteen dealt with design considerations and were more expansive in nature. The remaining twenty focused on thoughts around the implementation, but were often shorter regarding content.

Data Analysis

Three types of data were collected during this research from the two data sources described above. These data types included Likert IMI survey responses, free-text responses to open-ended survey questions, and numeric ratio data tracking summative employee performance over time in several job performance categories. For each data set, a different method of analysis was used. Analysis methods for each data type are described below. The specific data sources and analysis methods for each research question are outlined in Table 4-2.

Table 4-2. Research questions, data sources and data analysis summary

Research question	Data source	Data analysis
How does a gamification implementation designed using the Self-Determined Gamification framework align with the motivation continuum within Self-Determination Theory?	Survey data from IMI (Intrinsic Motivation Indicator)	Descriptive statistics
How does the presence of a gamification layer in an online web portal impact college student employee perceptions of the online workplace environment?	Open ended survey responses	Open coding
Does college student employee performance change after the implementation of a gamification layer within an online web portal used to complete job requirements?	Numeric ratio metrics from the web portal	Descriptive statistics

Data analysis: self-determination survey

Likert data from the IMI survey responses were analyzed to determine the extent to which the gamification incentivizing intervention aligns with the autonomy continuum within Self Determination Theory (SDT). The Likert responses align with four subscales that map to autonomous extrinsic and intrinsic motivation on the autonomy continuum within SDT. Calculating the results of the IMI survey responses involved reverse-scoring specific items and then averaging items across subscale scores (Deci & Ryan, n.d.). Because the gamification implementation was designed with SDT in mind, this data set helped determine the fidelity of the design. How the gamification implementation aligned with the autonomy continuum also influenced interpretations of other data sources during the convergence of data analysis.

Open-ended responses were reviewed and coded using an open coding process. Here, a process of emergence was utilized as phrases, activities and behaviors emerge from the data (Creswell, 2013; LeCompte & Schensul, 2013). These initial codes were grouped around concepts and ideas prior to determining if responses were weighted or skewed in any direction. Finally, responses were analyzed for specific suggestions and perceptions pertaining to the achievements. Free responses were analyzed for thematic elements based on this open coding process.

Data analysis: performance data

Retrospective summative performance data from student staff was compared to corresponding performance data for staff using the gamification layer. Because returning staff existed in all three groups and because this research did not track those individuals between the groups, inferential statistics were not possible. Instead, means and standard deviations for each of the performance indicators were compared for the

three time periods to determine if any changes to performance occurred. Because descriptive statistics were used, statistical significance could not be determined. This analysis helped to determine if any change in performance occurred during the semester that the achievements and progress bars were in use within the web portal.

Rigor

As was stated previously, the IMI survey used in this study consists of questions rated on a 7-point Likert scale and various versions have been found to be both reliable and valid within different settings (Deci & Ryan, n.d.). Summative performance data from prior years was compared to comparable data from the semester the gamification layer was in use. In addition, employees had the opportunity to leave anonymous feedback through open-ended survey responses. This data was analyzed using open coding, looking for themes about participant perceptions of the gamification elements. By using a vetted questionnaire and bringing both qualitative and quantitative data together for analysis, this study leverages the strengths of both forms of research, yielding high quality meta-inferences consistent with relevant theory and other research findings (Onwuegbuzie & Johnson, 2006; Tashakkori & Teddlie, 2006).

Creswell (2014) describes mixed methods research as involving the rigorous collection and analysis of both quantitative and qualitative data that is then merged or connected. Either form of data on its own may not be sufficient to paint the entire picture when conducting research and the two methods can complement each other when used in conjunction appropriately (Ivankova, Creswell & Stick, 2006). When identifying the specific mixed method design, it was important to consider the way data would be merged, the timing of the data collection, and the relative emphasis placed on the two types of data. Due to time constraints created by the dissertation process, data needed

to be gathered as quickly as possible during the gamification implementation. The goal of the evaluation was to use both forms of data in tandem and compare and contrast results. It was important in this case to place equal weight on the two data types. With this in mind, a triangulation approach was best suited to the needs of the study. Within the triangulation model, three common variants were described in the literature that varied in terms of when the data was merged in the research process and the intent behind merging the data (Creswell & Clark, 2007). Because comparing and contrasting the two forms of data was the focus, the convergence model made the most sense, where data is merged during interpretation.

Limitations

While a formal control group was not possible, comparison of overall staff performance to prior staff who utilized the web portal without a gamification layer had the potential to reveal interesting trends. Without random sampling or random assignment, there were clear threats to both internal and external validity. While findings may not generalize to the greater population as a result, recommendations may be transferrable to similar populations in similar settings. This is consistent with current gamification research which is exploratory in nature. It is important to note that there were numerous other variables that may have impacted employee performance metrics. In addition, this intervention may have appealed to this target population specifically, since they are between the age of 18 and 26 and the intervention may have had different results with other age groups. Findings from the survey represent a subset of the target population and may not be reflective of the entire staff. This research attempted to compare Spring semester data from previous semesters to the Spring 2017 semester data for staff performance, in an effort to compare the most similar data

sets. Fall semester data was excluded, as it is often inflated due to the number of technology issues at the start of an academic year. As a proponent of many of the motivational benefits of video game elements, my own bias needed to be situated within the context of the study. Recognition of the Hawthorne Effect and the potential that participants would want to please me as a coworker, was also important (Gilbert, 2007). Survey responses were anonymous in an effort to mitigate this effect.

Ethical Considerations and Bias

As the Director of the Techworks Program, I am typically responsible for evaluating participant performance each semester. Techworks student employees are aware that their performance is tracked within the web portal at all times and the data used in this study is the same performance data that is normally tracked and reviewed with employees on a monthly basis. As stated previously, participation with the gamified elements of the web portal was entirely voluntary and any feedback was anonymous. The intent of this implementation was to create a personal experience for staff to track their progress and see their achievements as they completed job requirements. For the semester in which the study took place, performance evaluations were conducted by another full-time employee, without knowledge of whether employees participated in the gamification implementation or the content of their feedback. The survey used within this study was anonymous and voluntary. All data used in the study, both retrospective and current, was stripped of any identifying features and only summative totals for the entire staff were used.

Summary

Chapter 4 outlined the research methods and approach used to investigate a gamification incentive implementation in an online web portal. The context is unique in

that student staff were college students living in residence halls and completing work autonomously, remotely and with minimal supervision. The intent of this research was to design a gamification intervention in accordance with researched best practices from the literature that aligned with SDT and the MDA Game Design Framework, analyze the fidelity of the design through a vetted SDT questionnaire, explore student employee perceptions of the gamification design, and compare retrospective data concerning performance indicators for Techworks student staff to performance indicators for current staff who experienced the gamification intervention to see if there was any impact on performance.

CHAPTER 5
RESULTS

Chapter 5 looks at the results of the research in the context of the overarching research questions guiding the study. Each research question is examined through a discussion of corresponding results from each of the three sources of data analyzed as part of this research. Likert results from the IMI survey are presented and mapped to the four factors of interest/enjoyment, perceived competence, perceived choice, and pressure/tension. Open-ended feedback from participants are organized according to thematic elements that emerged during the open coding process. Performance data from several key performance metrics is compared for the entire staff from comparable three-month windows in the prior two years. Descriptive statistics for each of the quantitative measures are provided. Finally, a brief summary of the results is presented prior to the discussion that follows in Chapter 6.

Data Analysis for Research Question 1: How Does a Gamification Implementation Designed Using the Self-Determined Gamification Framework Align With the Motivation Continuum Within Self-Determination Theory?

IMI Survey Results. The Self-Determination Theory (SDT) Intrinsic Motivation Indicator (IMI) Survey was made available to staff on March 27, 2017 and closed on April 1, 2017 after three months of using the achievements in the web portal (Deci & Ryan, n.d.). During the week the survey was available, 15 individuals submitted feedback. The IMI Survey consisted of 22 statements and asked participants to indicate how true they felt each statement was on a 7-point Likert scale with 1 indicating not at all true, 4 indicating somewhat true, and 7 indicating very true. Means and standard deviations for each question are provided in Appendix G. Likert data for items 2, 9, 11, 14, 19, and 21 were reverse scored as indicated in the instructions for issuing the

survey, to ensure that scores could be accurately compared across the four factors. An average Likert rating between 4 and 7 on any factor would indicate that participants felt that the factor was present when considering achievements. An average Likert rating between 1 and 4 on any factor would indicate that participants felt that the factor was not present when considering achievements. The closer the average Likert response across a factor is to 7, the stronger the factor is represented and the closer the average Likert response across a factor is to 1, the weaker the factor is represented. Table 5-1 provides the means and standard deviations for each of the four factors.

Table 5-1. IMI factor alignment

Factor	Mean	Std. deviation	Item count	Cronbach's α
Interest/Enjoyment	5.429	1.400	7	0.92
Perceived Competence	5.347	1.289	5	0.83
Perceived Choice	5.787	1.553	5	0.70
Pressure/Tension	1.520	0.795	5	0.85

Each of the four factors aligns with the autonomy continuum within Self-Determination Theory. Low levels of interest and enjoyment, perceived competence, perceived choice, and high levels of pressure and tension in a work environment are associated with a lack of employee motivation, employee apathy, and control on the part of the employer. High levels of interest and enjoyment, perceived competence, perceived choice and low levels of pressure and tension are associated with internalizing organizational and individual goals, equity in the workplace, and autonomous extrinsic motivation. Survey responses indicated a score of greater than 5 for each of the first three factors. On the Likert scale, this reflects feelings of high interest and enjoyment, high levels of perceived competence, and a high level of choice when engaging with the achievements. At the same time, the Likert score of 1.520 for

the fourth factor suggested a lack of pressure or tension when engaging with the achievements. When looking at responses across the four factors, participant responses indicated that the design of the achievements in the web portal aligns with more autonomous forms of extrinsic motivation on the autonomy continuum.

Data Analysis for Research Question 2: How Does the Presence of a Gamification Layer in an Online Web Portal Impact College Student Employee Perceptions of the Online Workplace Environment?

Open-Ended Feedback

From the 15 survey responses, participants provided open-ended feedback about their perceptions of the achievements while completing work in the portal. Specifically, participants responded to the following three questions.

- Please provide any feedback regarding the achievements added to the Techworks web portal this semester.
- If any of the achievements impacted the work you completed in the Techworks web portal this semester, please describe how. If possible, please provide examples.
- What changes would you make to the achievements to improve this feature in future semesters?

Responses were grouped by question and coded using an open coding process. Here, words, concepts and ideas emerged from the data that represented codes across the responses. Specific suggestions as they related to the research question around employee perceptions and changes in performance were also categorized into codes. In total, seven codes emerged grouped into three overarching themes from the open-ended responses that are outlined below based on the coded data set.

Theme 1: Positive Experience

The primary theme throughout the responses was the positive experience participants expressed in interacting with the achievements. Responses included words

like fun (7), cool (3), interesting (2), enjoyed (1) and neat (1) and expressed the sentiment of liking the addition of achievements. One response stated “I was impressed to see this at work. It made work more fun and gave me specific things to target when doing work.” The targeting mentioned in this statement is a separate theme from the responses and will be explored in greater depth, but multiple responses shared this feeling of enjoyment. Participants referred to the achievements as “a really cool new feature” and referenced the achievements as “a great way to make the job more fun.” Another participant referred to the achievements as “a more fun way to see what goal I am working to for the semester. This makes the overall task of helping clients more fun.” The positive experience was consistent in all but one response, where a participant expressed ambivalence, having not engaged with the achievements. Here, the participant stated “I would not say I dislike the achievements, I just never really bothered to look in them.” No participant indicated a negative experience or expressed disliking the achievements.

Theme 2: Motivation and Impact

The second overarching theme that emerged from the open-ended responses deals with motivation and specific performance impact. Coded responses pointed to staff engaging in goal-setting behavior through interacting with the achievements and in several cases suggested that they targeted specific achievements. Additionally, staff indicated specific changes to work habits as they navigated the new achievement structure. Staff also expressed increased motivation and noted the incentivizing nature of the achievements on their work. In some cases staff felt that the achievements gave recognition for the work they completed within the web portal.

Setting goals and targeting achievements

Several participants made reference to targeting specific achievements or using the achievements to set specific goals. Three individuals referenced goal-setting using the achievements and seven referenced targeting achievements specifically. Three additional responses described the practice of targeting or goal-setting without using that exact language. In total, thirteen of the responses dealing with general feedback or areas where the achievements impacted a participant's work made reference to this practice. One participant stated "the achievements gave me something to target with my work. I always have another benchmark to strive for." Another participant referenced looking through all the achievements that were available to see what the requirements were in order to focus work efforts on those requirements. References to specific job-related tasks that participants targeted are discussed in the next section, but the general practice of setting goals or targeting was referenced consistently. While one participant indicated they would be graduating in a few months, they also stated that if the achievements "existed when I started working here, I would probably have targeted achievements to get over my entire time working here." Another participant stated "I hope to work here for the next three years and earn all the achievements I can."

Job-specific impact

Beyond the general practice of targeting achievements, participants indicated very specific areas where their work was impacted by the addition of achievements. Two individuals mentioned noticing that there were achievements for logging into the portal and began trying to make sure they logged in each day. "I saw there were achievements for logging in each day so I started making that part of my routine, to log in and see if there was anything I needed to be working on." Another participant

indicated a similar impact stating “I now log into the portal more often to check my events and profile snapshot.” One participant mentioned leaving more performance feedback about other staff due to the achievements associated with that task. “Some of them gave me targets to shoot for with my work – like leaving performance feedback about someone when I might not have otherwise – now I had a reason to where before it would have just been a nice thing to do.” In all these examples, the participant indicated the achievements impacting their work by changing how often they engaged in a specific job-related task. In another example of this pattern, a participant discussed the impact of achievements on performing proactive door-to-door technology checks, stating “with hallsweeps in particular it helped motivate me to get them finished.” One participant referenced visiting the achievements page to see the number of tickets he or she had worked on and using this to set goals for the semester, while another referenced signing up for extra events. Two responses also indicated that the participant went above and beyond in certain job requirements because of the associated achievements, without referencing the specific areas where work was impacted. In total, ten of the fifteen responses dealing with how the achievements impacted work referenced specific areas where a participant refocused efforts through interacting with the achievement system. No participant indicated that the achievements had a negative impact on work, with one participant stating that they felt their performance stayed the same and was not impacted by achievements.

Incentivizing work and feelings of legitimacy

The practice of targeting and goal setting, along with specific areas where participants changed work habits due to the achievements were accompanied in some cases by comments around incentivizing work and motivating participants to complete

work. Two responses specifically referenced an increase in motivation to perform work tasks and two responses mentioned the achievements as incentivizing their work. One participant stated “seeing the achievements I could earn while working here helped motivate me to work towards earning them as goals.” Another indicated appreciating the positive reinforcement the achievements provided. The concept of the achievements legitimizing work performed was alluded to in statements like “you get to see some form of recognition for what you do,” and “it gives an incentive to go above and beyond in doing our job because it recognizes our achievements.”

Theme 3: Design Considerations

The third theme that emerged in the open-ended responses focused on design considerations. Several responses suggested a need to adjust the requirements for attaining specific achievements. Additionally, responses pointed to specific suggestions to improve or change the design of the achievements. These suggestions ranged from specific interface adjustments to adding additional game elements.

Attainability and requirements

One of the most consistent codes from the open-ended responses involved participants describing certain achievements as being too difficult to attain or the inability to obtain certain achievements due to graduating or leaving the position. One participant stated “since it was my last semester, there were a lot of achievements I couldn’t get.” Along those lines, multiple participants indicated they may have approached work differently had the achievements been in place longer. Another participant stated “I think some of the achievements are a little too high in regards to attainability.” This sentiment was echoed in statements like “some achievements are not realistically achievable,” and “I would possibly lower some of the achievement

requirements." Similarly, some participants made suggestions to increase the number of realistically achievable achievements or to add more achievements that could be earned by staff who only work two to four semesters. It was apparent from some responses that the difficult achievements to earn would require working for six to eight semesters, but others expressed a desire to be able to collect all the achievements in a shorter window of time. Regardless, eight of the responses dealing with either general feedback or suggesting changes to achievements recommended lowering the requirements for difficult achievements or increasing the number of easier achievements.

