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Assessing the Fit Between Child Welfare Information Systems and Frontline Workers: Development of a Task-Technology Fit Instrument

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ASSESSING THE FIT BETWEEN CHILD WELFARE INFORMATION SYSTEMS

AND FRONTLINE WORKERS:

DEVELOPMENT OF A TASK-TECHNOLOGY FIT INSTRUMENT

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ABSTRACT

ASSESSING THE FIT BETWEEN CHILD WELFARE INFORMATION SYSTEMS AND FRONTLINE WORKERS: DEVELOPMENT OF A TASK-TECHNOLOGY FIT INSTRUMENT

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Old Dominion University, 2014
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States and the federal government continue to invest heavily in child welfare information systems (CWIS) to improve caseworkers' performance, but the extent to which these systems meet caseworkers' needs is unclear. In the field of child welfare there are no reliable user-evaluation measures states can use to assess the degree to which a CWIS meets caseworkers' needs, and identify which specific features of the CWIS most need improvement. The study developed such a measure based on the task-technology fit (TTF) framework, which posits that users will evaluate the usefulness of a technology based on how well it meets their tasks needs and individual abilities.

Concept mapping with caseworkers was used to produce an initial pool of 100 items and 10 dimensions that measure various facets of TTF, which is the central construct of the TTF framework. The items and dimensions were refined with survey responses from 240 caseworkers based on factor analysis and psychometric testing, which yielded a 4-factor TTF construct related to Case Tracking and Prioritizing, IT Support, CWIS Training, and Data Capture and Control. Structural equation modeling was used to test the propositions suggested by the TTF framework, namely that individual, task, and technology characteristics impact user evaluations of TTF, and that

TTF impacts individual performance. There was mixed support for the hypotheses in the TTF framework: Workers with more experience on the CWIS gave significantly higher evaluations on all four TTF dimensions. Workers who viewed the CWIS as more compatible with their work style (Work Compatibility) gave significantly higher evaluations on Data Capture and Control. Higher evaluations on Case Tracking and Support was positively and significantly related to Individual Performance. No support was found for the relationship between Task Characteristics, worker type, and urban/rural setting on any TTF dimension. The analysis found support for an unanticipated positive and direct relationship between Work Compatibility and Individual Performance, such that workers who viewed the CWIS as more compatible with their work style reported greater levels of Individual Performance. Work Compatibility explained most of the variance in Individual Performance, and suppressed the effect of other variables in the TTF framework.

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CHAPTER 1

INTRODUCTION

States and the federal government continue to invest heavily in child welfare information systems (CWIS) to improve caseworkers' performance, but the extent to which these systems meet caseworkers' needs is unclear. In the field of child welfare there are no reliable user-evaluation measures states can use to assess the degree to which a CWIS meets caseworkers' needs, and identify which specific features of the CWIS most need improvement. This study developed such a measure based on the task-technology fit (TTF) framework, which posits that users will evaluate the usefulness of a technology based on how well it meets their tasks needs and individual abilities.

Child welfare information systems are automated case management tools used by child welfare agencies to facilitate the delivery of child welfare services, such as adoption, foster care, and child protection. Task technology fit, a construct in the TTF framework, refers to the degree to which a technology supports an individual's tasks. Although reports of worker frustration with CWIS suggest a poor fit between the two (Child Welfare League of America, 2003; Committee on Ways and Means, 2004; Moses, Weaver, Furman, & Lindsey, 2003), fit has never been empirically assessed in CWIS evaluations. Instead, researchers tend to evaluate CWIS using broad constructs (such as user satisfaction) (see e.g., Arkansas Legislative Analysis Research and Planning Section, 2000) which fail to explain why a given technology is or is not meeting users' needs. Fit, on the other hand, is a multidimensional construct, meaning it assesses users' experiences across multiple attributes of the technology, such as data quality, IT support, and ease of use. A feedback score is provided for each attribute, thus giving evaluators detailed information on what specific features of the technology need improvement. Evaluations of CWIS also suffer from lack of standardization: primarily state personnel using custom feedback surveys which lack established validity and reliability. The lack of standard methodology makes it impossible to compare results of evaluations across multiple CWIS. These limitations undermine the usefulness of CWIS evaluations and were the motivation for this study.

Child welfare information systems emerged in the early 1990s when the federal government began funding their development and implementation across the country. States could receive up to 75% matching funds to develop a CWIS, so long as it became the sole case management tool (and official case record) for children and families served by the state's social service agencies (U.S. Department of Health and Human Services Administration for Children and Families Division of State Systems, 2013a). Since that time, CWIS have become a cornerstone of casework and are used in every state. More than 2.5 billion dollars have been invested in CWIS, but that figure continues to rise as more states develop and expand their systems (U.S. Government Accountability Office, 2003a).

States have faced significant challenges developing and implementing CWIS that support caseworkers needs (Child Welfare League of America, 2003; U.S. Government Accountability Office, 2003a). Challenges include lack of training for workers, poor interface design, and system instability. Although CWIS should by design free workers from manual processes so they can spend more time with families, workers in several states report having trouble balancing time between seeing families and the demands of data entry (U.S. Government Accountability Office, 2003b). Despite these problems the science of CWIS evaluation and research remains underdeveloped. Whereas the health care IT field has almost 40 journals and publications dedicated to evaluating health care technologies (Institute of Medical Biometry and Medical Informatics, 2010), the human services field has one (*The Journal of Technology in Human Services*). As of 2003 (the latest date for which a national review was performed), no state had conducted a formal evaluation of their CWIS and only two evaluation studies have been published in a peer-reviewed journal (U.S. Government Accountability Office, 2003a; Weaver, Moses, Furman, & Lindsey, 2003; Zorn, 2003).

Statement of the Problem

Reliable user evaluations are required to thoroughly understand what contributes to the fit or lack of fit between caseworkers and CWIS. In child welfare, however, many states do not have the time and resources needed to develop an evaluation instrument that is psychometrically sound and informed by theory and research in information system evaluation (Hakkinen, Turunen, & Spil, 2003). Instead, states manage with either not evaluating their CWIS or developing their own ad-hoc surveys with little to no data on their reliability and validity. Many of these surveys have no apparent theoretical basis and do not control for factors that are known to influence a worker's evaluation of the system, such as her comfort with computers, experience with the system, and the nature of her tasks. These limitations may obscure or overlook the underlying problems and prevent evaluators from making targeted improvements to their CWIS.

Purpose of the Study

This study developed and validated a survey instrument that measures the degree to which a state's CWIS and services meet caseworkers' needs. The instrument was conceptually based on the task-technology fit (TTF) theory in which the correspondence between an information system's functionality and the users' task requirements leads to positive user evaluations of TTF and positive ratings of job performance. The instrument also measures how workers' assessments of fit are affected by characteristics of the worker (e.g., experience with the CWIS), her tasks (e.g., level of difficulty; CPS vs. Foster Care/Adoption vs. Generic), and her work setting (rural vs. urban).