Design suggestions

Many of the responses made suggestions to improve the design of the system or add additional functionality. Two responses mentioned that the achievements are in the background, making them an optional interface to interact with, but that this design decision also served to deemphasize the achievements. "Right now they're tucked away in the interface. It's nice because that way you don't have to do anything with them if you don't want to – but also you can kind of forget they're there sometimes." This sentiment was also reflected by a participant who stated "after the first month or so, I kind of forgot the achievements were there. Maybe have a way to put them more front and center?" One participant suggested making the achievements pop up in the interface when earned and several expressed a desire to have the achievements emphasized from the outset of working in Techworks, covering the achievements in initial training materials and working with staff to use them to set goals. Three responses suggested leveraging the achievements to foster healthy competition amongst the staff. In all three cases, the participant specifically referenced incorporating

leaderboards, though the approach was different. In one case, the suggestion included all-time records with historical data, while another focused on current staff. Two of the leaderboard suggestions referenced making the leaderboards anonymous in some way, but allowing staff to see how many people had earned certain achievements. One response also indicated the color scheme was too bright and suggested more minimalist icons for the achievements.

Data Analysis for Research Question 3: Does College Student Employee Performance Change After the Implementation of a Gamification Layer Within an Online Web Portal Used to Complete Job Requirements?

Performance Indicators

In total, 18 performance indicators were tracked across three different time periods during the months of January, February and March in 2015, 2016 and 2017. With the achievements in place for the 2017 months, retrospective performance totals for each performance metric were compared to totals after the gamification layer was in place. Because the total number of staff differed from year to year, both the summative totals for each performance indicator and the average per staff member are reported. Descriptive statistics for each performance indicator across the three-year period are presented below. It is important to note that the performance indicators represent all the job responsibilities a student employee is asked to complete. Achievements were mapped to each performance indicator in an effort to emphasize the importance of all job requirements and not de-emphasize any job requirements through omission. While some job responsibilities afford an employee the opportunity to go above and beyond, others have a finite or relative expectation based on the volume of work. At the same time, some job responsibilities are within an employee's control to complete, while others fall outside an employee's control due to the nature of the work. These

distinctions will be explained in greater detail in the sections below. The performance indicators are grouped into four categories, to make this distinction clear. While it was unlikely achievements could impact performance for job responsibilities outside an employee's control and where an employee could not go above and beyond the expectation, it was worth tracking all aspects of the work completed to determine if any changes in performance were seen. Figure 5-1 shows the performance indicators grouped into four quadrants based on those that are within an employee's control and those that allow an employee to go above and beyond the expectation. The numbered quadrants will be referenced in the sections that follow.

	Within Employee's Control	Outside Employee's Control
Employee Can Go Above and Beyond Expectations	• Performance Feedback Submissions • Proactive Equipment Checklists • Proactive Hallsweeps • Office Shifts Completed • Late Notices Received • Critical Notices Received • Mobile Support Site Events Attended • Portal Logs by Day 1	• Positive Customer Service Surveys • Negative Customer Service Surveys • Event Assists Completed 2
Employee Cannot Go Above and Beyond Expectations	• Monthly Evaluations Completed • Area Meetings Attended • Staff Meetings Attended 3	• Technical Forum Posts • Assigned Reactive Support Tickets • Ad-Hoc Reactive Support Tickets • Mobile Support Site Reactive Tickets 4

Figure 5-1. Performance indicators grouped by employee control and ability to go above and beyond.

Performance Indicators Quadrant 1 – Within Employee's Control and Employee Can Go Above and Beyond Expectations

Performance indicators quadrant 1 – performance feedback submissions

Techworks staff can leave performance feedback about other employees through the Techworks Portal. This feedback can be either anonymous or identified and can be either viewable by the employee receiving the feedback or only viewable to management. Performance feedback provides qualitative data in evaluating employee performance and staff are encouraged to leave feedback when they have any interactions with other staff they would like to highlight. This performance indicator is a numeric total of all performance feedbacks the employee posts. In Table 5-2, the total number of performance feedback submissions is reported for each time period along with the staff mean and standard deviation.

Table 5-2. Performance indicators – performance feedback submissions

Year	PI total	Total staff	Staff mean	Std. deviation
2017	47	43	1.09	4.879
2016	5	46	0.11	0.526
2015	14	48	0.29	0.683

The mean for performance feedback entered for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 1.09 (4.879), 0.11 (0.526), and 0.29 (0.623), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-2). Performance feedback submissions increased a great deal during the 2017 time frame when compared to 2016 and 2015. With less staff, the average number of performance feedback posts per staff member also increased a great deal in 2017. This performance metric is entirely within a staff member's control, as they can leave performance feedback about other staff at any time. This performance metric is also an area where staff can go above and beyond

management expectations since there is no limit to the number of performance feedbacks that can be entered.

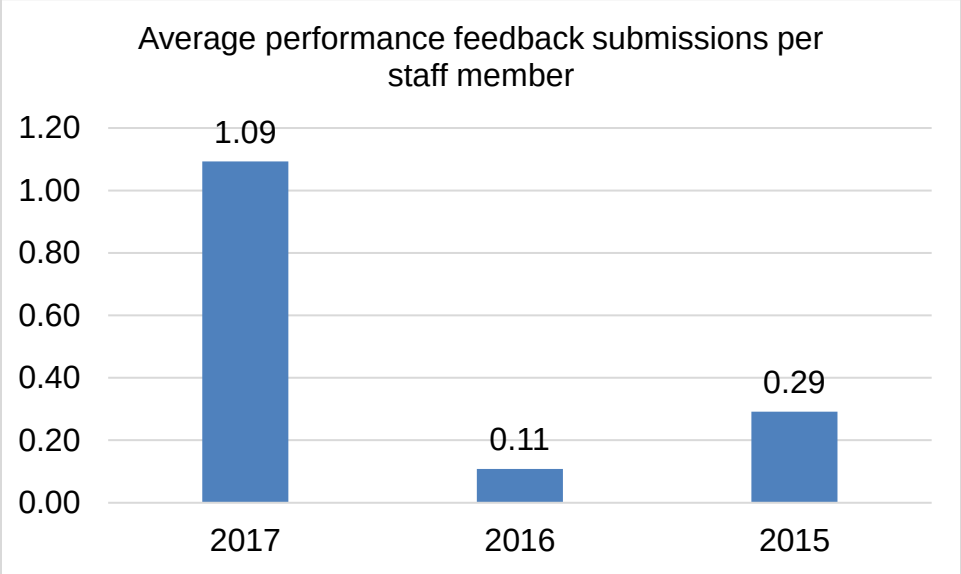

Figure 5-2. Bar graph – average performance feedback submissions per staff member.

Performance indicators quadrant 1 – proactive equipment checklists

Techworks staff complete proactive checklists on all technology equipment permanently installed in the residence halls. This equipment includes touch-screen digital signs, HDTVs, game systems, desktops, communal printers, and collaborative workstations. This performance indicator is a numeric total of all proactive checklists an employee completes. In Table 5-3, the total number of proactive equipment checklists completed is reported for each time period along with the staff mean and standard deviation.

Table 5-3. Performance indicators – proactive equipment checklists

Year	PI total	Total staff	Staff mean	Std. deviation
2017	2172	43	50.51	11.196
2016	1296	46	43.20	15.175
2015	2159	48	37.48	13.756

The mean for proactive equipment checklists completed for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 50.51 (11.196), 43.20 (15.175), and 37.48 (13.756), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-3). Completion of proactive equipment checklists increased in 2017 when compared to comparable time frames in 2016 and 2015. The average number of equipment checklists completed by a staff member also increased in 2017. This performance indicator is within a staff member's control to complete since proactive checklists are available in the web portal at the start of each semester. Additionally, staff have the ability to go above and beyond expectations by taking on additional proactive checklists or volunteering to complete checklists throughout the semester.

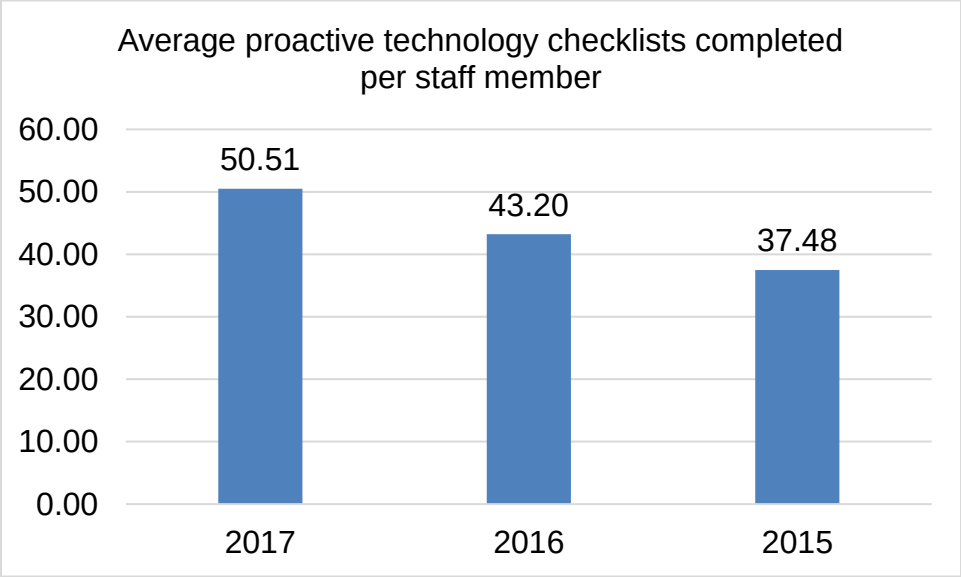

Figure 5-3. Bar graph – average proactive equipment checklists completed per staff member.

Performance indicators quadrant 1 – proactive hall-sweeps

Each semester, Techworks staff visit each room on campus to inform residents about the service and verify there are no technical issues. Staff are encouraged to

complete hall-sweeps as early in a semester as possible so that the interactions have a higher impact. This performance indicator is a numeric total of all proactive hall-sweeps an employee completes. In Table 5-4, the total number of proactive hall-sweeps completed is reported for each time period along with the staff mean and standard deviation.

Table 5-4. Performance indicators – proactive hall-sweeps

Year	PI total	Total staff	Staff mean	Std. deviation
2017	4971	43	115.60	77.051
2016	1296	46	28.17	16.928
2015	2159	48	44.98	21.486

The mean for proactive hall-sweeps completed for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 115.60 (77.051), 28.17 (16.928), and 44.98 (21.486), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-4). The number of proactive hall-sweeps completed in 2017 exceeded those completed for comparable time frames in 2016 and 2015, as did the average number of proactive hall-sweeps completed by staff. This performance indicator is within a staff member's control to complete since hall-sweeps are available in the web portal at the start of each semester. In addition, staff can go above and beyond expectations by taking on extra hall-sweeps. Staff are encouraged to complete hall-sweeps during the first two months of a semester so they have a greater impact.

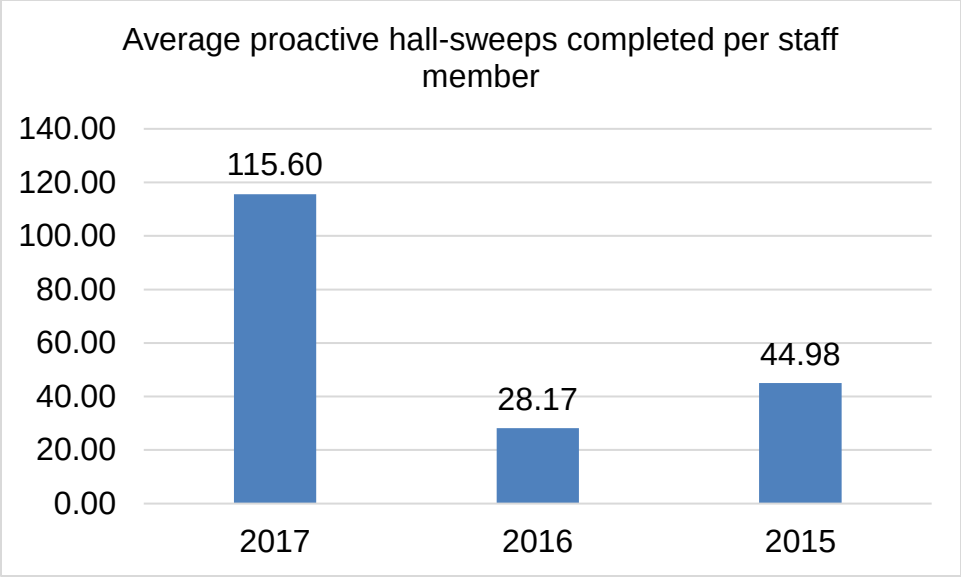

Figure 5-4. Bar graph – average proactive hall-sweeps completed per staff member.

Performance indicators quadrant 1 – office shifts completed

Each semester, Techworks student staff are required to complete a minimum of six office shifts at the Techworks office. This performance indicator is a numeric total of the office shifts completed by an employee. In Table 5-5, the total number of office shifts completed is reported for each time period along with the staff staff mean and standard deviation.

Table 5-5. Performance indicators – office shifts completed

Year	PI total	Staff total	Staff mean	Std. deviation
2017	176	43	4.09	2.255
2016	174	46	3.78	1.965
2015	182	48	3.79	2.361

The mean for the number of office shifts completed for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 4.09 (2.255), 3.78 (1.965), and 3.79 (2.361), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-5). The total number of office shifts completed by staff in 2017 was slightly less than in the comparable time periods in 2016

and 2015. Due to fewer staff in 2017, the average number of office shifts completed was slightly higher than in 2016 or 2015. This performance indicator is within a staff member's control since office shifts area available for sign up at the outset of each semester within the web portal. Additionally, staff can go above and beyond expectations by signing up for extra office shifts.

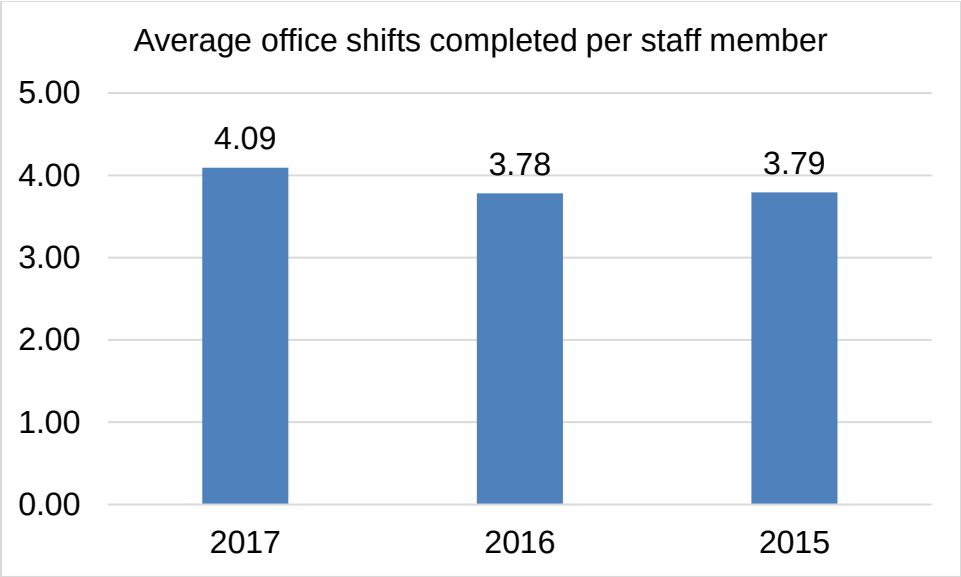

Figure 5-5. Bar graph – average office shifts completed per staff member.

Performance indicators quadrant 1 – late notices received

For all Techworks job responsibilities tied to a due date, employees receive a proactive reminder. If the employee is late in completing a job requirement that can still be completed after the due date, they receive a late notice. It is important to note that when an employee receives a late notice, she would still have the opportunity to complete the job requirement. This performance indicator is a numeric total of all late notices an employee receives. In Table 5-6, the total number of late notices received by staff is reported for each time period along with the staff mean and standard deviation.

Table 5-6. Performance indicators – late notices received

Year	PI total	Total staff	Staff mean	Std. deviation
2017	17	43	0.40	0.583
2016	30	46	0.65	0.795
2015	74	48	1.54	2.405

The mean for late notices received for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 0.40 (0.583), 0.65 (0.795), and 1.54 (2.405), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-6). The number of late notices, along with the average number of late notices per staff member was lower in 2017 when compared to 2016 or 2015. With each late notice representing an incident of a staff member who was late in completing a job requirement, this performance metric is entirely within a staff member's control. In addition, staff are able to go above and beyond expectations by receiving no late notices during a semester, with the expectation being set that one to three late notices over an entire semester is acceptable.

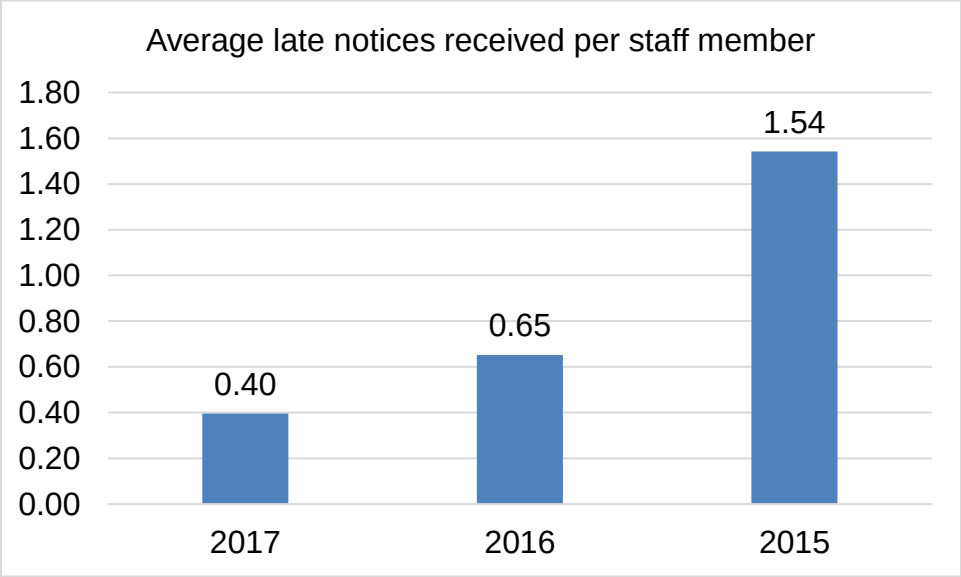

Figure 5-6. Bar graph – average late notices received per staff member.

Performance indicators quadrant 1 – critical notices received

For all Techworks job responsibilities tied to a due date, employees receive a proactive reminder. If the employee is late in completing a job requirement that cannot be completed after the fact, they receive a critical notice. It is important to note that when an employee receives a critical notice, she would no longer be able to complete the job requirement. This performance indicator is a numeric total of all critical notices an employee receives. In Table 5-7, the total number of critical notices received by staff is reported for each time period along with the staff mean and standard deviation.

Table 5-7. Performance indicators – critical notices received

Year	PI total	Total staff	Staff mean	Std. deviation
2017	21	43	0.49	0.736
2016	19	46	0.41	0.777
2015	29	48	0.60	0.962

The mean for critical notices received for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 0.49 (0.736), 0.41 (0.777), and 0.60 (0.962), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-7). The total number of critical notices remained fairly consistent in 2017, 2016 and 2015. The average number of critical notices per staff was slightly higher in 2017 when compared to 2016 but was lower when compared to 2015, however in all three years, the average remained less than one critical notice per staff member. There was very little change in this performance metric across the three time periods tracked. Since each critical notice represents an incident of a staff member missing a job responsibility, this performance metric is entirely within a staff member’s control. Staff can also exceed expectations by receiving no critical notices in a semester with expectations set that one critical notice is acceptable.

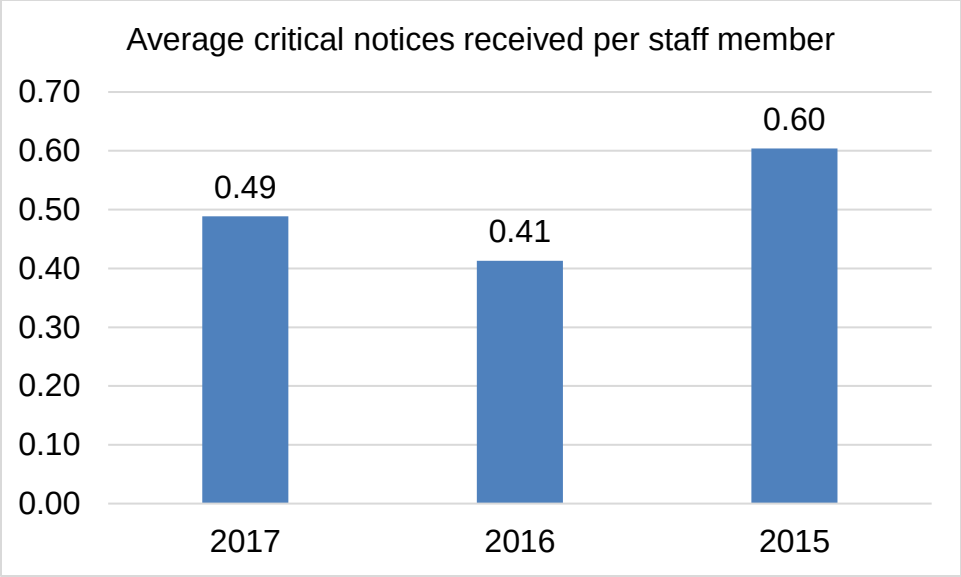

Figure 5-7. Bar graph – average critical notices received per staff member.

Performance indicators quadrant 1 – mobile support site events attended

Techworks staff put on mobile technology support sites rotated between the different residence halls each week. This performance indicator is a numeric total of all support sites an employee attends. Attendance is tracked by supervisors at the event and is only recorded with active participation. In Table 5-8, the total number of mobile support site events attended by staff is reported for each time period along with the staff mean and standard deviation.

Table 5-8. Performance indicators – mobile support site events attended

Year	PI total	Total staff	Staff mean	Std. deviation
2017	213	43	4.95	1.573
2016	199	46	4.33	1.564
2015	141	48	2.94	1.508

The mean for the number of mobile support sites attended for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 4.95 (1.573), 4.33 (1.564), and 2.94 (1.508), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-8). Staff attendance at mobile

support sites increased in 2017, as did the average number of support sites attended by staff when compared to 2016 and 2015. Staff are expected to attend seven support sites in a semester, but they can sign up for as many support sites as they would like. With the ability to sign up for extra events and the availability of events at the outset of each semester, this performance indicator is entirely within a staff member's control in meeting or going above and beyond the requirement.

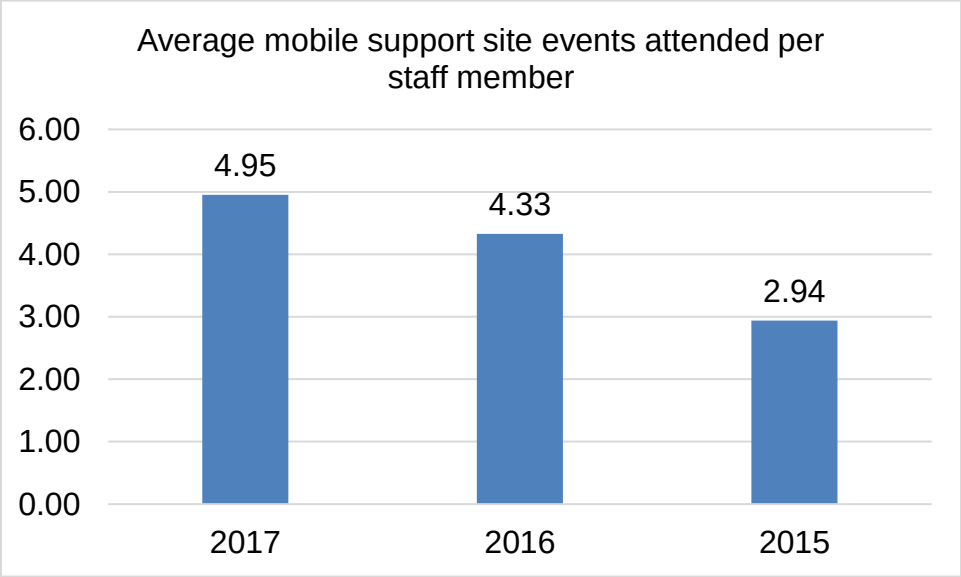

Figure 5-8. Bar graph – average mobile support site events attended per staff member.

Performance indicators quadrant 1 – portal logs by day

While Techworks staff are not required to log into the portal every day, they are encouraged to log in periodically to keep track of the work assigned within the portal. This performance indicator is a numeric total of all distinct days that an employee logs into the online portal. Logging in is automatically tracked in the portal and repeat log-ins during the same day do not count towards the total. In Table 5-9, the total number of distinct portal logs by day is reported for each time period along with the staff mean and standard deviation.

Table 5-9. Performance indicators – portal logs by day

Year	PI total	Total staff	Staff mean	Std. deviation
2017	1450	43	33.72	16.087
2016	1346	46	29.26	8.609
2015	1095	48	22.81	8.401

The mean for the number of distinct portal log-ins by day for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 33.72 (16.087), 29.26 (8.609), and 22.81 (8.401), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-9). The total number of distinct portal logs increased during 2017 when compared to 2016 and 2015. The average number of distinct portal logs per staff member also increased during 2017. This indicates that staff are logging into the portal more frequently in 2017 than in the prior two years. Because staff can log into the portal any day, this performance metric is entirely within their control. Staff are also able to go above and beyond the expectation, since they are only expected to log into the portal on days when they have a job requirement that needs to be recorded or completed in the portal.

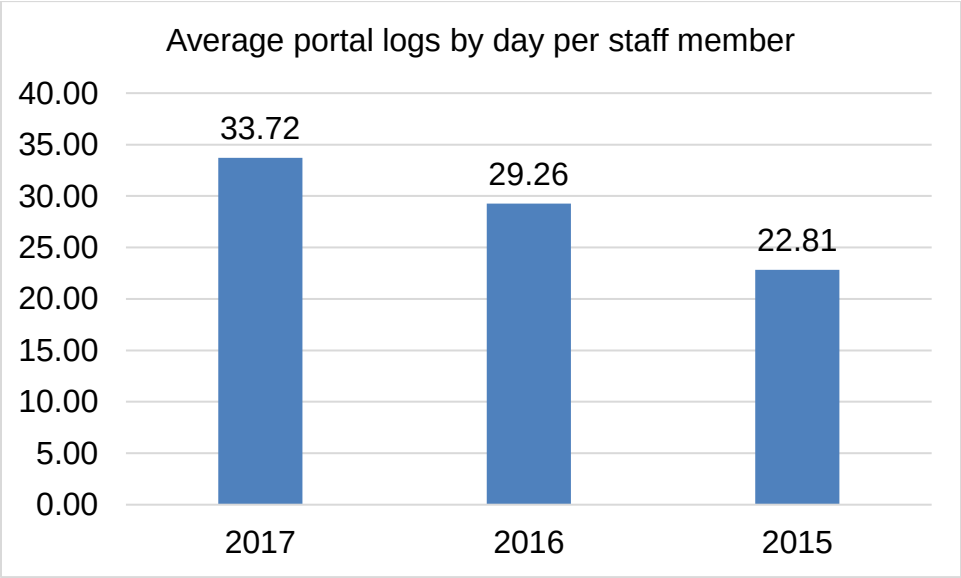

Figure 5-9. Bar graph – average portal logs by day per staff member.

Performance Indicators Quadrant 2 – Outside Employee's Control and Employee Can Go Above and Beyond Expectations

Performance indicators quadrant 2 – positive customer service surveys

Each reactive support ticket generates a customer service survey to clients. When a survey is submitted, it is reviewed along with the ticket worklog by a supervisor to ensure the content is in reference to the employee in question. This performance indicator is a numeric total of all positive customer service surveys an employee receives. Positive surveys are defined as surveys that receive a rating of Good, Very Good or Outstanding on the five-point Likert scale. In Table 5-10, the total number of positive customer service surveys received by staff is reported for each time period along with the staff mean and standard deviation.

Table 5-10. Performance indicators – positive customer service surveys

Year	PI total	Total staff	Staff mean	Std. deviation
2017	91	43	2.12	3.033
2016	57	46	1.24	1.754
2015	83	48	1.73	1.932

The mean for positive customer surveys received for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 2.12 (3.033), 1.24 (1.754), and 1.73 (1.932), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-10). While the total number of positive customer service surveys varied from year to year, the average number of positive customer service surveys received by each staff member was higher in 2017 at 2.12 per employee than the prior two years. This is a performance indicator that staff have little control over since a client initiates the feedback, however staff are asked to encourage clients to leave feedback during training. The increase in the average positive customer service surveys per staff member could be indicative of staff making an effort to

encourage clients to fill out the survey. Staff are able to go above and beyond expectations with this performance metric by receiving more surveys than the expected amount.

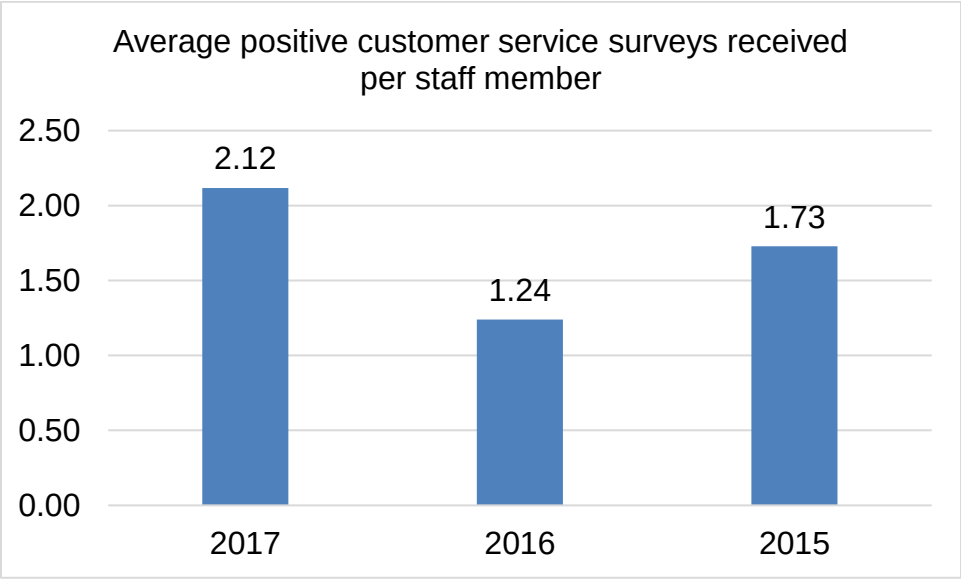

Figure 5-10. Bar graph – average positive customer service surveys received per staff member.

Performance indicators quadrant 2 – negative customer service surveys

This performance indicator is a numeric total of all negative customer service surveys an employee receives. Negative surveys are defined as surveys that receive a rating of Below Good or Unsatisfactory on the five-point Likert scale. In Table 5-11, the total number of negative customer service surveys received by staff is reported for each time period along with the staff mean and standard deviation.

Table 5-11. Performance indicators – negative customer service surveys

Year	PI total	Total staff	Staff mean	Std. deviation
2017	0	43	0.00	0.000
2016	1	46	0.02	0.147
2015	2	48	0.04	0.202

The mean for negative customer surveys received for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 0 (0), 0.02 (0.147), and 0.04 (0.202), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-11). Very few negative customer service surveys were submitted by clients during any of the time periods tracked here. That said, there were no negative surveys submitted during the 2017 time period compared to 1 and 2 respectively during the previous two years. When looking at staff averages, 2017 saw the fewest per staff member and the fewest per ticket when compared to the previous two years. The difference between years is marginal however. While staff have little control over whether a client submits a customer service survey, they can minimize the likelihood through providing quality customer service. Staff can also go above and beyond the expectations set at the outset of the semester by receiving no negative customer service surveys.

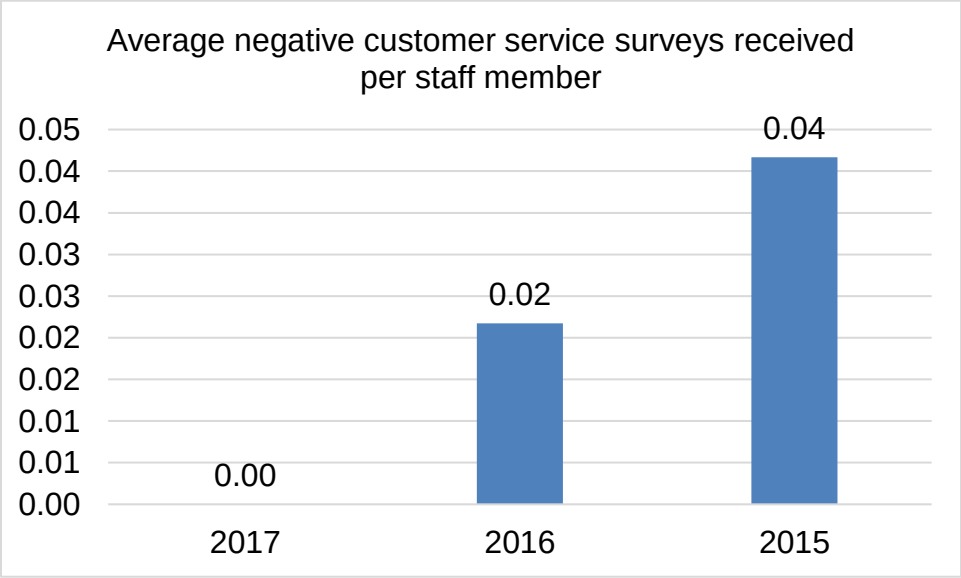

Figure 5-11. Bar graph – average negative customer service surveys received per staff member.