Significance of the Study

Child welfare information systems were developed to make caseworkers more effective in serving children and families in the child welfare system. In order to verify that this has happened, evaluators must collect reliable feedback from caseworkers regarding how well their CWIS supports their needs. Collecting such feedback is not possible given the lack of CWIS survey instruments with known reliability and validity. This study remedies this problem by developing an instrument that is grounded in theory, psychometrically sound, and designed specifically for CWIS and caseworker populations. The instrument provides detailed feedback that evaluators can use to make targeted improvements in their CWIS, and shows how feedback might vary by characteristics of the worker and her tasks. The instrument can be used to collect feedback from workers in foster care, adoption, child protection, or any combination of the above. This study is novel because it uses both theory and input from end users to guide the development of an end-user instrument. Lastly, information from this study will also contribute to the knowledge base of IT research in child welfare and stimulate more research on how CWIS and related technologies can improve worker performance and ultimately outcomes for children and families.

Theoretical Framework: Task-Technology Fit (TTF) Framework

The instrument developed in this study is based on the task-technology fit (TTF) framework. The central premise of the TTF framework is that users will evaluate the usefulness of technology based on the extent to which it meets their tasks needs and individual abilities (Goodhue, 1995). As seen in Figure 1, the framework consists of four constructs: individual characteristics, task characteristics, technology characteristics, TTF, and individual performance.

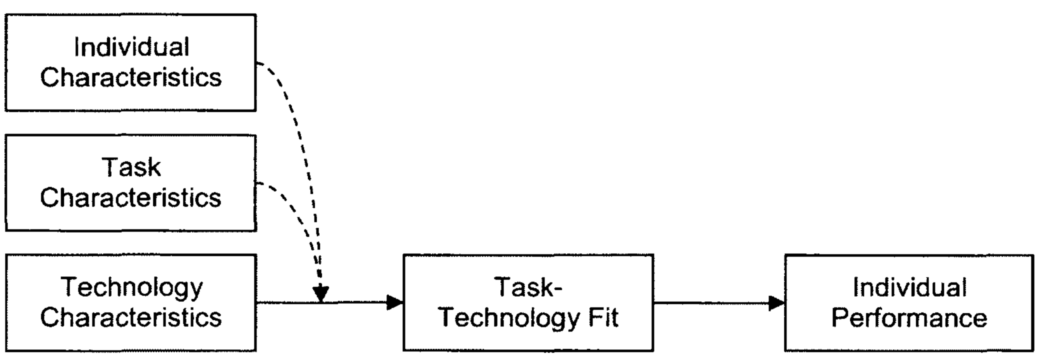

Figure 1. Framework for Understanding Task-Technology Fit (Goodhue & Thompson, 1995).

The TTF construct measures the extent to which the user's various task needs are being met by the technology. The more those needs are met, the greater the fit which should lead to better individual performance. Technology characteristics (e.g., functionality) exerts the greatest influence on TTF, but its influence is moderated by individual characteristics (e.g., experience with the system) and task characteristics (i.e., nature of the tasks required for the job; e.g., routine vs. complicated). For example, two individuals using the same technology may report different levels of fit due to individual differences, their task portfolio, or both. In studies involving only one technology (as is the case with this study), technology characteristics is usually a constant, in which case individual characteristics and task characteristics are presumed to have a direct effect on TTF.

Task-technology fit has been studied extensively in the business IT setting, and has led to a TTF "profile" for business managers who use information systems for decision-making. The profile suggests that for technology to be helpful to business managers it must address twelve key dimensions: the technology must be *easy to use* and *reliable; assistance* must be available when problems arise; and the data must be *accurate*, *current*, at the *right level of detail*, *easy to locate*, *easy to access*, *not confusing*, *meaningful*, *presented clearly,* and *compatible* with data stored in other systems.[1] These dimensions can be measured with a user-evaluation questionnaire

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[1] Similar TTF profiles have been developed for end-users of other technologies, including electronic medical record systems (Ammenwerth, Mansmann, Iller, & Eichstädter, 2003), software development

consisting of multiple statements (i.e., measurement items) which tap each dimension. High scores suggest good fit (i.e., between that dimension and the user's task); low scores suggest poor fit. Individual performance is usually assessed by asking users to rate the impact of the technology on their job, usually in terms of perceived productivity and effectiveness (W.H. DeLone & McLean, 2003; Goodhue & Thompson, 1995). In the context of this study, the task is Case Management, the technology is the CWIS, and performance is how well case workers perform Case Management.

Because TTF user-evaluations provide feedback on distinct attributes of the technology environment, evaluators can make focused decisions about unmet needs and what corrective actions to pursue. As a multidimensional construct, TTF goes beyond other theoretical models by measuring more explicitly how separate but related aspects of technology affect users' evaluations of fit and ultimately their job performance. As a result, TTF can identify more precisely what aspects of an information system is or is not meeting users' needs (Goodhue & Thompson, 1995).

Overview of Methods

The purpose of this study was to develop a reliable and valid user-evaluation TTF instrument to assess the extent to which CWIS meets caseworkers' needs when performing case management. The instrument was developed over three stages: item pool development, scale development, and scale evaluation. Each stage involved the

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tools (Dishaw & Strong, 1998b), e-commerce systems (Klopping & McKinney, 2004), e-learning programs (Larsen, Sørebø, & Sørebø, 2009), and even the world wide web (D'Ambra & Wilson, 2004).

participation of CPS, adoption, foster care, and generic workers from Virginia, which was chosen as a convenience sample.

In item pool development, three focus groups comprising 18 workers generated items for the TTF construct. In scale development, approximately 40 caseworkers rated the importance of each item and sorted them into preliminary subscales using a method called concept mapping (Kane & Trochim, 2007). The items were then put into questionnaire format and administered to a stratified random sample of approximately 420 caseworkers. The questionnaire also included demographic questions and scales from the literature to measure the non-TTF constructs in the TTF framework (i.e., individual characteristics, task characteristics, and individual performance). Confirmatory (CFA) and exploratory factor analysis (EFA) was used to confirm or explore the scale structure suggested by the concept mapping and refine the scales so they were factorially distinct and internally reliable. In scale evaluation, structural equation modeling (SEM) was used to examine the relationship of TTF to the other constructs as suggested by the TTF framework (i.e., nomological validity). These three stages correspond to the four aims of this study (scale development spans two aims):

1. Develop item pool - Develop a pool of items to measure TTF, which for this study is the degree to which a CWIS meets the needs of frontline caseworkers performing case management.
2. Develop preliminary TTF dimensions and scales – Identify from the item pool preliminary dimensions of TTF and the scales to measure each dimension.