Performance indicators quadrant 2 – event assists completed

Each semester, Techworks student staff provide technology assistance at events in the residence halls. This performance indicator is a numeric total of all events an employee assists. In Table 5-12, the total number of event assists completed is reported for each time period along with the staff staff mean and standard deviation.

Table 5-12. Performance indicators – event assists completed

Year	PI total	Staff total	Staff mean	Std. deviation
2017	41	43	0.95	0.844
2016	21	46	0.46	0.504
2015	19	48	0.40	0.574

The mean for event assists completed for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 0.95 (0.844), 0.46 (0.504), and 0.40 (0.574), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-12). There were twice as many event assists during the 2017 time period when compared to either 2016 or 2015. The average number of event assists per staff increased greatly during this time period as well. While this performance metric is somewhat outside the control of a staff member, since clients request assistance at events, staff are encouraged to reach out to Housing staff to try to foster partnerships and seek out events where they could provide assistance. Staff are able to go above and beyond the expectation in assisting events by completing one or more event assists.

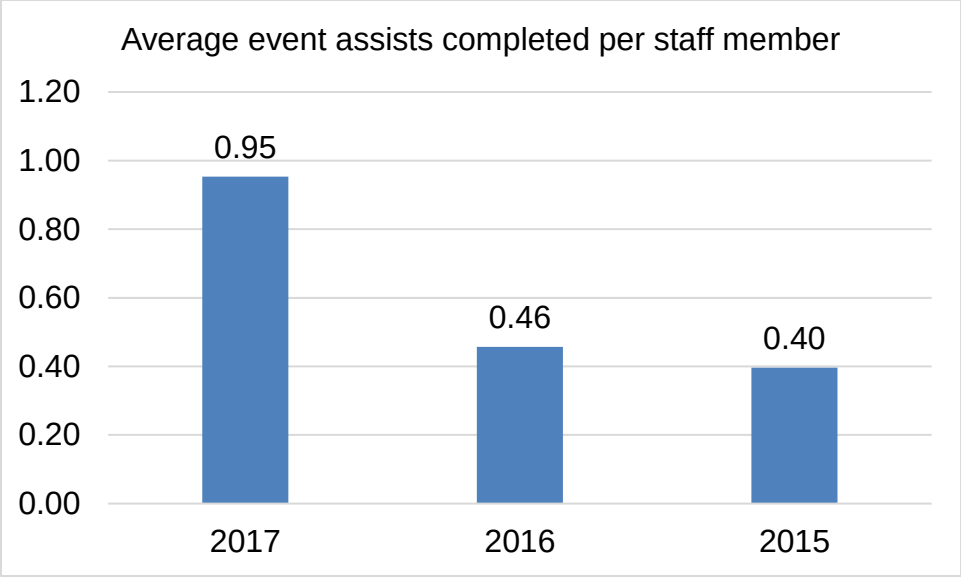

Figure 5-12. Bar graph – average event assists completed per staff member.

Performance Indicators Quadrant 3 – Within Employee's Control and Employee Cannot Go Above and Beyond Expectations

Performance indicators quadrant 3 – monthly evaluations completed

Each month, Techworks staff engage in a 360° evaluation, where they evaluate their own performance, the performance of their supervisor, the performance of any supervisees, and the overall Techworks program. Results of this feedback are viewable to individual employees and supervisors on their performance snapshot page, along with information about all other performance indicators detailed herein, accessible from an employee's profile. This performance indicator is a numeric total of all monthly evaluations completed by an employee. In Table 5-13, the total number of monthly evaluations completed is reported for each time period along with the staff mean and standard deviation.

Table 5-13. Performance indicators – monthly evaluations completed

Year	PI total	Total staff	Staff mean	Std. deviation
2017	127	43	2.95	0.213
2016	131	46	2.85	0.363
2015	130	48	2.71	0.459

The mean for monthly evaluations completed for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 2.95 (0.213), 2.85 (0.363), and 2.71 (0.459), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-13). The total number of monthly evaluations submitted was relatively consistent during 2017, 2016 and 2015. The average number of monthly reports submitted increased slightly each subsequent year with 2017 having the highest average but this difference was marginal. Each staff member is asked to submit a report each month, making three the maximum the staff average could be during the given time period. 2017 saw staff come the closest to the average of 3 per staff member. Submitting the monthly report is a performance metric entirely within the control of the staff member, but they cannot go above and beyond the expectation.

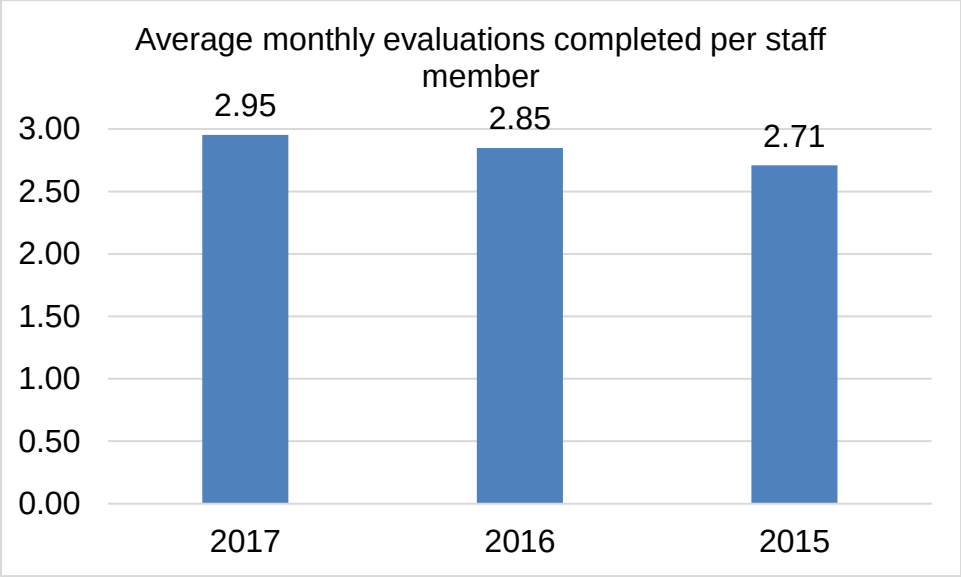

Figure 5-13. Bar graph – average monthly evaluations completed per staff member.

Performance indicators quadrant 3 – area meetings attended

Techworks staff attend regional meetings with their immediate supervisor and other staff in their region. This performance indicator is a numeric total of all area meetings an employee attends. Attendance is tracked by supervisors at the event and is only recorded with active participation. In Table 5-14, the total number of area meetings attended is reported for each time period along with the staff mean and standard deviation.

Table 5-14. Performance indicators – area meetings attended

Year	PI total	Total staff	Staff mean	Std. deviation
2017	109	43	2.53	0.702
2016	97	46	2.11	0.971
2015	108	48	2.25	1.021

The mean for area meetings attended for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 2.53 (0.702), 2.11 (0.971), and 2.25 (1.021), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-14). Area meeting attendance, along with the average number of area meetings attended per staff member remained relatively consistent across all three years tracked. With a finite number of area meetings, staff are unable to go above and beyond with this performance metric. That said, there were 3 area meetings each staff member could have attended, assuming the meetings fit their class schedule. 2017 saw the staff average come closer to three than in 2016 or 2015, however the difference was marginal.

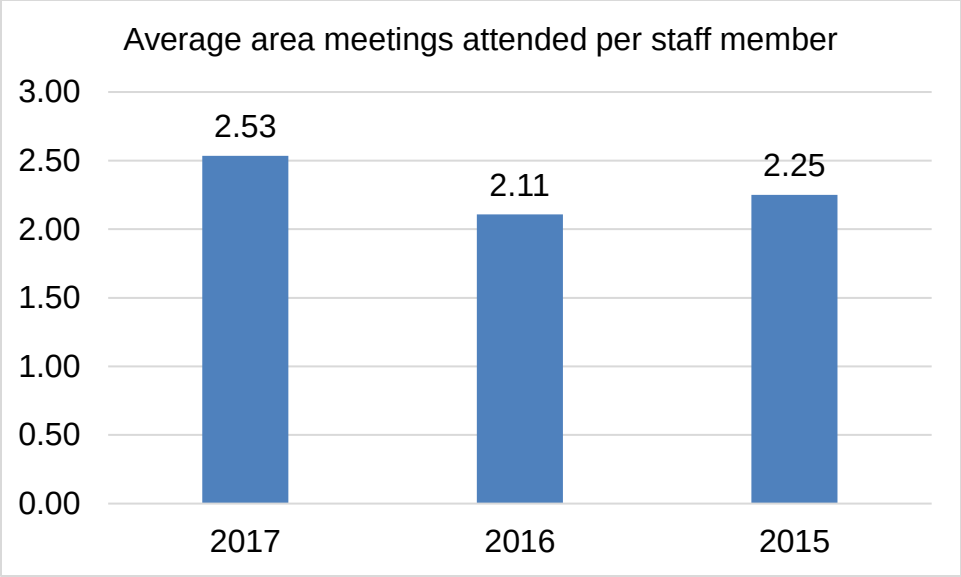

Figure 5-14. Bar graph – average area meetings attended per staff member.

Performance indicators quadrant 3 – staff meetings attended

Techworks staff attend periodic staff meetings with the entire staff. This performance indicator is a numeric total of all staff meetings an employee attends. Attendance is tracked by supervisors at the event and is only recorded with active participation. In Table 5-15, the total number of staff meetings attended by staff is reported for each time period along with the staff mean and standard deviation.

Table 5-15. Performance indicators – staff meetings attended

Year	PI total	Total staff	Staff mean	Std. deviation
2017	67	43	1.56	0.734
2016	72	46	1.57	0.750
2015	78	48	1.63	0.733

The mean for the number of staff meetings attended for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 1.56 (0.734), 1.57 (0.750), and 1.63 (0.733), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-15). Staff meeting attendance was lower in 2017 than in 2016 or 2015, however the average number of staff meetings

attended per staff member remained relatively consistent across the three time frames. There were two staff meetings a staff member could have attended, assuming the meeting time fit their class schedule. 2017 had the lowest attendance average between the three time frames, but the difference was marginal. Although a staff member could not go above and beyond in this performance metric, attendance at the two staff meetings is within a staff member's control.

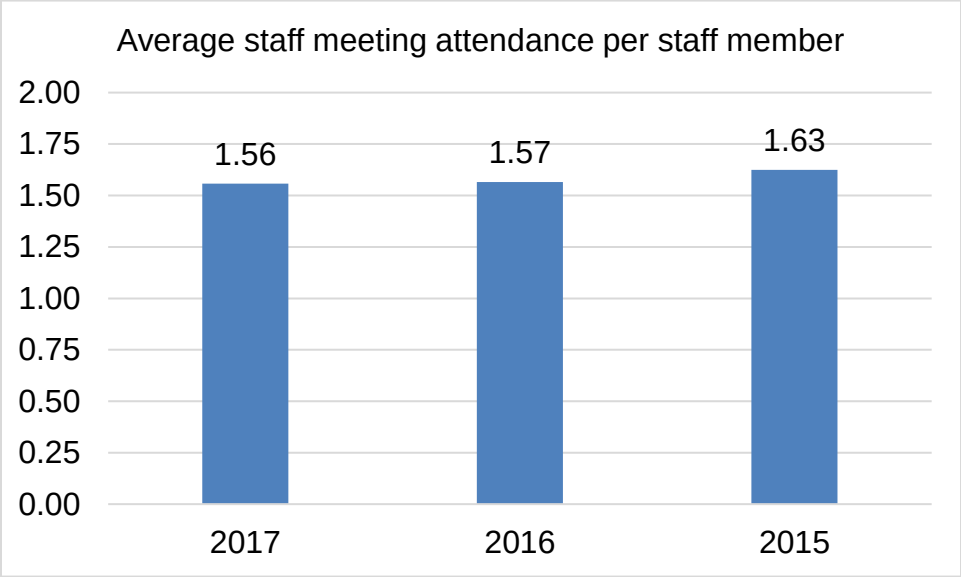

Figure 5-15. Bar graph – average staff meetings attended per staff member.

Performance Indicators Quadrant 4 – Outside Employee's Control and Employee Cannot Go Above and Beyond Expectations

Performance indicators quadrant 4 – technical forum posts

Techworks staff utilize a technical forum to ask questions and offer support to one another as they address client issues in the field. This allows for asynchronous communication and documentation of the resolution method for a variety of technical problems. This performance indicator is a numeric total of all posts made by an employee that were flagged as quality posts by a supervisor. Quality posts are defined as work-related, relevant posts that contributed to the discussion. In Table 5-16, the

total number of technical forum posts is reported for each time period along with the staff mean and standard deviation.

Table 5-16. Performance indicators – technical forum posts

Year	PI total	Total staff	Staff mean	Std. deviation
2017	87	43	2.02	2.739
2016	90	46	1.96	4.120
2015	301	48	6.27	8.338

The mean for technical forum posts for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 2.02 (2.739), 1.96 (4.120), and 6.27 (8.338), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-16). The number of technical forum posts decreased in 2017, when compared to the previous two years. The average number of posts per staff member was lower in 2017 than in 2015, but remained relatively constant when compared to 2016. This is a trend that extends beyond the three years under review, with technical forum posts decreasing each year for the past four years. The number of reactive support tickets has also decreased consistently for the past four years and may contribute to the decline in forum posts. With less reactive issues, there are less questions about support and less need to post to the forum. Additionally, as issues are documented in the forum, there is less need to make new posts, since there is a repository of technical solutions for staff to browse. Staff have little control over this metric and little opportunity to go above and beyond since participation is limited by issues being reported. Posting to the forum is only encouraged if you have actual questions or need assistance, with a focus on substantive posts.

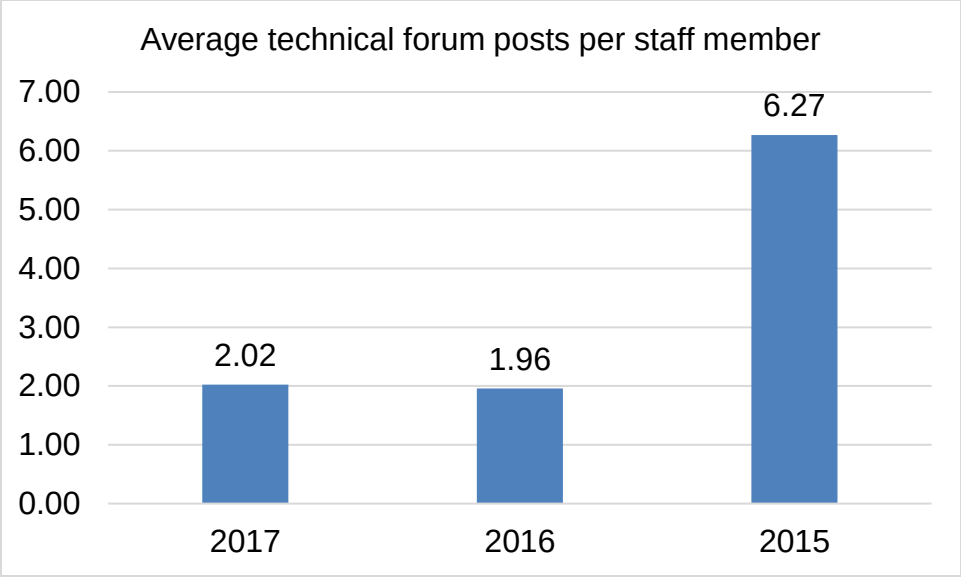

Figure 5-16. Bar graph – average technical forum posts per staff member.

Performance indicators quadrant 4 – assigned reactive support tickets

Techworks staff are assigned reactive support tickets as clients report issues to the university Service Desk. This performance indicator is a numeric total of all reactive support tickets that an employee is assigned. In Table 5-17, the total number of reactive support tickets is reported for each time period along with the staff mean and standard deviation.

Table 5-17. Performance indicators – assigned reactive support tickets

Year	PI total	Total staff	Staff mean	Std. deviation
2017	482	43	11.21	17.277
2016	463	46	10.07	12.797
2015	1045	48	21.77	18.556

The mean for assigned reactive support tickets for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 11.21 (17.277), 10.07 (12.797), and 21.77 (18.556), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-17). The number of assigned reactive support tickets in 2017 increased slightly from the corresponding time period in

2016. That said, both totals have decreased when compared to 2015 and the annual totals have been lower each year for the past four years. With less staff in 2017, the average number of tickets completed by a staff member increased slightly when compared to 2016, but both decreased when compared to 2015. This performance metric is outside the control of staff, as assigned reactive support tickets occur when clients report issues and they have little opportunity to go above and beyond in this category as a result.

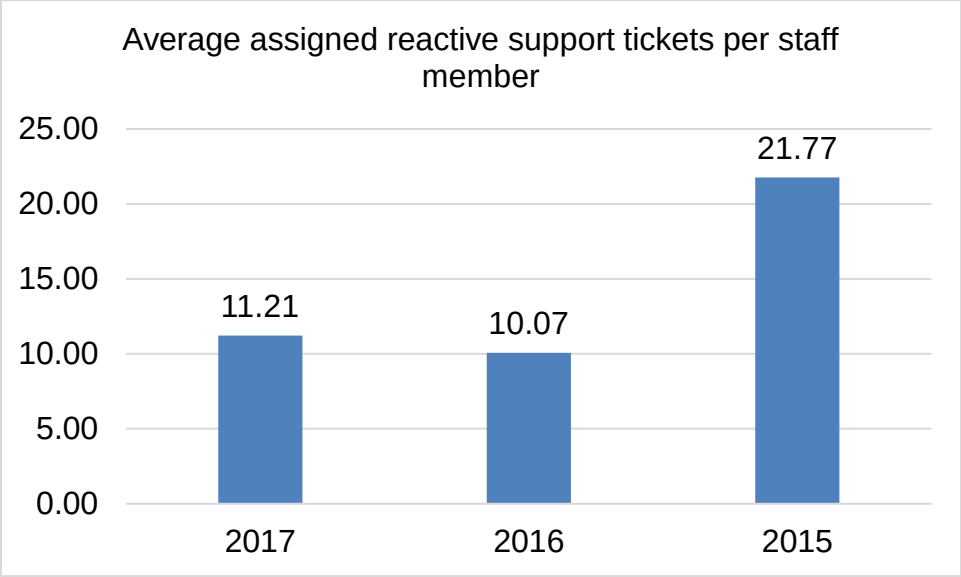

Figure 5-17. Bar graph – average assigned reactive support tickets per staff member.

Performance indicators quadrant 4 – ad-hoc reactive support tickets

Techworks staff create reactive support tickets when clients come to them directly. We track these tickets separately from those that are assigned to an employee, as they indicate availability to residents in the community. This performance indicator is a numeric total of all ad-hoc support tickets that an employee creates. In Table 5-18, the total number of ad-hoc support tickets is reported for each time period along with the staff mean and standard deviation.

Table 5-18. Performance indicators – ad-hoc support tickets

Year	PI total	Total staff	Staff mean	Std. deviation
2017	194	43	4.51	5.091
2016	233	46	5.07	4.587
2015	526	48	10.96	9.607

The mean for ad-hoc reactive support tickets for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 4.51 (5.091), 5.07 (4.587), and 10.96 (9.607), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-18). Ad-hoc ticket totals during the 2017 window were lower than the prior two time frames in 2016 and 2015. Like technical forum posts and other forms of reactive support, annual totals reflect this trend as well, with reactive totals decreasing each year over the past four years. The average number of reactive ad-hoc tickets per staff member was also less in 2017 than in 2016 or 2015. Staff have little control over this performance metric, as a reactive measure of support, since tickets are only created if clients report issues. Consequently, staff have little opportunity to go above and beyond in this category.

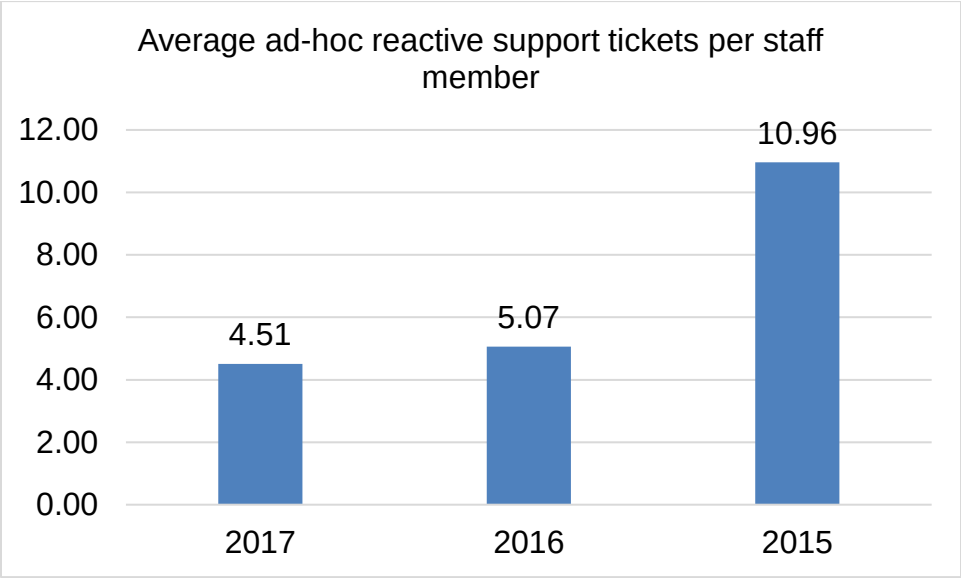

Figure 5-18. Bar graph – average ad-hoc reactive support tickets per staff member.

Performance indicators quadrant 4 – mobile support site reactive support tickets

Techworks staff complete reactive support tickets at mobile support sites. This performance indicator is a numeric total of all mobile support site tickets that an employee works on at the Techworks support site events. In Table 5-19, the total number of mobile support support tickets is reported for each time period along with the staff staff mean and standard deviation.

Table 5-19. Performance indicators – mobile support site tickets

Year	PI total	Total staff	Staff mean	Std. deviation
2017	56	43	1.30	1.846
2016	74	46	1.61	1.437
2015	162	48	3.38	2.922

The mean for reactive support site tickets for each group of staff (with standard deviations in parenthesis) for 2017, 2016, and 2015 were 1.3 (1.846), 1.61 (1.437), and 3.38 (2.922), respectively. Staff averages are also represented in a bar graph to visually see these distinctions (Figure 5-19). Totals for reactive mobile support site tickets were lower in 2017 than in 2016 or 2015. The average per staff was also lower, even with less staff. This is consistent with other forms of reactive support over the past four years, where totals for all forms of reactive support have decreased year-to-year. Like other forms of reactive support, this performance metric is outside the control of staff and they have little opportunity to go above and beyond, since tickets are only created when a client reports an issue.

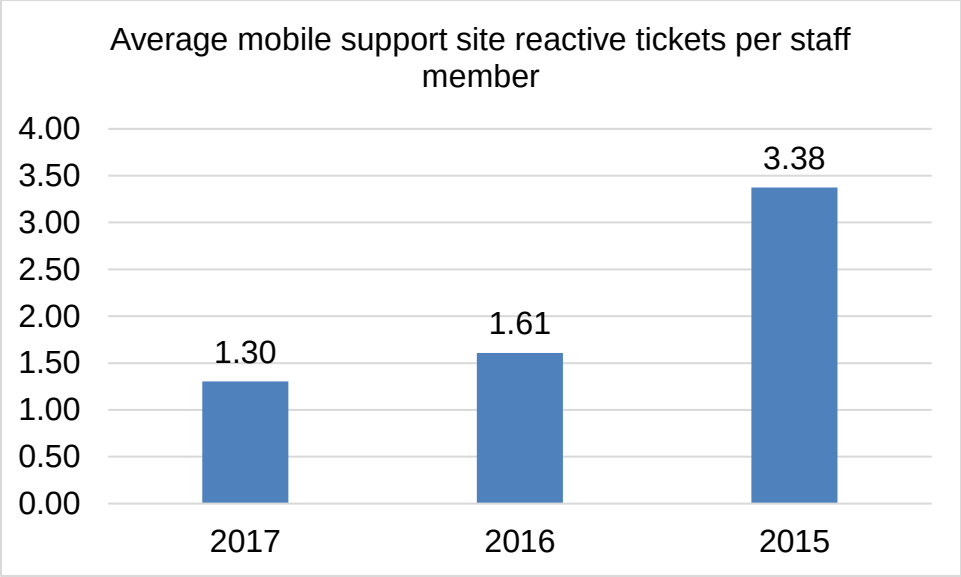

Figure 5-19. Bar graph – average mobile support site reactive support tickets per staff member.

Performance Indicators Summary

To better understand the changes in performance that occurred, it was useful to examine each of the three comparative time frames in more detail. In the sections that follow, each of the three time periods is examined independently, prior to an overall summative discussion. First 2017 performance indicators are compared to 2016 in more depth, followed by 2017 indicators compared to 2015. 2016 performance indicators are also compared to 2015 to provide additional context. A table for each time frame is also provided summarizing areas where performance improvement occurred.

Performance indicators summary – 2017 compared to 2016

The 2017 time frame saw performance improvement in 14 of the 18 performance indicators when compared to 2016. These improvement areas include performance feedback submissions, proactive equipment checklists, proactive hall-sweeps, office shifts, late notices, mobile support event attendance, portal logs by day, positive customer service surveys, negative customer service surveys, event assistance,

monthly evaluation completion, area meeting attendance, technical forum posts and assigned reactive support tickets. Where performance improvement occurred, it was frequently in areas where an employee had either control or the ability to go above and beyond expectations, characteristics of indicators in quadrants 1, 2, and 3. Table 5-20 summarizes the areas of improvement below. The two areas in quadrants 1, 2 and 3 where performance improvement did not occur saw performance remain relatively constant across, with staff receiving a similar number of critical notices and attending a similar number of staff meetings.

Table 5-20. Performance indicators summary – 2017 compared to 2016

Performance metric	Quadrant	Improvement in 2017
Performance feedback	1	Yes
Equipment checklists	1	Yes
Hallsweeps	1	Yes
Office shifts	1	Yes
Late notices	1	Yes
Critical notices	1	No
Mobile support events	1	Yes
Portal logs by day	1	Yes
Positive customer surveys	2	Yes
Negative customer surveys	2	Yes
Event assists	2	Yes
Monthly evaluations	3	Yes
Area meetings	3	Yes
Staff meetings	3	No
Forum posts	4	Yes
Assigned tickets	4	Yes
Ad-hoc tickets	4	No
Support site tickets	4	No

Performance indicators summary – 2017 compared to 2015

The 2017 time frame saw performance improvement in 13 of the 18 performance indicators when compared to 2015. These improvement areas include performance feedback submissions, proactive equipment checklists, proactive hall-sweeps, office

shifts, late notices, critical notices, mobile support event attendance, portal logs by day, positive customer service surveys, negative customer service surveys, event assistance, monthly evaluation completion, and area meeting attendance. All performance improvement took place in areas where an employee had either control or the ability to go above and beyond expectations. The one area in quadrant 3 that did not see improvement saw performance remain relatively constant with staff attending a similar number of staff meetings across the two time periods. Table 5-21 summarizes the areas of improvement below.

Table 5-21. Performance indicators summary – 2017 compared to 2015

Performance metric	Quadrant	Improvement in 2017
Performance feedback	1	Yes
Equipment checklists	1	Yes
Hallsweeps	1	Yes
Office shifts	1	Yes
Late notices	1	Yes
Critical notices	1	Yes
Mobile support events	1	Yes
Portal logs by day	1	Yes
Positive customer surveys	2	Yes
Negative customer surveys	2	Yes
Event assists	2	Yes
Monthly evaluations	3	Yes
Area meetings	3	Yes
Staff meetings	3	No
Forum posts	4	No
Assigned tickets	4	No
Ad-hoc tickets	4	No
Support site tickets	4	No

Performance indicators summary – 2016 compared to 2015

While comparing performance between 2016 and 2015 was not a major focus of this research, it was useful to explore the changes in performance to get a clearer picture of the changes in 2017. The 2016 time frame saw performance improvement in

8 of the 18 performance indicators when compared to 2015. These improvement areas include proactive equipment checklists, late notices, critical notices, mobile support event attendance, portal logs by day, negative customer service surveys, event assistance, and monthly evaluation completion. All performance indicators where improvement occurred were in areas where an employee had either control or the ability to go above and beyond expectations, however there were more performance indicators where no improvement occurred in quadrants 1, 2, and 3 when looking at the other comparative time periods. Table 5-22 summarizes the areas of improvement below.

Table 5-22. Performance indicators summary – 2016 compared to 2015

Performance metric	Quadrant	Improvement in 2016
Performance feedback	1	No
Equipment checklists	1	Yes
Hallsweeps	1	No
Office shifts	1	No
Late notices	1	Yes
Critical notices	1	Yes
Mobile support events	1	Yes
Portal logs by day	1	Yes
Positive customer surveys	2	No
Negative customer surveys	2	Yes
Event assists	2	Yes
Monthly evaluations	3	Yes
Area meetings	3	No
Staff meetings	3	No
Forum posts	4	No
Assigned tickets	4	No
Ad-hoc tickets	4	No
Support site tickets	4	No

Performance indicators summary – key findings

The 2017 time frame saw performance improvement across quadrants 1, 2 and 3 when compared to 2016 and 2015, where employees had control over completing a requirement and where employees had the ability to go above and beyond

expectations. When both those conditions were present, performance improvement was more likely with 7 of the 12 areas of improvement between 2017 and either 2016 or 2015 occurring in quadrant 1. Those 7 areas include performance feedback submissions, completion of equipment checklists, completion of hall-sweeps, office shifts completed, receipt of late notices, attendance at mobile support sites, and portal logs by day. A comparison of 2016 with 2015 saw less consistent improvement across the 18 performance indicators, suggesting that 2017 was unique in that respect. As expected, performance indicators where employees had little control or no ability to exceed expectations saw little to no improvement in 2017.

Summary

Chapter 5 outlined the data collected and analyzed as part of this research study. Survey results from the IMI Survey within Self-Determination Theory indicate that the achievements within the web portal align with more autonomous extrinsic motivation. Participants reported high levels of interest and enjoyment with the system, a high degree of competence in using the system and a high degree of choice when engaging with the achievements. Participants also reported very little pressure or tension in using the achievements. Open-ended responses suggested staff had a primarily positive experience in using the achievements and that the achievements served to motivate and incentivize certain aspects of their work. Performance data reflects this as well in several of the metrics tracked during the time period achievements were in use, particularly when staff had the ability to go above and beyond and when they had control over the performance indicator in question. In total, twelve of the eighteen performance indicators showed improvement in 2017 when compared to both 2016 and 2015. These findings suggest that achievements have great potential to incentivize work

when designed with SDT and the MDA Game Design Framework in mind. Several additional design considerations emerged from the data around accurately mapping achievement requirements to reasonable performance expectations. These results are discussed in greater depth in the context of this research in Chapter 6.

CHAPTER 6
DISCUSSION

Overview

This study sought to address a problem of practice by incentivizing job requirements through the addition of achievements in an online web portal. To do this, a workplace analysis was conducted, along with a thorough review of relevant literature. The result was the creation of a framework for designing gamified systems entitled Self-Determined Gamification. Using this framework as a guide, an attempt was made to design achievements with Self-Determination Theory (SDT) in mind, paying particular attention to organizational goals, equity in attaining achievements, employee autonomy in interacting and engaging with the achievements, and individual goals. Design best practices were incorporated through the use of the MDA Design Framework in addition to drawing upon design considerations from the SAPS Reward System (Zichermann & Cunningham, 2011), Bartle's Player Types (Bartle, 1996; Zichermann & Cunningham, 2011), Lazzaro's Four Types of Fun (Lazzaro, 2004; Zichermann & Cunningham, 2011), Dreyfus' Five Levels of Mastery (Dreyfus & Dreyfus, 1980; Zichermann & Cunningham, 2011), and Czikszentmihalyi's Flow Theory (Czikszentmihalyi, 1989; Zichermann & Cunningham, 2011). With the design of the system as a major focus of this research, determining the success of the design in aligning with SDT considerations was important. Additionally, looking at performance indicators along with employee feedback about the achievements provided insight into the overall success of the design and future considerations.

Chapter 6 begins by discussing the major findings that emerged from the data along with several additional findings. A discussion of design considerations follows that

takes into account entries from the research journal, along with employee feedback and results from the IMI survey. Employee performance is also discussed in the context of specific performance indicators and employee self-reported feedback. Implications of these results are discussed in the context of the specific research context along with the field as a whole. A discussion of both implications and significance of the research follows. Chapter 6 concludes with suggestions for future research and an overall summary of the research.

Discussion of Findings

Two major findings emerged through an analysis of the results discussed in Chapter 5. The intentional design of the system using the Self-Determined Gamification framework, which incorporated design best practices and relevant theory, was successful in creating a system that aligns with more autonomous forms of motivation on the autonomy continuum within Self-Determination Theory. In addition, employees indicated specific job requirements where their performance was impacted positively by the achievements. Performance metrics indicated improvements in several areas after achievements were implemented, particularly in performance areas where employees could go above and beyond and where they had control in completing the requirement.