3. Establish the instrument's structural validity – Confirm or refine the preliminary scale structures to achieve adequate levels of reliability.
4. Establish the instrument's nomological validity – Test the relationship among TTF and other constructs as suggested by the TTF framework, namely that individual, task, and technology characteristics impact user evaluations of TTF, and that TTF impacts individual performance.

Delimitations

Task-technology fit is one of several constructs in a larger conceptual framework (called the Technology-to-Performance Chain [TPC]) that posits multiple direct, indirect, and mediating relationships to explain the impact of technology on an individual's job performance (Goodhue & Thompson, 1995). It is beyond the scope of this study to examine this entire framework. This study developed the TTF construct and tests its relationship with the top half of the TPC model, which posits that individual, task, and technology characteristics affect workers' evaluations of TTF, which further affects individual performance (i.e., Figure 1 shown earlier). The study did not address the bottom half of the TPC model, which describes factors affecting use of the technology, the impact of TTF on use, and the role of use in individual performance. Nor did this study explore the relationship between TTF and distal outcomes, like service delivery and client outcomes. Although these questions are important, it was not feasible to assess them in this study.

Limitations

One limitation concerns the TTF instrument's generalizability. Because the TTF instrument was developed and tested with caseworkers from one state using one CWIS, the TTF profile may not be as valid for caseworkers in other states using a different CWIS. For instance, the initial TTF item pool originated from the responses of 18 caseworkers who participated in focus groups. Another group of caseworkers with different CWIS experiences and attitudes may have generated different items and, consequently, different dimensions of TTF. There may also be concerns regarding the instrument's content validity. Critics of concept mapping argue that concept maps (i.e., the clusters into which caseworkers rated and sorted their statements) reflect workers' understanding of the domain, but not necessarily their knowledge of it (Albert & Steiner, 2005). Consequently, the TTF instrument produced in this study may not represent all facets of TTF. To assess content validity a future study could compare the items, concept maps, and scales generated by caseworkers in this study with the same elements generated by experts in CWIS and case management. A high similarity between the caseworkers and experts would provide support for content validity (Albert & Steiner, 2005).

Organization of the Study

Chapter 1 covers the background, purpose, overview, and limitations of the study. It reviews briefly the history of CWIS, the theory of task-technology fit (TTF), and the advantage of using TTF to evaluate CWIS.

Chapter 2 reviews the literature relevant to this study. The chapter first describes the child welfare system, the services it provides and the children who receive them, and the types and demographics of caseworkers. The next section describes the historical events that led to the need for CWIS, the current status of CWIS across the country, and the challenges states have faced implementing them. The review continues with a synthesis of the research and evaluation literature on CWIS and other child welfare technologies, as well as broader review of social workers' history and use of technology. The next sections discuss this study's theoretical framework (task-technology fit), its constructs and propositions, and the link between caseworker tasks and TTF. The chapter concludes with a review of traditional techniques for developing and validating new instruments, and how those techniques can be supplemented with a technique called concept mapping.

Chapter 3 outlines the methods (sampling frame, data collection procedures, and analysis plan), research questions, and hypotheses for each aim of the study. It describes how data were collected in three stages from three independent samples of caseworkers, using focus groups (to develop the item pool), an online rating and sorting activity (to develop the preliminary TTF dimensions and scales), and a survey (to establish the instrument's structural and nomonological validity). Chapter 3 also discusses the use of random stratified sampling, the use of Dillman's tailored design method to maximize survey response rates (Dillman, Smyth, & Christian, 2008), and the protection of human subjects.

Chapter 4 reviews the results, by study aim and research question. The chapter summarizes the demographic characteristics of each sample and the participation rates at each stage of data collection. Also described is the iterative use of the sorting and rating data to select a concept map that best reflects the preliminary dimensions TTF, and how challenges with identifying an interpretable concept map were addressed. The section for Aim 3 details how results from the concept mapping and factor analysis were used to test various measurement models and arrive at one with the strongest statistical and theoretical fit to the data. The last section describes the results of the structural equation modeling which tested the relationship between TTF and the various constructs in the TTF framework.

Chapter 5 provides a concise summary of the entire study and summarizes the key findings and conclusions. It discusses implications for the results as well as suggested areas of future research.

CHAPTER 2

LITERATURE REVIEW

The Child Welfare System

The child welfare system is comprised of a network of public and private agencies which provide protective, adoption, and foster care services to children and families at risk for abuse and neglect. The goal of these services is "to promote the well-being of children by ensuring safety, achieving permanency, and strengthening families to care for their children successfully" (Child Welfare Information Gateway, 2013). States have primary responsibility for providing these services, but the federal government assists them through legislative initiatives, funding of programs, monitoring performance against national standards, ensuring compliance with federal laws, and providing technical support (Child Welfare Information Gateway, 2013). The primary responsibility of the federal government's role rests with the Children's Bureau within the Administration on Children, Youth, and Families, Administration for Children and Families, U.S. Department of Health and Human Services.

Child welfare systems are considered state-administered (39 states including the District of Columbia), county-administered but state-supervised (9 states), or a "hybrid" of the two approaches (3 states) (Child Welfare Information Gateway, 2012). Virginia (where this study took place) is a county-administered system. A national survey in 2001 identified more than 3,000 U.S. counties with child welfare agencies (U.S. Department of Health and Human Services Administration for Children and Families, 2001).

Most children and families first enter the child welfare system due to a report of suspected abuse or neglect (i.e., child maltreatment). State definitions of maltreatment vary but all must meet a minimum federal standard which defines child maltreatment as "any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation, or an act or failure to act which presents an imminent risk of serious harm" (*Child Abuse Prevention and Treatment Act (CAPTA) Reauthorization Act of 2010*, 2010, p. 6). States vary in how they respond to reports of maltreatment and determine whether a child was a victim, but the general framework is outlined in Figure 2.

Child Protective Service (CPS) workers receive most reports of suspected child maltreatment, which are either "screened in" (for investigation or assessment) or "screened out" (Child Welfare Information Gateway, 2013). The screening decision is generally based on whether the report meets the state's legal definition of maltreatment and if sufficient information is provided to warrant an investigation. In federal fiscal year (FFY) 2012, CPS agencies screened in approximately 2.1 million (out of 3.4 million) referrals alleging child maltreatment and established that 686,000 children were victims (U.S. Department of Health and Human Services Administration for Children and Families Administration on Children Youth and Families Children's Bureau, 2012).

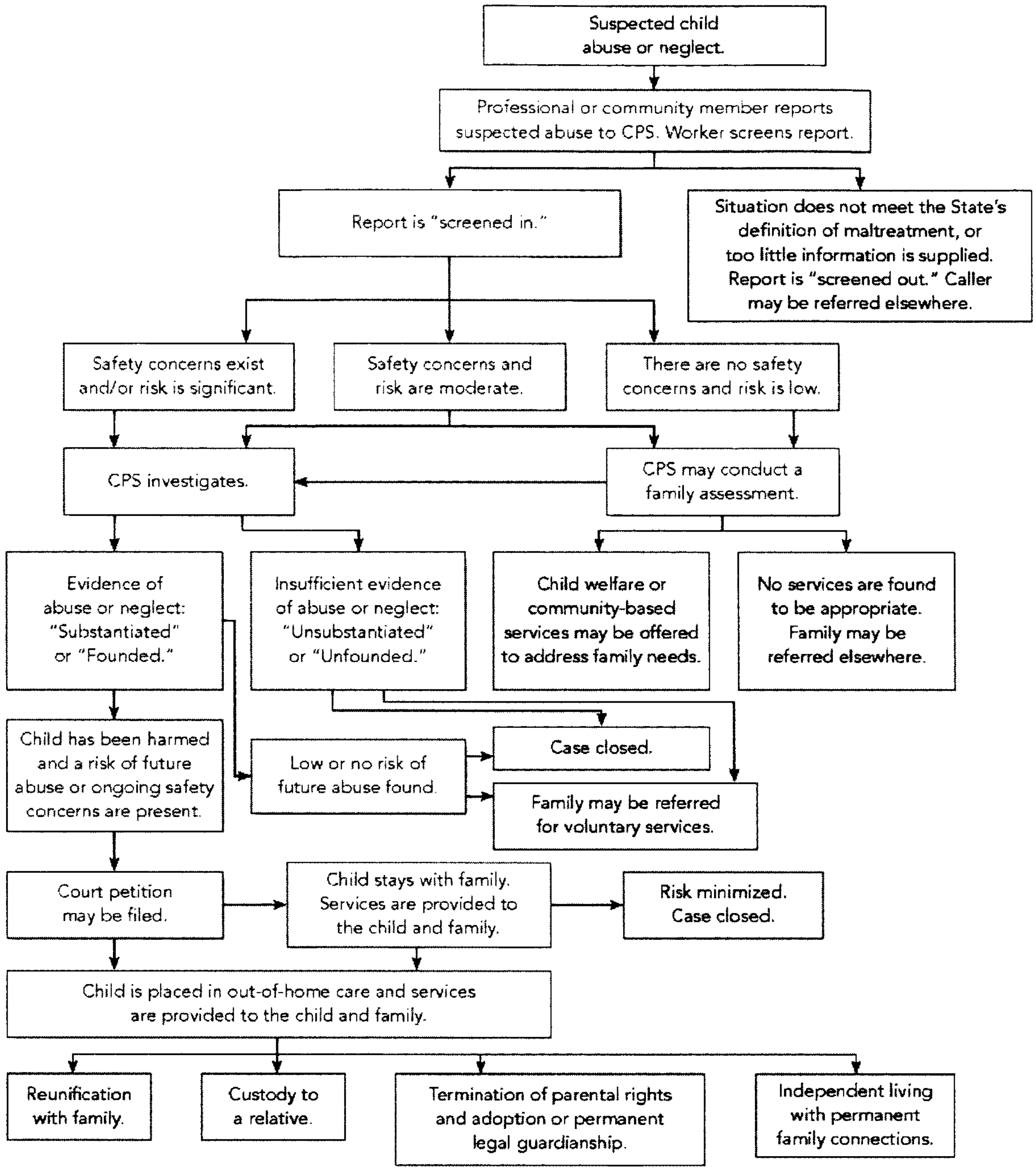

Figure 2. Overview of Steps Followed by Cases through the Child Protective Services and Child Welfare Systems (Child Welfare Information Gateway, 2013).

When children and families enter the child welfare system agencies provide two types of services: preventive and post-investigative (U.S. Department of Health and Human Services Administration for Children and Families Administration on Children Youth and Families Children's Bureau, 2012). Preventive services are provided to parents and caregivers whose children may be at risk for maltreatment. Examples include parenting education, individual and family counseling, substance abuse treatment, respite care, daycare, housing assistance, and home visits. Post-investigative services focus on ensuring the safety of the child. Examples include case management; individual and family counseling; and in-home, foster care, adoption, or court services. In FFY 2012, preventive and post-investigative services were provided to approximately 3.2 and 1.2 million children, respectively. Approximately 247,000 of these children received foster care services (U.S. Department of Health and Human Services Administration for Children and Families Administration on Children Youth and Families Children's Bureau, 2012).

Child Welfare Caseworkers

Caseworker Roles. The primary role of most child welfare workers is to provide services and case-management related to CPS, foster care, and adoption. CPS workers "provide child welfare first responder services to families in which a child has been reported as a victim of or at risk of abuse or neglect" (American Public Human Services Association, 2005, p. 50). Some states hire more specialized CPS workers, called in-home protective service workers, who "provide services to victims of abuse or neglect who remain at home with family or other caregivers" (American Public Human Services Association, 2005, p. 50). Foster care and adoption workers

> "provide services to families in which a child has been identified as a victim of abuse or neglect, and is either living in foster care or the court has approved a permanent out of home placement or termination of parental rights has been filed and adoption has been pursued" (American Public Human Services Association, 2005, p. 50).

Small counties often employ generic workers who work in all three areas of CPS, foster care, and adoption.

Child welfare workers are generally considered a subtype of social workers, although agencies vary in how they define "social worker." The National Association of Social Work (NASW) defines "professional social workers" as having completed a minimum number of hours of supervised fieldwork and holding a bachelor's (BSW), master's (MSW), or doctoral degree in social work from a school accredited by the Council on Social Work Education (National Association of Social Workers, 2010). "Licensed social workers" (LSWs) have passed a national examination and met certain education and training requirements which vary by state. Social workers may also hold additional credentials or certifications, most of which are regulated by the NASW's Credentialing Center (National Association of Social Workers, 2014). NASW currently offers two professional credentials and 15 specialty certifications (11 for MSWs and 4 for BSWs), all of which reflect additional training and experience with certain populations (e.g., children, youth and families) or practice (e.g., case management). Virginia requires LCWs to hold either a BSW with supervised experience or a MSW, pass the examination, and maintain continuing education requirements (Virginia Board of

Social Work, 2011). However, social workers employed by agencies funded by the Commonwealth are not required to hold licensure (*Code of Virginia, § 54.1-37-01*, 2010).