Several additional findings are also worth mentioning. Employees responded positively to the achievements and expressed enjoying the new feature. They expressed high levels of interest and enjoyment, perceived competence and perceived choice, and low levels of pressure and tension regarding interacting with the achievements. Employees also engaged in targeting and goal-setting when interacting with the achievements and highlighted the incentivizing nature of the achievements. These findings are encouraging, but it is also important to note that designing a system

of this kind is an iterative process and additional adjustments are needed around achievement benchmarking in particular. Along those lines, changes to an organization and changes to specific job requirements need to be addressed and reflected in the achievement system over time through the iterative nature of the design process.

Gamification Design

Gamification Design - Overview

The gamification within the Techworks Portal was designed very intentionally using the Self-Determined Gamification framework. Here, an approach rooted in Self-Determination theory incorporated considerations for an achievement system that would be equitable in an individual's ability to attain achievements, while seeking to emphasize organizational goals with the hope that staff would internalize these goals. The framework also sought to incorporate design best practices in selecting game elements and designing specific achievements that addressed the needs of different video game player archetypes, different levels of skill in the job, and different types of fun. Underlying this design was the hope that the difficulty of any task would maintain a balance with the degree of interest an individual might have. The overall goal was to create a personalized experience that facilitated a more enjoyable work environment.

Gamification Design – Staff Perceptions and SDT Alignment

Results from the open-ended responses indicated that staff enjoyed the achievements and found them both fun and interesting. This is consistent with early gamification research where self-reported feedback is frequently positive about gamification implementations (Hamari et al., 2014). Staff pointed to specific areas of their work that changed as a result of interacting with the achievements and indicated that these were positive changes. At the same time, staff referenced the goal-setting

behavior that is characteristic of more autonomous forms of extrinsic and intrinsic motivation on the autonomy continuum within Self-Determination Theory. Here, SDT identifies two forms of more autonomous extrinsic motivation, identified regulation and integrated regulation (Gagné & Deci, 2005; Ryan & Deci, 2000). Integrated regulation sees organizational and personal goals as the motivation contingency, where identified regulation sees the internalization of those organizational goals on the part of the individual as the motivation contingency (Gagné & Deci, 2005; Ryan & Deci, 2000). Staff also self-reported feelings of motivation and feeling that the achievements legitimized some of the work they perform. Numerous studies found similar results, in non-work contexts, with participants indicating that badges or achievements incentivized or motivated a specific behavior (Anderson et al., 2013; Cheong et al., 2013; Conaway & Garay, 2014; Cruz & Penley, 2014; De Schutter & Abeele, 2014; Denny, 2013; Domínguez et al., 2013; Grant & Betts, 2013). These findings support other research that postulated gamification in the workplace might increase employee motivation, particularly when aligned with SDT considerations (Cardador et al., 2017; Perryer et al., 2016).

The open-ended responses were encouraging regarding the design of the overall achievements and they were supported by the Likert responses on the IMI survey. Here, participants reported high levels of interest and enjoyment with the achievements, along with high levels of competence in using the achievements. High levels of interest and enjoyment in a workplace setting characterize a work environment more conducive to autonomous extrinsic motivation, according to SDT (Gagné & Deci, 2005; Ryan & Deci, 2000). Similarly, high levels of competence in a workplace setting is an indicator

that employees are displaying more autonomous motivation on the autonomy continuum (Gagné & Deci, 2005; Ryan & Deci, 2000). Staff also indicated a high degree of perceived choice when interacting with the achievements, implying that the decision to do so did not feel forced. Participants indicated low levels of pressure or control in interacting with the achievements. The presence of high pressure or controlling characteristics in a work environment is associated with less motivating workplace settings and is an indicator of a-motivation at work (Gagné & Deci, 2005; Ryan & Deci, 2000). The lack of pressure or control along with the perceived degree of choice in interacting with the achievements suggests that staff were motivated but did not feel forced to do so. These findings are encouraging and point to the importance of intentionally designing systems of this kind. On all four factors tracked by the IMI Survey, participant responses indicate alignment with the autonomous side of the autonomy continuum. SDT considerations during the design process were incredibly important in designing a system that staff were comfortable with.

Gamification Design – Additional Theory Alignment Considerations

Informal interactions with staff concerning the achievements were rare, though the research journal pointed to two interactions that indicated staff were interested in attaining achievements and curious about the impact of certain work as they related to achievement attainment. Staff appeared to be continuing to work as normal, with most interactions recorded in the journal focusing on work-related tasks or questions around standard end-of-year considerations such as graduation, move-out procedures, and reference requests. Journal entries noted this lack of discussion on multiple occasions throughout the notes on implementation, with only two notable exceptions. In the first, a staff member mentioned the achievements during an office shift. Here the staff member

asked if there were any hidden or secret achievements other than the ones visible in the portal and indicated this would be a fun addition to the system. This behavior is characterized in the literature by the explorer player type, where an individual is interested in exploring a game or system and finding aspects of a game that others might not discover (Bartle, 1996; Zichermann & Cunningham, 2011). In the other exception, a staff member asked after a staff meeting if being late to a staff meeting still counted as attending and if that would impact earning related achievements. Here, the staff member displayed characteristics of the achiever player type, where an individual is interested in meeting goals within a game and completing tasks (Bartle, 1996; Zichermann & Cunningham, 2011). Other open-ended responses through the survey also pointed to characteristics from each of the four player types. While evidence of the four player types were apparent through the survey responses and research journal, other theoretical considerations in the Self-Determined Gamification framework were less apparent. References to the achievements being fun, for example, were difficult to map to the four types of fun.

Gamification Design – Iterative and Continuous Improvement

Some participants mentioned the potential need to adjust requirements for some of the more difficult achievements to attain. This was also reflected in the analysis of performance metrics where achievement requirements for reactive support may need to be lowered. This includes technical forum posts, assigned reactive support tickets, ad-hoc reactive support tickets and reactive mobile support site tickets. Adjustments of this kind are expected and reflect the iterative nature of a design process of this kind. Research also points to the need to make additional changes to the design of a system after a gamification implementation (Attali & Arieli-Attali, 2014; Cruz & Penley, 2014; De

Schutter & Abeele, 2014; Farzan & Brusilovsky, 2011; Fitz-Walter et al., 2011; Hakulinen et al., 2013; Hanus & Fox, 2015; Osipov, Nikulchev, et al., 2015). The research journal highlighted these considerations as well. The initial design of the system set the highest achievement benchmarks based on historical examples of exemplary performance. Additional achievements were scaled up to that benchmark with gradually increasing levels of difficulty that could be attained over time. Throughout the journal, during the design of the system, the difficulty in appropriately aligning the achievement benchmarks with a reasonable performance expectation arose as a concern. The primary issue arose around outliers with inflated examples of performance expectations. This occurred when an employee worked for a significantly longer period of time, such as an individual who worked for the organization for all eight semesters during their undergraduate career, and then continued to work during graduate school. Other mitigating circumstances that impacted exemplary examples of employee performance included major events, such as a software rollout or virus outbreak, or contextual changes, such as an increased need for event assistance prior to the permanent installation of technology in the halls that addressed the same need. Ultimately, a decision to remove outliers and focus on reasonable performance expectations lowered the required benchmarks and leveled the achievement requirement conditions in a number of categories, such as reactive support tickets and event assists.

Though not directly related to the research, the journal entries frequently included thoughts around the changing nature of the work environment. Where early work centered on reactive support, 2014 saw the addition of more proactive measures in

supporting the technology infrastructure in the halls. Practices like door-to-door hall-sweeps and performing routine technology checklists saw the need for reactive support decrease. This trend, and the need to consider the maturing nature of the IT environment in designing the achievements was a consistent theme expressed as a concern throughout the research journal. Both during the design and the implementation, this theme emerged as a consideration, along with the expressed need for an iterative process of reflection and redesign as an organization changes. Along those lines, the reflection on additional services that might be offered by the organization, along with services that were retired in the past came up as a consideration. These entries reflected the need to be able to add achievements that correspond to new job requirements, along with retiring legacy achievements when a service is no longer offered and is no longer a job requirement for employees.

Other design suggestions from the open-ended responses may be motivating for some, but overly competitive and potentially de-motivating for others. Particularly the suggestion of incorporating a leaderboard could be viewed as adding pressure to an otherwise low-pressure work environment. This is consistent with findings from other studies which suggested some individuals found leaderboards to be demotivating or controlling, while others were highly motivated by the competition (Hanus & Fox, 2015; Witt et al., 2011).

Gamification Design - Summary

The design process in this research benefitted greatly from considerations outlined by Self-Determination Theory and the MDA Game Design framework. The Self-Determined Gamification framework used in this research led to a system that staff enjoyed. Staff also pointed to specific areas of their work that were influenced by the

achievements and the performance data reflects these changes. At the same time, additional design considerations point to the need for a cyclical and iterative design process that builds on prior findings and that can adapt to a changing work environment. Continuing to refine the Self-Determined Gamification framework will be essential, but initial results suggest it outlines key considerations for designing gamification in a workplace setting.

Employee Performance

With a gamification layer in place in January of 2017, 18 performance metrics were tracked over a corresponding time period in 2017, 2016 and 2015. In total, twelve of the fourteen performance indicators where an employee had control in completing the job requirement or where the employee had the opportunity to go above and beyond expectations saw some improvement in 2017 when compared to both 2016 and 2015. Those twelve improvement areas include performance feedback submissions, proactive equipment checklists, proactive hall-sweeps, office shifts, late notices, mobile support event attendance, portal logs by day, positive customer service surveys, negative customer service surveys, event assistance, monthly evaluation completion, and area meeting attendance. These performance improvements point to the potential of achievements in incentivizing completion of job requirements in a workplace setting when employees have control and the ability to exceed performance expectations. Interestingly, the four performance indicators where an employee could not go above and beyond and that were outside the employee's control saw a decrease in 2017 when compared to 2015. This could be due to the general trend of an increase in proactive support and a decrease in reactive support. It could also be the case that aspects of an

employee's work that are outside their control and that do not provide an outlet for going above and beyond expectations will naturally show less improvement.

Self-reported feedback from the open-ended responses pertaining to the achievements indicated that some staff logged into the portal to see job responsibilities more frequently and that some staff targeted specific achievements by completing hall-sweeps early or signing up for extra events. The performance metric data reflects this in that the 2017 time frame saw more portal log-ins, fewer late notices on average per staff member, and an increase in both average service event sign ups and average event assist sign ups. The reduction in late notices is noteworthy in particular, as it reflects an overall improvement in performance by completing work within the expected timeframe. Performance issues with staff often coincide with a high number of late notices. For performance metrics within a staff member's control, they tended to improve in 2017. That said, certain areas remained fairly consistent over time, such as attendance at staff meetings and the number of critical notices received on average. This may be an indicator that those metrics are less likely to change from semester to semester. For example, attendance at staff meetings is impacted by an employee's class schedule and their subsequent ability to attend.

Open-ended responses pointed to a positive experience when interacting with achievements within the web portal. Participants described the achievements as fun, cool, interesting, and neat. Participants indicated being impressed by the new feature and even suggested it made aspects of the job more enjoyable. Participants also indicated changing their work practices through the achievement interface, both referencing setting goals and targeting specific achievements. Responses indicated that

the achievements had a motivating effect in some cases, or in one response, no impact on performance. Responses also indicated that the achievements helped recognize the work being completed and encouraged staff to log into the web portal to check requirements. Perceptions of the online work environment after the incorporation of a gamification layer were primarily positive in nature. In one case, a participant indicated not interacting with the achievements, but suggested this had no impact on performance or completing work requirements. No responses indicated a negative perception of the online work environment or the achievements, outside of proposed adjustments to color schemes or iconography.

In the end, results point to improved performance in several key areas after the achievement implementation. In particular, when a performance indicator was within an employee's control and/or afforded the opportunity to go above and beyond expectations, performance improvement was frequently present when looking at staff averages. Anonymous, self-reported feedback indicated that some staff were more motivated or targeted specific aspects of their work through interacting with the achievement interface. The performance metrics indicated that this was true in some cases as well. This sparks several suggestions for future research, discussed later in Chapter 6.

Implications and Significance

Context-Specific Implications and Significance

This study sought to address a problem of practice in a work environment where employees complete job responsibilities remotely with minimal supervision. Results from this research are encouraging in this regard and the achievements worked particularly well in giving staff autonomy in selecting areas where they wanted to focus

efforts. The design of the gamification layer using the Self-Determined Gamification framework resulted in a positive work environment and seemed to have a perceived motivating effect on staff in addition to improved performance in several areas. The achievement system addresses a problem of practice in the Techworks work environment by providing an incentive for staff to complete job responsibilities. The decrease in the number of late notices is particularly encouraging and suggests that staff are completing work in a more timely manner on average, resulting in improved service to the client population. In addition to addressing a problem of practice, staff within Techworks now have consistent access to performance data and can check their status in relation to the achievements at any time. Going forward, achievement benchmarks in certain areas will be adjusted based on staff feedback and an assessment of earned achievements. Results from this study indicate that designing gamification intentionally, utilizing a framework of this kind can have a positive impact within a work setting and Self-Determination Theory is a strong contender to guide this process. As the iterative nature of the design framework is followed, improvements to the system will be realized in future semesters within the Techworks portal. The cyclical nature of a student staffing model, along with the improvements to design will create opportunities for both follow up studies and longitudinal studies in this environment.

As the achievement structure is adjusted and a process that addresses entropy within the work environment is defined in relation to the achievements, there is potential to expand the web portal and achievements to other areas of the university. Particularly in areas where student staff are employed, the web portal could be adjusted to accommodate different work environments with achievements integrated and mapped

to specific job requirements in those contexts. Beyond a focus on student employees, the portal could be adjusted and tested at the university with full time staff or in non-work contexts.

Broader Implications and Significance

To date, many examples of gamification in the literature do not specify a formal design approach, design best practices, or theoretical considerations. In conducting this research, the Self-Determined Gamification framework resulted in a standardized approach that incorporates both design best practices and relevant theory. This framework represents a significant contribution to the field by providing both a model for designing a system of this kind and a method for evaluating that design. Here, researchers of performance improvement, gamification, or workplace motivation, have the opportunity to use a tested framework that moves beyond theoretical considerations and offers a practical example of those considerations in practice. The success of this framework in designing a gamified system highlights the importance of SDT considerations within a workplace setting such as autonomy, equity and both organization and individual goals. Continuing to use this approach to design other gamification implementations will help refine and improve the model. At the same time, several studies have suggested the potential of gamification in a workplace setting, but few studies exist that actually test that potential. This study addresses a gap in the literature by laying the groundwork for both gamification design in a workplace setting and the specific application of game elements as they relate to completion of job responsibilities.

Findings from this study suggest that gamification can improve employee motivation and incentivize work. From a performance improvement standpoint, this

intervention represents an additional environmental support that employers can leverage to help motivate staff to set individual goals and potentially internalize organizational goals. This study also suggests that employees having control over the completion of job requirements and the opportunity to exceed expectations in completing job requirements are both important considerations for anyone designing an achievement structure. Where possible, adjusting job requirements to accommodate these two considerations, in conjunction with the design of gamification can yield improved performance. In a work setting, achievements offer a non-monetary incentive structure that can grow and adjust over time based on the changing needs of an organization. Employers have an opportunity to realize real performance improvement through this incentive structure, which is particularly relevant when monetary incentives are not available as a means of recognizing the work employees complete.

Suggestions for Future Research

It is important to note that the impact and positive reception of gamification in a workplace setting may be unique to college-age student employees. The positive interactions expressed by participants may also be a reflection of the novelty effect or a predisposition for gamification in general. Additionally, there are several variables outside of the gamification implementation that could have impacted performance metrics. With these considerations in mind, more research in this area is needed.

While the results of this research are encouraging, there are several potential areas for additional research that could build off this approach. To begin with, this study took place over a three-month time period. Although retrospective data allowed for comparisons to be made over time, a more longitudinal study is needed within the field. With any study in a workplace setting, particularly one that changes frequently, it is

difficult to sufficiently isolate a variable like a gamification implementation. A longitudinal study would help control for this by examining the potential impact over a longer period of time.

The Self-Determined Gamification framework helped organize the design process and ground the approach in relevant theory. The results were primarily positive, but the use of this framework in other contexts, with other populations, and with other game elements would help evaluate the framework further. Additional studies that make use of the framework will help improve and adjust the overall approach and the need to focus on specific aspects of the framework. For example, while incorporating the SAPS reward system and the Four Types of Fun may have helped create a more balanced system overall, the open-ended responses made no reference to status when discussing the achievements and references to fun were difficult to link to a specific categorization of fun. These design considerations may be present, but unnoticed by staff, or they may be less important than some of the other design considerations. Building out an assessment to track specific design considerations used in the framework could help determine the relative need for each consideration.