This study concerns only case-carrying child welfare workers who work in the public sector (i.e., federal, state, and local government child welfare agencies) and provide services directly to children and families. This population includes CPS workers, foster care and adoption workers, and case managers, but excludes paraprofessional staff. There are approximately 273,920 employed child, family, and school social workers in the U.S. (Bureau of Labor Statistics U.S. Department of Labor, 2012).[2] In Virginia, the child and family workers are designated by the job title "Social Worker" I through IV and a function code (e.g., CPS, foster care) that reflects their primary role(s). The roman numerals represent increasing levels of education, training, and experience, but minimum requirements for hire vary by county. Paraprofessional staff hold titles such as "Human Services Assistant" and "Social Services Assistant." As mentioned earlier, Virginia does not require public workers to hold a license (*Code of Virginia, § 54.1-37-01*, 2010). Consequently, this study does not attempt to generalize to child welfare workers employed in other sectors such as private non-profit, private for-profit (other than private practice), and private practice (i.e., self-employed), nor does it attempt to generalize to the population of licensed social workers.

Caseworker Demographics. Consistent and up-to-date demographic data on public sector child welfare workers is difficult to find, due to the varying ways that states

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[2] The Bureau of Labor Statistics does not provide a count that excludes school social workers.

define and regulate the profession and the lack of systematic data collection in place for this occupation. A 2004 survey completed by public child welfare administrators in 42 states found that average salaries ranged from $34,929 to $36,136 for four types of child welfare workers (CPS, in-home protective service workers, foster care and adoption workers, and multiple program workers) (American Public Human Services Association, 2005). Twenty-nine percent of the states required their CPS workers to hold a social work license; 42% of the states required the same for its foster care and adoption workers. Preventable turnover rates were highest among CPS workers (13%).[3] The median child caseload size was 18 for CPS, foster care and adoption workers, 38 for in-home protective services workers, and 19 for multiple program workers. Caseloads ranged from 9 to 80 children (American Public Human Services Association, 2005).

In 2004, NASW surveyed a random sample of 10,000 licensed social workers in the United States, stratified by region (NASW Center for Health Workforce Studies, 2006). The sample included social workers in all areas of practice (not just child welfare), so the findings do not necessarily represent those of the child welfare workforce. Among the respondents, the majority (80%) had a master's degree in social work, which in many states is the minimum qualification for licensure. Seventeen percent of workers reported fewer than five years of experience; 32% reported more than 20 years of experience. Sixty-two percent were 45 years or older and 81% were female. Thirteen

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[3] Preventable turnover was defined as turnover due to reasons other than retirement, death, marriage/parenting, returning to school, spousal job move, or intra-agency transfer (due to promotion, demotion, or lateral transfer). The rate was calculated by dividing the number of preventable turnovers for each worker group during calendar year 2003 by the number of authorized full-time equivalent positions on April, 2004.

percent of the respondents reported "child welfare/family" as among their practice areas; 60% of these workers worked in social service agencies (NASW Center for Health Workforce Studies, 2006).

Statewide Child Welfare Information Systems

History of Statewide Child Welfare Information Systems (CWIS). For many years the federal government lacked accurate information on the number of children in foster care and adopted families (Walter R. McDonald & Associates, 2009). To address this, Congress amended the Social Security Act which required the federal government institute a foster care and adoption data collection system (*Collection of data relating to adoption and foster care*, 1986). The process was delayed as the federal government sought input from states and other sources to further define the collection and reporting requirements, which were finally issued on December 22, 1993. The regulations established the Adoption and Foster Care Analysis and Reporting System (AFCARS) and required states to submit on a semiannual basis 103 data elements for every adopted and foster child served by the state's CW system.

When AFCARS regulations were issued, most states did not have an information system that was capable of meeting the reporting requirements (Walter R. McDonald & Associates, 2009). Many state CW agencies did not even have desktop computers available for their caseworkers. To offset states' limited resources, the federal government passed legislation to provide states with up to 75 percent enhanced funding to design, develop, and implement an automated data collection system known as a Statewide Automated Child Welfare Information System (SACWIS) (*Omnibus Budget*

Reconcilation Act of 1993, 1993). This legislation proposed a system that would not only support the collection and reporting of AFCARS data, but also help states improve outcomes for children and families:

> "When implemented, these information systems will result in more efficient and effective practices in administering child welfare programs which in turn will ultimately result in improved service delivery. Readily available information and automated procedures to assist in case assessments and plans will allow States to be more proactive in program administration and to focus efforts on preventive services and measures rather than constantly reacting to crisis. With a single statewide automated information system, States will realize more efficient and effective processes and procedures" (*Statewide Automated Child Welfare Information Systems, Final Rule*, 1995).

If this vision were borne out, these systems could have a measurable impact on the safety, permanency, and well-being of millions of children.

States were not required to build a system with the matching funds, but most opted for this choice due to the significant cost savings (U.S. Government Accountability Office, 2003a). Systems built with the matching funds are known officially as SACWIS, which refers to a specific category of CWIS, the generic term used to describe any statewide child welfare information system. Although SACWIS systems have to meet a set of core requirements and are subject to a federal review process, states retain wide flexibility regarding the development, design, and implementation.

Status and Characteristics of Child Welfare Information Systems. Figure 3 illustrates the current status of CWIS implementation across the United States. As of 2012, every state is in some phase of planning, developing, or implementing a CWIS system. Thirty-eight states and the District of Columbia are using or building a SACWIS and 13 states are considered non-SACWIS models (U.S. Department of Health and

Human Services Administration for Children and Families Division of State Systems, 2013b). Since 1993, total state and federal costs for the SACWIS initiative have totaled more than 2.4 billion dollars (U.S. Government Accountability Office, 2003a).