Designing a gamification study utilizing the Self-Determined Gamification framework that allows for inferential statistics would also be beneficial to the field. Here, either tracking individual performance changes over time, instead of staff averages, or comparing groups without any staff overlap would allow for inferential statistics to be run. This would help in determining if any performance improvements were also statistically significant.

Follow up studies represent another area of future research in the field that would be incredibly beneficial. The Self-Determined Gamification framework offers an iterative design process for designing gamification implementations. Though beyond the scope of this study, conducting research using a similar method to the one described here, along with a follow-up study that incorporates feedback and improvements to the system would help mature the field and identify any potential impacts of gamified systems.

Summary

This study sought to address a problem of practice in a specific work context. At the same time, it attempted to identify a gap in the literature and address that gap through the incorporation of a formalized design process for gamification grounded in appropriate theory in a workplace setting. Within the context of the problem of practice, the gamification implementation had positive results with staff self-reporting improved work practices and performance metrics reflecting this improvement. The study also provided a meaningful contribution to the field through the development of the Self-Determined Gamification framework. Here, it was demonstrated that through utilizing design best practices and relevant theory, gamification can be designed intentionally and lead to both a positive user experience and real performance improvement. The framework not only offered a model for designing a gamification solution, but also offered a method of evaluating that model. Through a mixed methods approach, data from the IMI survey, open ended responses, and performance metrics over time combined to provide a comprehensive assessment of the gamification implementation which can help guide future assessments of this kind. SDT considerations in the work environment pertaining to autonomy, equity, organizational goals and individual goals,

in addition to the need for employees to have control in completing job requirements and the opportunity to exceed expectations all emerged as areas of focus when designing gamification in a work environment. Several opportunities to expand on this research also emerged where the Self-Determined Gamification framework can be refined and improved through follow up studies or gamification implementations in other contexts. While additional research might help determine if all aspects of the framework are needed and the extent to which there is a causal relationship between the introduction of achievements and changes to performance, the results of this study are encouraging and build upon prior efforts in the field.

APPENDIX A
ORGANIZATIONAL GOALS

Table A-1. Organizational goals

Goal abbreviation	Goal detail
A	To enhance the educational environment within the residence halls through technology
B	To enhance the entertainment opportunities within the residence halls through technology
C	To provide quality customer service to every client through timely and reliable on-site technology support
D	To support fellow Techworks staff through timely communication, clear expectations, and mentoring

APPENDIX B
MAPPING ORGANIZATIONAL GOALS TO JOB REQUIREMENTS

Table B-1. Mapping organizational goals to job requirements

Job requirement	Job category	Organizational goal
customer service surveys received	customer service	C
technical forum posts	tech forum	A, B, C, D
assigned reactive support tickets	support tickets	A, B, C
ad-hoc reactive support tickets	support tickets	A, B, C
mobile support site support tickets	support tickets	A, B, C
performance feedback submissions	general	D
proactive equipment checklists	other support	A, B
proactive hallsweeps	other support	A, B, C
office shifts	other support	C, D
event assists	other support	A, B, C
monthly evaluations	evaluations	D
late notices received	general	C
critical notices received	general	C
mobile support site events attended	events	A, B, C, D
area meetings attended	events	D
staff meetings attended	events	D
portal logs by day	general	C, D

APPENDIX C
ACHIEVEMENT LIST AND DYNAMICS MAPPING

Table C-1. Achievement list and dynamics mapping

Achievement title	Threshold	ML	PT	F
Tech Guru	Receive a Tech Guru End of Semester Award	E	K, A, S	H
Community Builder	Receive a Community Builder End of Semester Award	E	K, A, S	H
Customer Service FISH	Receive a Customer Service FISH end of semester award	E	K, A	H
Team Player	Receive a Team Player end of semester award	E	K, A, S	H
I'll Be There	Receive an I'll Be There end of semester award	E	K, A	H
Tech of the Semester	Receive a Tech of the Semester award	M	K, A	H
Rookie of the Semester	Receive a Rookie of the Semester Award	M	K, A	H
Senior Tech of the Semester	Receive a Senior Tech of the Semester award	M	K, A	H
Awarded!	Receive a monthly award	PS	K, A	H
Awarded Again!	Receive more than one monthly award in a semester	E	K, A	H
Notable Recognition	Receive 5 or more monthly awards while working for Techworks	M	K, A	H
Retire My Jersey	Receive any combination of Tech, Senior Tech or Rookie of the Semester (or multiple of one)	V	K, A	H
Well Rounded	Receive any combination of semester awards during multiple semestesrs (e.g. Tech Guru and Community Builder)	M	K, A	H
Consistently Consistent	Receive any single semester award during multiple semesters (e.g. Tech Guru multiple times)	M	K, A	H
Helping Hand	Receive your first positive customer service survey	N	K, S	E
Helping Hand x5	Receive 5 positive customer service surveys	PS	K, S	E
Helping Hand x10	Receive 10 positive customer service surveys	PS	K, S	E
Helping Hand x25	Receive 25 positive customer service surveys	PS	K, S	S
Helping Hand x50	Receive 50 positive customer service surveys	E	K, S	S

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
Helping Hand x100	Receive 100 positive customer service surveys	E	K, S	S
Helping Hand x175	Receive 175 positive customer service surveys	M	K, S	S
Helping Hand x250	Receive 250 positive customer service surveys	V	K, S	S
Customer Driven	Receive 20 positive customer service surveys in a single semester	M	K, S	S
Customer Focused	Receive 40 or more positive customer service surveys in a single semester	V	K, S	S
Your first review!	Attend your first midterm review	N	A, S, E	P
More Midterms x 2!	Attend 2 midterm reviews	PS	A, S	P
More Midterms x 4!	Attend 4 midterm reviews	E	A, S	P
More Midterms x 6!	Attend 6 midterm reviews	M	A, S	P
More Midterms x 8!	Attend 8 midterm reviews	V	A, S	P
Your First Report!	Complete your first monthly report	N	K, A, E	E
Reporting in x 6	Complete 6 monthly reports	PS	K, A	E
Reporting in x 12	Complete 12 monthly reports	E	K, A	E
Reporting in x 18	Complete 18 monthly reports	M	K, A	E
Reporting in x 24	Complete 24 monthly reports	V	K, A	E
Full Report	Complete all monthly reports for a single semester	E	K, A	E
An Outstanding Month!	Receive an overall evaluation of Outstanding on a Monthly Report	M	K, A	H
An Outstanding Semester!	Receive an overall evaluation of Outstanding for every month in a semester	M	K, A	H
You're Outstanding!	Receive an overall evaluation of Outstanding on a Semester Evaluation	M	K, A	H
You've Been Great x 2!	Receive 2 overall evaluations of Very Good or Outstanding on a Semester Evaluation	M	K, A	H
You've Been Great x 4!	Receive 4 overall evaluations of Very Good or Outstanding on a Semester Evaluation	M	K, A	H
You've Been Great x 6!	Receive 6 overall evaluations of Very Good or Outstanding on a Semester Evaluation	V	K, A	H
You've Been Great x 8!	Receive 8 overall evaluations of Very Good or Outstanding on a Semester Evaluation	V	K, A	H

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
Your first evaluation!	Complete your first semester evaluation	N	K, A, E	E
Thanks for the feedback x 2	Complete 2 semester evaluations	PS	K, A	E
Thanks for the feedback x 4	Complete 4 semester evaluations	E	K, A	E
Thanks for the feedback x 6	Complete 6 semester evaluations	M	K, A	E
Thanks for the feedback x 8	Complete 8 semester evaluations	V	K, A	E
Meeting Master	Attend 24 staff meetings and 24 area meetings	V	K, A, S	P
Your First Area Meeting	Attend you first area meeting	N	A, E, S	P
Meet and Greet	Attend all the area meetings for your region in a semester	N	K, A, S	P
Assembling the Area x 4	Attend 4 area meetings	N	K, A, S	P
Assembling the Area x 8	Attend 8 area meetings	PS	K, A, S	P
Assembling the Area x 16	Attend 16 area meetings	E	K, A, S	P
Assembling the Area x 24	Attend 24 area meetings	M	K, A, S	P
Your first support site!	Attend your first move-in support site	N	E, S	P
So Much Support!	Attend more than 2 move-in support sites in a single semester	M	K, A, S	P
Move-in Support x2!	Attend 2 move-in support sites	PS	A, S	P
Move-in Support x 4!	Attend 4 move-in support sites	E	A, S	P
Move-in Support x 6!	Attend 6 move-in support sites	M	A, S	P
Move-in Support x 8!	Attend 8 move-in support sites	V	A, S	P
A Life of Service	Attend your first service event	N	A, E, S	P
A Life of Service x 7	Attend 7 service events	PS	A, E, S	P
A Life of Service x 14	Attend 14 service events	PS	A, E, S	P
A Life of Service x 28	Attend 28 service events	E	A, E, S	P

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
A Life of Service x 42	Attend 42 service events	M	A, E, S	P
A Life of Service x 56	Attend 56 service events	V	A, E, S	P
You've Been Served!	Attend 10 service events in a single semester	M	K, A, E, S	P
You've Been Served x 14!	Attend 14 service events in a single semester	V	K, A, E, S	P
Your First Tech Gathering	Attend your first staff meeting	N	A, E, S	P
A Meetingful Semester	Attend all the staff meetings in a semester	E	K, A, S	P
Tech Gathering x 6	Attend 6 staff meetings	N	A, S	P
Tech Gathering x 12	Attend 12 staff meetings	PS	A, S	P
Tech Gathering x 18	Attend 18 staff meetings	E	A, S	P
Tech Gathering x 24	Attend 24 staff meetings	M	A, S	P
Welcome to Techworks	Attend your first training session	N	A, E, S	P
Trained	Attend all required training sessions during your first semester	PS	K, A, S	P
Around the Block	Live in three Techworks Areas while working for Techworks	E	A, E	E
Housed	Live in four Techworks Areas while working for Techworks	M	A, E	E
Getting to Know You	Fill out all optional fields in your profile	PS	A, E	E
Dependable	Receive no critical notices for a semester	E	K, A	H
Steady as a Rock	Receive no critical notices for four or more semesters	M	K, A	H
Steadfast	Receive no late notices or critical notices for a semester	M	K, A	H
Unswerving	Receive no late or critical notices for four or more semesters	V	K, A	H
Reliable	Receive no late notices for a semester	E	K, A	H
Unfailing	Receive no late notices for four or more semesters	M	K, A	H
Welcome	Log into the portal for the first time	N	E	E
Logged in x 5	Log into the portal 5 times	N	K, A	E
Logged in x 10	Log into the portal 10 times	N	K, A	E

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
Logged in x 25	Log into the portal 25 times	N	K, A	E
Logged in x 50	Log into the portal 50 times	N	K, A	E
Logged in x 100	Log into the portal 100 times	PS	K, A	E
Logged in x 200	Log into the portal 200 times	PS	K, A	E
Logged in x 300	Log into the portal 300 times	PS	K, A	E
Logged in x 400	Log into the portal 400 times	PS	K, A	E
Logged in x 500	Log into the portal 500 times	E	K, A	E
Logged in x 600	Log into the portal 600 times	E	K, A	E
Logged in x 700	Log into the portal 700 times	E	K, A	E
Logged in x 800	Log into the portal 800 times	E	K, A	E
Logged in x 900	Log into the portal 900 times	M	K, A	E
Logged in x 1000	Log into the portal 1000 times	M	K, A	E
Logged in x 1250	Log into the portal 1250 times	M	K, A	E
Logged in x 1500	Log into the portal 1500 times	V	K, A	E
Shout Out!	Leave a performance feedback about another staff member	N	A, E, S	E
Shout Out x 5!	Leave 5 performance feedbacks about other staff members	N	A, S	E
Shout Out x 10!	Leave 10 performance feedbacks about other staff members	PS	A, S	E
Shout Out x 25!	Leave 25 performance feedbacks about other staff members	PS	A, S	E
Shout Out x 50!	Leave 50 performance feedbacks about other staff members	E	A, S	E
Shout Out x 75!	Leave 75 performance feedbacks about other staff members	E	A, S	E
Shout Out x 100!	Leave 100 performance feedbacks about other staff members	M	A, S	E
Shout Out x 200!	Leave 200 performance feedbacks about other staff members	M	A, S	E
Shout Out x 300!	Leave 300 performance feedbacks about other staff members	V	A, S	E
Thorough Feedback x 10	Leave 10 performance feedbacks about other staff members in a single semester	E	A, S	E
Thorough Feedback x 25	Leave 25 performance feedbacks about other staff members in a single semester	M	A, S	E
Thorough Feedback x 50	Leave 50 performance feedbacks about other staff members in a single semester	V	A, S	E

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
Profile Updated	Update your profile	N	K, A, E	E
Change of Scenery	Live in two or more residence halls while working for Techworks	PS	A, E	E
New Recruit	Start your first semester	N	A	E
Returner	Start your third semester working for Techworks	PS	A	E
Returner Again	Start your fifth semester working for Techworks	M	A	E
Veteran	Start your seventh semester working for Techworks	V	A	E
Your First Sweep!	Complete your first hallsweep	N	A, E, S	P
Swept Away x 25	Complete 25 hallsweeps	N	A, E, S	P
Swept Away x 50	Complete 50 hallsweeps	N	A, E, S	P
Swept Away x 100	Complete 100 hallsweeps	PS	A, E, S	P
Swept Away x 250	Complete 250 hallsweeps	E	A, E, S	P
Swept Away x 500	Complete 500 hallsweeps	M	A, E, S	P
Swept Away x 1000	Complete 1000 hallsweeps	M	A, E, S	P
Swept Away x 2000	Complete 2000 hallsweeps	V	A, E, S	H
Sweeping Up the Halls	Complete all hallsweeps assigned to you in a semester	M	K, A, E, S	P
The Grim Sweeper x 50	Complete 50 hallsweeps in a single semester	PS	K, A, E, S	P
The Grim Sweeper x 100	Complete 100 hallsweeps in a single semester	E	K, A, E, S	P
The Grim Sweeper x 200	Complete 200 hallsweeps in a single semester	M	K, A, E, S	H
The Grim Sweeper x 400	Complete 400 hallsweeps in a single semester	V	K, A, E, S	H
Community Presence	Complete your first housing assist	N	A, E, S	P
Community Presence x3	Complete 3 housing assists	PS	A, E, S	P
Community Presence x6	Complete 6 housing assists	E	A, E, S	P
Community Presence x12	Complete 12 housing assists	M	K, A, E, S	H
Community Presence x25	Complete 25 housing assists	V	K, A, E, S	H
Friend of Housing	Complete more than one housing assist in a single semester	E	K, A, E, S	H
Your First Shift!	Complete your first office shift	N	A, E	E
Shifting Gear x 6	Complete 6 office shifts	PS	A	E
Shifting Gear x 12	Complete 12 office shifts	PS	A	E

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
Shifting Gear x 24	Complete 24 office shifts	E	A	E
Shifting Gear x 36	Complete 36 office shifts	M	A	E
Shifting Gear x 40	Complete 40 office shifts	V	A	E
Overshifting x 10	Complete 10 shifts in one semester	M	K, A	E
Overshifting x 20	Complete 20 shifts in one semester	V	K, A	S
Your First Rounds!	Complete your first set of rounds	N	A, E	E
Rounding x 3	Complete 3 sets of rounds	PS	A, E	E
Rounding x 5	Complete 5 sets of rounds	PS	A, E	E
Rounding x 10	Complete 10 sets of rounds	PS	A, E	E
Rounding x 15	Complete 15 sets of rounds	PS	A, E	E
Rounding x 25	Complete 25 sets of rounds	E	A, E	E
Rounding x 35	Complete 35 sets of rounds	E	A, E	E
Rounding x 45	Complete 45 sets of rounds	M	A, E	E
Rounding x 55	Complete 55 sets of rounds	M	A, E	E
Rounding x 75	Complete 75 sets of rounds	V	A, E	E
In a Round-About Way	Complete all rounds assigned to you for a semester	M	K, A, E	E
Round House Kick	Complete 10 sets of rounds in a single semester	M	K, A, E	E
Round House Kick x 15	Complete 15 sets of rounds in a single semester	V	K, A, E	S
Task Completionist	Complete a task in task central other than an office shift or weekly rounds	N	K, A, E	E
Task Completionist x 5	Complete 5 tasks in task central other than an office shift or weekly rounds	E	K, A, E	S
Task Completionist x 10	Complete 10 tasks in task central other than an office shift or weekly rounds	M	K, A, E	S
Your first ad-hoc!	Create your first ad-hoc ticket	N	A, E	P
10 ad-hocs!	Work on 10 ad-hoc tickets	N	K, A, E	P
20 ad-hocs!	Work on 20 ad-hoc tickets	N	K, A, E	P
30 ad-hocs!	Work on 30 ad-hoc tickets	PS	K, A, E	H
40 ad-hocs!	Work on 40 ad-hoc tickets	PS	K, A, E	H
50 ad-hocs!	Work on 50 ad-hoc tickets	PS	K, A, E	H
75 ad-hocs!	Work on 75 ad-hoc tickets	E	K, A, E	H
100 ad-hocs!	Work on 100 ad-hoc tickets	E	K, A, E	H
125 ad-hocs!	Work on 125 ad-hoc tickets	E	K, A, E	H
150 ad-hocs!	Work on 150 ad-hoc tickets	E	K, A, E	H
175 ad-hocs!	Work on 175 ad-hoc tickets	E	K, A, E	H
200 ad-hocs!	Work on 200 ad-hoc tickets	E	K, A, E	H
225 ad-hocs!	Work on 225 ad-hoc tickets	E	K, A, E	H