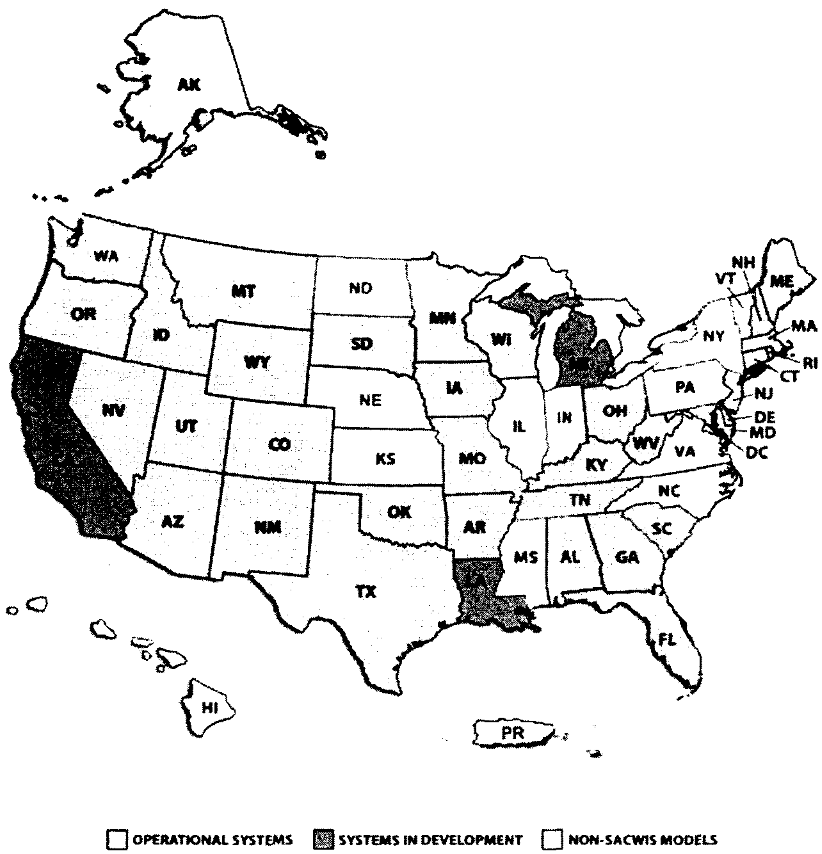

Figure 3. Status of SACWIS Systems across the United States (U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth and Families, 2012b).

Among the SACWIS states, 36 have what the federal government categorizes as "Operational Systems" and three states have "Systems In Development." The federal government further categorizes "Operational Systems" into five groups: SACWIS

Compliance Achieved (9 states), Enhancing to Maintain SACWIS Compliance (2 states), SACWIS Compliance Action Plans Approved (11 states), SACWIS Compliance Assessment Initiated (8), and Pending Assessment Review (6 states) (U.S. Department of Health and Human Services Administration for Children and Families Division of State Systems, 2013b). Compliance with SACWIS requirements is based on the extent to which the SACWIS meets federal guidelines. The guidelines include a list of 88 distinct functions (41 of which are required) SACWIS systems may support (U.S. Department of Health and Human Services Administration for Children and Families Division of State Systems, 1995). As will be discussed later, the federal assessment of compliance focuses on the presence or absence of required functionality; it does not focus on usability, or whether the feature improves outcomes like caseworker performance or service delivery.

Challenges with Child Welfare Information Systems. Most states have faced significant challenges developing CWIS that meet the needs of child welfare caseworkers (U.S. Government Accountability Office, 2003a). The degree of difficulty is reflected by the current status of state implementation of SACWIS systems: only nine states have achieved federal "Compliance" with their SACWIS, despite the availability of federal matching funds since 1993 (Child Welfare League of America, 2003; U.S. Department of Health and Human Services Administration for Children and Families Division of State Systems, 2013b). Some of the "non-SACWIS" states like New York and Virginia are so labeled because they tried, but failed to meet the SACWIS requirements. According to some leaders in the field and practitioners, many states have million-dollar systems which caseworkers underutilize, circumvent, or struggle with in their efforts to provide services to children and families (Child Welfare League of America, 2003; Committee on Ways and Means, 2004). Also, although many might assume that increased automation would reduce the amount of paperwork caseworkers must handle, many caseworkers report the opposite has occurred. In a 2004 national survey of licensed social workers, more than three-fifths of child welfare workers reported an increase in paperwork over the last two years as the greatest barrier to effective practice (Whitaker, Weismiller, & Clark, 2006).

Using Caseworkers to Evaluate Child Welfare Information Systems. Despite years of CWIS challenges, as of 2003 no state had formally evaluated their CWIS to determine how well it was meeting caseworkers' needs (U.S. Government Accountability Office, 2003a). Only two peer-reviewed studies that identified factors that influence caseworkers' assessments of their CWIS were available. Moses and colleagues (2003) surveyed users of California's CWIS and found that frustrations with data quality, accessibility, and system performance were related to low user satisfaction. Zorn's (2003) study of Minnesota's CWIS system identified both technological and non-technological factors that influenced workers' assessments of their CWIS. Technological factors included inadequate user training and lack of involvement of experienced practitioners in CWIS development. Non-technological factors included the requirement that workers collect data they do not need, workers' geographic setting, and work experience. Rural workers and workers with less work experience perceived more value in the CWIS in terms of job performance and service delivery (Zorn, 2003). It is important to note that these findings were incidental to the studies' aims, which was to assess the impact of the CWIS on workers' job attitudes, job performance, and satisfaction.

The Administration for Children and Families collects feedback from caseworkers about their states' CWIS during a federal review known as the SACWIS Assessment Review (U.S. Department of Health and Human Services Administration for Children and Families Division of State Systems, 2012). A review is conducted for each SACWIS system once it is fully operational. The assessment includes interviews and a system walk-through with a sample of caseworkers to assess how well the system meets their needs. (For a list of sample interview questions, see Appendix D in U.S. Department of Health and Human Services Administration for Children and Families Division of State Systems, 2011). However, it is difficult to draw conclusions from the feedback collected because the interview process is highly unstructured, the same interview questions are not asked of everyone, and the approach ACF uses to document results has changed over time. Also, results from the interviews are spread across multiple reports; a content analysis has never been done.

The Administration for Children and Families collects additional user feedback regarding CWIS from another type of federal review known as the Child and Family Service Reviews (CFSR) (U.S. Department of Health and Human Services Administration for Childen and Families, 2013). The CFSR is designed to ensure that each state is providing quality services to children and families. Part of this review involves interviews with state and local agency administrators, caseworkers and supervisors, and information system staff to determine how well the state's CWIS functions. (For a list of sample interview questions, see U.S. Department of Health and Human Services Administration for Children and Families, 2009). A content analysis of 35 CFSRs done between 2002 and 2004 found that 15 states reported problems with agency workers not entering information on a timely basis (U.S. Department of Health and Human Services Administration for Children and Families, 2007). The author's content analysis of all 51 CFSR reports confirmed this finding but also found problems with ease of use (40 states) and information quality (37 states) (Heisler & Okwara, 2008). Like the feedback from SACWIS Assessment Reviews, the CFSR results are limited: the same questions are not asked of everyone and the questions focus narrowly on the systems' ability to track the legal status and characteristics of children. Also, the feedback from multiple stakeholders (e.g., caseworkers, supervisors, and program managers) is pooled together, thus making it impossible to isolate concerns unique to caseworkers.

Studies of other child welfare technologies. Child welfare information systems are not the only type of child welfare technologies in use. In fact, computerization in social work dates back to the 1970s, long before the CWIS initiative began (Maxwell, 1999). This early use of technology was limited to supporting administrative functions such as processing financial transactions. Only much later was technology used to support the activities of caseworkers (Oyserman & Benbenishty, 1997), who soon developed a reputation of being antagonistic toward computerization (Cnaan, 1989; Roosenboom, 1995).