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
250 ad-hocs!	Work on 250 ad-hoc tickets	E	K, A, E	H
275 ad-hocs!	Work on 275 ad-hoc tickets	E	K, A, E	H
300 ad-hocs!	Work on 300 ad-hoc tickets	E	K, A, E	H
325 ad-hocs!	Work on 325 ad-hoc tickets	M	K, A, E	H
350 ad-hocs!	Work on 350 ad-hoc tickets	M	K, A, E	H
400 ad-hocs!	Work on 400 ad-hoc tickets	M	K, A, E	H
450 ad-hocs!	Work on 450 ad-hoc tickets	M	K, A, E	H
500 ad-hocs!	Work on 500 ad-hoc tickets	M	K, A, E	H
25 ad-hocs in a semester!	Work on 25 ad-hoc tickets in a single semester	N	K, A, E	P
50 ad-hocs in a semester!	Work on 50 ad-hoc tickets in a single semester	PS	K, A, E	P
75 ad-hocs in a semester!	Work on 75 ad-hoc tickets in a single semester	PS	K, A, E	H
100 ad-hocs in a semester!	Work on 100 ad-hoc tickets in a single semester	E	K, A, E	H
125 ad-hocs in a semester!	Work on 125 ad-hoc tickets in a single semester	E	K, A, E	H
150 ad-hocs in a semester!	Work on 150 ad-hoc tickets in a single semester	M	K, A, E	H
175 ad-hocs in a semester!	Work on 175 ad-hoc tickets in a single semester	M	K, A, E	H
200 ad-hocs in a semester!	Work on 200 ad-hoc tickets in a single semester	V	K, A, E	H
Ticket Master x 10	Work on 10 tickets in one semester	N	A, E	H
Ticket Master x 25	Work on 25 tickets in one semester	N	A, E	H
Ticket Master x 50	Work on 50 tickets in a single semester	PS	A, E	H
Ticket Master x 100	Work on 75 tickets in a single semester	PS	K, A, E	H
Ticket Master x 150	Work on 100 tickets in a single semester	E	K, A, E	H
Ticket Master x 200	Work on 125 tickets in a single semester	E	K, A, E	H
Ticket Master x 250	Work on 150 tickets in a single semester	M	K, A, E	H
Ticket Master x 300	Work on 175 tickets in a single semester	M	K, A, E	H
Ticket Master x 400	Work on 200 tickets in a single semester	V	K, A, E	H
First Client!	Work on your first ticket	N	A, E	P
25 Ticket Tech	Work on 25 Techworks tickets	N	A, E	P
50 Ticket Tech	Work on 50 Techworks tickets	N	A, E	P

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
75 Ticket Tech	Work on 75 Techworks tickets	PS	K, A, E	H
100 Ticket Tech	Work on 100 Techworks tickets	PS	K, A, E	H
125 Ticket Tech	Work on 125 Techworks tickets	PS	K, A, E	H
150 Ticket Tech	Work on 150 Techworks tickets	E	K, A, E	H
175 Ticket Tech	Work on 175 Techworks tickets	E	K, A, E	H
200 Ticket Tech	Work on 200 Techworks tickets	E	K, A, E	H
225 Ticket Tech	Work on 225 Techworks tickets	E	K, A, E	H
250 Ticket Tech	Work on 250 Techworks tickets	E	K, A, E	H
275 Ticket Tech	Work on 275 Techworks tickets	E	K, A, E	H
300 Ticket Tech	Work on 300 Techworks tickets	E	K, A, E	H
350 Ticket Tech	Work on 350 Techworks tickets	E	K, A, E	H
400 Ticket Tech	Work on 400 Techworks tickets	E	K, A, E	H
450 Ticket Tech	Work on 450 Techworks tickets	E	K, A, E	H
500 Ticket Tech	Work on 500 Techworks tickets	M	K, A, E	H
600 Ticket Tech	Work on 600 Techworks tickets	M	K, A, E	H
700 Ticket Tech	Work on 700 Techworks tickets	M	K, A, E	H
800 Ticket Tech	Work on 800 Techworks tickets	M	K, A, E	H
900 Ticket Tech	Work on 900 Techworks tickets	M	K, A, E	H
1000 Ticket Tech	Work on 1000 Techworks tickets	V	K, A, E	H
Poster Child x5	Complete 5 tech forum posts in a single semester	N	A, S	E
Poster Child x10	Complete 10 tech forum posts in a single semester	N	A, S	E
Poster Child x20	Complete 20 tech forum posts in a single semester	PS	A, S	E
Poster Child x30	Complete 30 tech forum posts in a single semester	E	K, A, S	S
Poster Child x40	Complete 40 tech forum posts in a single semester	M	K, A, S	S
Poster Child x50	Complete 50 tech forum posts in a single semester	V	K, A, S	S
First Post!	Complete your first tech forum post	N	A, E, S	E
25 posts	Complete 25 tech forum posts	PS	A, S	E
50 posts	Complete 50 tech forum posts	E	K, A, S	S
75 posts	Complete 75 tech forum posts	E	K, A, S	S
100 posts	Complete 100 tech forum posts	M	K, A, S	S
125 posts	Complete 125 tech forum posts	M	K, A, S	S
150 posts	Complete 150 tech forum posts	M	K, A, S	S
175 posts	Complete 175 tech forum posts	M	K, A, S	S
200 posts	Complete 200 tech forum posts	M	K, A, S	S
250 posts	Complete 250 tech forum posts	M	K, A, S	S
300 posts	Complete 300 tech forum posts	V	K, A, S	S

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
Tech Guru	Receive a Tech Guru Award	E	K, A, S	H
Community Builder	Receive a Community Builder End of Semester Award	E	K, A, S	H
Customer Service FISH	Receive a Customer Service FISH end of semester award	E	K, A	H
Team Player	Receive a Team Player end of semester award	E	K, A, S	H
I'll Be There	Receive an I'll Be There end of semester award	E	K, A	H
Tech of the Semester	Receive a Tech of the Semester award	M	K, A	H
Rookie of the Semester	Receive a Rookie of the Semester Award	M	K, A	H
Senior Tech of the Semester	Receive a Senior Tech of the Semester award	M	K, A	H
Awarded!	Receive a monthly award	PS	K, A	H
Awarded Again!	Receive more than one monthly award in a semester	E	K, A	H
Notable Recognition	Receive 5 or more monthly awards while working for Techworks	M	K, A	H
Retire My Jersey	Receive any combination of Tech, Senior Tech or Rookie of the Semester (or multiple of one)	V	K, A	H
Well Rounded	Receive any combination of semester awards during multiple semestesrs (e.g. Tech Guru and Community Builder)	M	K, A	H
Consistently Consistent	Receive any single semester award during multiple semesters (e.g. Tech Guru multiple times)	M	K, A	H
Helping Hand	Receive your first positive customer service survey	N	K, S	E
Helping Hand x5	Receive 5 positive customer service surveys	PS	K, S	E
Helping Hand x10	Receive 10 positive customer service surveys	PS	K, S	E
Helping Hand x25	Receive 25 positive customer service surveys	PS	K, S	S
Helping Hand x50	Receive 50 positive customer service surveys	E	K, S	S
Helping Hand x100	Receive 100 positive customer service surveys	E	K, S	S
Helping Hand x175	Receive 175 positive customer service surveys	M	K, S	S

Table C-1. Continued

Achievement title	Threshold	ML	PT	F
Helping Hand x250	Receive 250 positive customer service surveys	V	K, S	S
Customer Driven	Receive 20 positive customer service surveys in a single semester	M	K, S	S
Customer Focused	Receive 40 or more positive customer service surveys in a single semester	V	K, S	S
Your first review!	Attend your first midterm review	N	A, S, E	P
More Midterms x 2!	Attend 2 midterm reviews	PS	A, S	P
More Midterms x 4!	Attend 4 midterm reviews	E	A, S	P
More Midterms x 6!	Attend 6 midterm reviews	M	A, S	P
More Midterms x 8!	Attend 8 midterm reviews	V	A, S	P
Your First Report!	Complete your first monthly report	N	K, A, E	E
Reporting in x 6	Complete 6 monthly reports	PS	K, A	E

APPENDIX D
ABBREVIATION KEY FOR ACHIEVEMENT LIST AND DYNAMICS MAPPING

Table D-1. Abbreviation key for achievement list and dynamics mapping

Abbreviation	Detail
ML	Mastery Levels – this abbreviation is a title header referencing the five levels of mastery (Dreyfus & Dreyfus, 1980).
--N	Novice – one of the five levels of mastery associated with being new to a system.
--PS	Problem Solver – one of the five levels of mastery associated with minimal experience within a system.
--E	Expert – one of the five levels of mastery associated with beginning to understand a system.
--M	Master – one of the five levels of mastery associated with understanding the system and spending significant time in the system.
--V	Visionary – one of the five levels of mastery associated with identifying new ways to improve the system due to high level of understanding.
PT	Player Types – this abbreviation is a title header referencing the four player types (Bartle, 1996).
--K	Killers – one of the four player types with motivation stemming from engaging with other players and competition.
--A	Achievers – one of the four player types with motivation stemming from completing tasks and goals.
--S	Socializers – one of the four player types with motivation stemming from collaborating with others.
--E	Explorers – one of the four player types with motivation stemming from exploring different aspects of an environment.
F	Types of Fun – this abbreviation is a title header referencing the four types of fun (Lazzaro, 2004).
--E	Easy Fun – fun associated with open-ended curiosity.
--S	Serious Fun – fun associated with open-ended relaxation and excitement.
--P	People Fun – fun associated with goal-oriented social amusement.
--H	Hard Fun – fun associated with goal-oriented triumph over challenges.

APPENDIX E
IMI SURVEY

(Deci & Ryan, n.d.)

TASK EVALUATION QUESTIONNAIRE

For each of the following statements, please indicate how true it is for you, using the following scale:

1	2	3	4	5	6	7
not at all true			somewhat true			very true

1. While I was working on the task I was thinking about how much I enjoyed it.
2. I did not feel at all nervous about doing the task.
3. I felt that it was my choice to do the task.
4. I think I am pretty good at this task.
5. I found the task very interesting.
6. I felt tense while doing the task.
7. I think I did pretty well at this activity, compared to other students.
8. Doing the task was fun.
9. I felt relaxed while doing the task.
10. I enjoyed doing the task very much.
11. I didn’t really have a choice about doing the task.
12. I am satisfied with my performance at this task.
13. I was anxious while doing the task.
14. I thought the task was very boring.
15. I felt like I was doing what I wanted to do while I was working on the task.
16. I felt pretty skilled at this task.
17. I thought the task was very interesting.
18. I felt pressured while doing the task.
19. I felt like I had to do the task.
20. I would describe the task as very enjoyable.
21. I did the task because I had no choice.
22. After working at this task for a while, I felt pretty competent.

APPENDIX F
MODIFIED IMI SURVEY

Techworks Portal Achievement Questionnaire

For each of the following statements, please indicate how true it is for you, using the following scale:

1	2	3	4	5	6	7
not at all true			somewhat true			very true

1. While I was working on earning achievements in the Techworks Portal I was thinking about how much I enjoyed it.
2. I did not feel at all nervous about earning achievements in the Techworks Portal.
3. I felt that it was my choice to earn achievements in the Techworks Portal.
4. I think I am pretty good at earning achievements in the Techworks Portal.
5. I found earning achievements in the Techworks Portal very interesting.
6. I felt tense while earning achievements in the Techworks Portal.
7. I think I did pretty well at earning achievements in the Techworks Portal, compared to other employees.
8. Earning achievements in the Techworks Portal was fun.
9. I felt relaxed while earning achievements in the Techworks Portal.
10. I enjoyed earning achievements in the Techworks Portal very much.
11. I didn’t really have a choice about earning achievements in the Techworks Portal.
12. I am satisfied with my performance at earning achievements in the Techworks Portal.
13. I was anxious while earning achievements in the Techworks Portal.
14. I thought earning achievements in the Techworks Portal was very boring.
15. I felt like I was doing what I wanted to do while I was working on earning achievements in the Techworks Portal.
16. I felt pretty skilled at earning achievements in the Techworks Portal.
17. I thought earning achievements in the Techworks Portal was very interesting.
18. I felt pressured while earning achievements in the Techworks Portal.
19. I felt like I had to earn achievements in the Techworks Portal.
20. I would describe earning achievements in the Techworks Portal as very enjoyable.
21. I earned achievements in the Techworks Portal because I had no choice.
22. After working at earning achievements in the Techworks Portal for a while, I felt pretty competent.

APPENDIX G
IMI SURVEY RESPONSES MEANS AND STANDARD DEVIATIONS

Table G-1. IMI survey responses – means and standard deviations

Survey statement	Factor	Mean	Standard deviation
While I was working on earning achievements in the Techworks Portal I was thinking about how much I enjoyed it.	Interest and Enjoyment	4.733	1.751
I did not feel at all nervous about earning achievements in the Techworks Portal.	Pressure and Tension	6.533	0.743
I felt that it was my choice to earn achievements in the Techworks Portal.	Perceived Choice	6.400	0.828
I think I am pretty good at earning achievements in the Techworks Portal.	Perceived Competence	5.467	1.187
I found earning achievements in the Techworks Portal very interesting.	Interest and Enjoyment	5.333	1.496
I felt tense while earning achievements in the Techworks Portal.	Pressure and Tension	1.467	0.834
I think I did pretty well at earning achievements in the Techworks Portal, compared to other employees.	Perceived Competence	4.800	1.474
Earning achievements in the Techworks Portal was fun.	Interest and Enjoyment	5.600	1.404
I felt relaxed while earning achievements in the Techworks Portal.	Pressure and Tension	6.333	0.816
I enjoyed earning achievements in the Techworks Portal very much.	Interest and Enjoyment	5.800	1.373
I didn’t really have a choice about earning achievements in the Techworks Portal.	Perceived Choice	2.267	1.944
I am satisfied with my performance at earning achievements in the Techworks Portal.	Perceived Competence	5.733	1.033
I was anxious while earning achievements in the Techworks Portal.	Pressure and Tension	1.533	0.915
I thought earning achievements in the Techworks Portal was very boring.	Interest and Enjoyment	2.333	1.291
I felt like I was doing what I wanted to do while I was working on earning achievements in the Techworks Portal.	Perceived Choice	5.400	1.242

Table G-1. Continued

Survey statement	Factor	Mean	Standard deviation
I felt pretty skilled at earning achievements in the Techworks Portal.	Perceived Competence	5.133	1.506
I thought earning achievements in the Techworks Portal was very interesting.	Interest and Enjoyment	5.333	1.234
I felt pressured while earning achievements in the Techworks Portal.	Pressure and Tension	1.467	0.743
I felt like I had to earn achievements in the Techworks Portal.	Perceived Choice	2.267	1.534
I would describe earning achievements in the Techworks Portal as very enjoyable.	Interest and Enjoyment	5.533	1.187
I earned achievements in the Techworks Portal because I had no choice.	Perceived Choice	2.333	1.952
After working at earning achievements in the Techworks Portal for a while, I felt pretty competent.	Perceived Competence	5.600	1.121

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BIOGRAPHICAL SKETCH

Paul Wolff is an information technology professional and leader in education at a major research university. He holds an Ed.D from the University of Florida (2017) in Curriculum and Instruction, with a concentration in Educational Technology, a Master of Science from the University of North Carolina at Chapel Hill in Information Science (2010), a Master of Arts from the University of North Carolina at Chapel Hill in Teaching (2003), and a Bachelor of Arts from the University of North Carolina at Chapel Hill in History (2002). His research interests and professional experience include designing technology tools and applications, gamification implementations, the use of mobile technology, and performance improvement in workplace settings.