Until recently, caseworkers' resistance to technology was attributed primarily to an intrinsic negative attitude toward computers held by members of the social service profession (Phillips, 1990). This notion was fueled by workers' concerns that computers will reduce their power within the agency (Mandell, 1989) and threaten their autonomy (Gelman, Pollack, & Weiner, 1999). But subsequent studies using multivariate techniques have shown that workers' attitudes are among the weakest predictors of computer use (actual, perceived, or intended). Instead, some of the strongest predictors of use are system attributes such as ease of use, system stability, and information quality (Monnickendam & Eaglstein, 1993; Monnickendam, 1999; Mutschler & Hoefer, 1990). Not coincidentally, these three system attributes are among the key dimensions in previous conceptualizations of TTF.

The studies reviewed thus far provide some insight into factors that influence caseworkers' assessments of technology, but they are limited by their choice of the dependent variable. For instance, measuring computer use is of little value when use of the system is mandatory, as is the case with CWIS. And measuring the impact of technology on outcomes like job performance (e.g., Zorn, 2003) and attitudes (e.g., Moses et al., 2003), without learning why the technology affected these outcomes, provides little in the way of actionable data. Moreover, most of these studies are atheoretical and attempt to understand workers' experiences with technology from a rationalist perspective (Fitch, 2005).

Research on the relationship between caseworkers and technology has placed little emphasis on the tasks these workers perform (Munro, 2005). Specifically: To what extent does the technology fit with the tasks it was designed to support? Mutschler and

Hoefer (1990) expressed a similar concern 20 years ago when talking about the use of computer systems in human service organizations:

> "If administrators want to use computers for unstructured complex decision tasks, they need to invest a considerable amount of time and manpower to first identify the decision processes, the decision rules and the needed information related to such tasks as program planning, decisions related to treatment, and outcome evaluation" (p. 99).

These tasks reflect workers' principal needs and should therefore be the markers by which a given technology is evaluated. This is the focus of TTF.

Task-Technology Fit (TTF) Framework

This section summarizes the TTF framework and describes its key constructs and propositions. This is followed by a summary of scales that have been used to measure the constructs in the TTF framework and empirical findings regarding its propositions. This summary is limited to six representative TTF studies (Dishaw & Strong, 1999; Goodhue & Thompson, 1995; Goodhue, 1995, 1998; Klopping & McKinney, 2004; Staples & Seddon, 2004). The methods each of these studies used to develop their scales (e.g., confirmatory factor analysis) and test the propositions (e.g., multiple regression, path analysis) are described in detail in the later section, Measurement Validity of a New Instrument.

Overview of Framework. The central premise of the TTF framework is that users will evaluate the usefulness of technology based on the extent to which it meets their tasks needs and individual abilities (Goodhue, 1995). As seen in Figure 4, the framework consists of four constructs: individual characteristics, task characteristics, technology characteristics, TTF, and individual performance.[4]

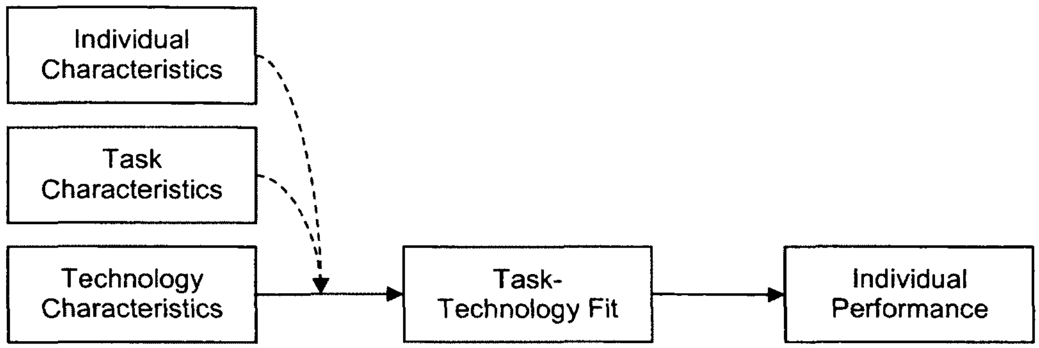

Figure 4. Framework for Understanding Task-Technology Fit (Goodhue & Thompson, 1995).

The TTF construct measures the extent to which the user's various task needs are being met by the technology. The more those needs are met, the greater the fit which should lead to better individual performance. Technology characteristics (e.g., functionality) exerts the greatest influence on TTF, but its influence is moderated by individual characteristics (e.g., experience with computers) and task characteristics (i.e., nature of the tasks required for the job; e.g., routine vs. complicated). For example, two individuals using the same technology may report different levels of fit due to individual differences, their task portfolio, or both. In studies involving only one technology,

[4] The TTF framework is sometimes included in a larger framework called the Technology to Performance Chain (Goodhue & Thompson, 1995), which also examines the impact of TTF on system use, the impact of TTF on predictors of system use, and the combined influence of TTF and system use on individual performance (Goodhue et al., 1997; Goodhue & Thompson, 1995; Staples & Seddon, 2004).

technology characteristics is usually a constant, in which case individual characteristics and task characteristics are presumed to have a direct effect on TTF.

Task-technology fit has been studied extensively in the business IT setting, and has led to a TTF "profile" for business managers who use information systems for decision-making. The profile suggests that for technology to be helpful to business managers it must address twelve key dimensions: the technology must be *easy to use* and *reliable; assistance* must be available when problems arise; and the data must be *accurate*, *current*, at the *right level of detail*, *easy to locate*, *easy to access*, *not confusing*, *meaningful*, *presented clearly,* and *compatible* with data stored in other systems.[5] These dimensions can be measured with a user-evaluation questionnaire consisting of multiple statements (i.e., measurement items) which tap each dimension. High scores suggest good fit (i.e., between that dimension and the user's task); low scores suggest poor fit. Individual performance is usually assessed by asking users to rate the impact of the technology on their job, usually in terms of perceived productivity and effectiveness (W.H. DeLone & McLean, 2003; Goodhue & Thompson, 1995). In the context of this study, the *task* is Case Management, the *technology* is the CWIS, and *performance* is how well case workers perform Case Management.

Because TTF user-evaluations provide feedback on distinct attributes of the technology environment, evaluators can make focused decisions about unmet needs

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[5] Similar TTF profiles have been developed for end-users of other technologies, including electronic medical record systems, software development tools, e-commerce systems, e-learning programs, and even the world wide web.

and what corrective actions to pursue. As a multidimensional construct, TTF goes beyond more simple evaluations of IT systems by measuring explicitly how separate but related aspects of technology affect users' evaluations of fit and, within the context of the full TTF framework, job performance. As a result, TTF can identify more precisely what aspects of an information system is or is not meeting users' needs (Goodhue & Thompson, 1995). The TTF model also "guides us away from thinking about particular systems characteristics or policies as being good or bad in themselves, encouraging us instead to rate systems as good or bad in relation to a task or set of tasks" (Goodhue, 1992, p. 306).

Task Domain. How one operationalizes TTF depends on the context and tasks being studied. This context refers to the task domain. For example, Goodhue (1998) developed a TTF profile to measure the degree to which an organization's information system and services support managers' decision-making needs (the task domain). Similar TTF profiles have been developed for other task domains, such as health professionals' use of IT for patient scheduling (Pendharkar, Rodger, & Khosrow-Pour, 2001), programmers' use of software engineering tools for software maintenance (Dishaw & Strong, 1998a), students' use of the web for online shopping (Klopping & McKinney, 2004), instructors' and students' use of e-learning programs (McGill & Hobbs, 2008), and use of the internet for personal day-to-day needs (D'Ambra & Rice, 2001).

The domain for this study is caseworkers' use of CWIS for case management. "Caseworkers" refer to case-carrying child protection, foster care, and adoption workers employed in public child welfare agencies. "Case management" refers broadly to the case-specific tasks these workers' perform, all of which are reviewed in the section, Caseworker Tasks and TTF.

Constructs in the TTF Framework.

Task-Technology Fit. Task-technology fit is the degree to which a technology assists an individual in performing his or her tasks (Goodhue, 1997). More specifically, "it is the fit among task requirements, individual abilities, and the functionality and interface of the technology" (Goodhue, 1997, p. 449). Technology refers broadly to hardware, software, and data as well as user support services like training and help desks. Task-technology fit can be measured by asking users to rate the extent to which the technology meets their needs across multiple dimensions (i.e., user evaluation) or by computing fit as an interaction variable (Venkatraman, 1989). The interaction approach involves matching the frequency of engaging a specific task with the availability of a corresponding supportive tool in the technology (i.e., Fit = f[task *tool]). It requires carefully controlled laboratory settings in which the task(s) and sometimes tool(s) can be manipulated, as was done by Dishaw, Strong, & Bandy (2003), Dishaw and Strong (1998b, 1999), Mathieson and Keil (1998), and Strong, Dishaw, and Bandy (2006). The interaction approach is not applicable to this study and interaction studies are not covered in the following review.

The first operationalization of TTF appeared in two studies by Goodhue (1995) and Goodhue and Thompson (1995). This TTF construct was developed and operationalized for a task domain in business: managerial use of organizational information for decision-making. Goodhue (1998) subsequently published a detailed paper describing the development and psychometric testing of his TTF instrument. It has since been reused, in part or in full, in several studies, although for different task domains. Goodhue's final instrument consisted of 12 TTF dimensions measured by 32 items on a 7-point agree-disagree scale (Table 1). Staples and Seddon (2004) operationalized TTF with 12 items spanning four dimensions, each measured with a subset of items from existing scales, none of which had been used explicitly to study TTF. The instrument measured TTF for two task domains: librarians' use of a library cataloging system for library tasks and students' use of word processors and spreadsheets for course-related work and personal activities. Klopping and McKinney (2004) used eight items to measure a unidimensional conceptualization of TTF for the use of e-commerce sites for online shopping. Items were taken from several of Goodhue's (1995) scales and combined; all were measured with a 5-point agree-disagree scale (Table 1). Dishaw and Strong's (1998a) TTF instrument consisted of four dimensions measured by 27 items on a 7-point agree-disagree scale. Each dimension was measured by combining two or more subscales developed by Goodhue (1992, 1995) (Table 1).

Table 1

Measures of Task-Technology Fit (TTF) Used in the TTF Literature

Source	Task Domain and Scale Properties	Scale Name	Scale Description (if provided)	Scale Measurement Items	No. of items	Cronbach's alpha
(Goodhue, 1998)	Managerial use of information for decision-making 12 dimensions, 32 items (7-point agree-disagree scale)	The Right Level of Detail	maintaining data at the right level or levels of detail [a]	Sufficiently detailed data is maintained by the corporation or division. The company maintains data at an appropriate level of detail for my purposes.	3	0.85
		Accuracy	correctness of data [a]	The data that I use or would like to use is accurate enough for my purposes. There are accuracy problems in the data I use or need.	3	0.83
		Compatibility	ease with which data from different sources can be aggregated or compared without inconsistencies	When it's necessary to compare or aggregate data from two or more different sources, there may be unexpected or difficult inconsistencies. There are times when supposedly equivalent data from two different sources is inconsistent. Sometimes it is difficult or impossible to compare or aggregate data from two different sources because the data is defined differently.	3	0.80

Table 1 Continued

Source	Task Domain and Scale Properties	Scale Name	Scale Description (if provided)	Scale Measurement Items	No. of items	Cronbach's alpha
		Locatability	ease of determining what data is available and where [a]	It is easy to locate corporate or divisional data on a particular issue, even if I haven't used that data before. It is easy to find out what data the corporation maintains on a given subject.	3	0.77
		Accessibility	ease of access to desired data [a]	I can get data quickly and easily when I need it. It is easy to get access to data that I need.	3	0.84
		Meaning	ease of determining what a data element on a report or file means, or what is included or excluded in calculating it [a]	The exact definition of data fields relating to my tasks is easy to find out.	2	0.77
		Assistance	ease of getting help on problems with the data [a]	I am getting the help I need in accessing and understanding the data. It is easy to get assistance when I am having trouble finding or using data.	3	0.87
		Ease of Use of Hardware & Software	ease of doing what I want to do using the system hardware and software for accessing and analyzing data [a]	It is easy to learn how to use the computer systems that give me access to data. The computer systems that give me access to data are convenient and easy to use.	3	0.77
		Systems Reliability	dependability of access and up-time of systems [a]	The data is subject to frequent system problems and crashes. I can count on the system to be "up" and available when I need it.	3	0.77

Table 1 Continued

Source	Task Domain and Scale Properties	Scale Name	Scale Description (if provided)	Scale Measurement Items	No. of items	Cronbach's alpha
		Currency	data is current enough to meet the user's needs	I can't get data that is current enough to meet my needs. The data is up-to-date enough for my purposes.	2	0.78
		Presentation		The data that I need is displayed in a readable and understandable form. The data is presented in a readable and useful format.	2	0.86
		Confusion		There are so many different systems or files, each with slightly different data, that it is hard to understand which one to use in a given situation. The data is stored in so many different places and in so many forms; it is hard to know how to use it effectively.	2	0.73

Table 1 Continued

Source	Task Domain and Scale Properties	Scale Name	Scale Description (if provided)	Scale Measurement Items	No. of items	Cronbach's alpha
(Staples & Seddon, 2004)	1) Librarian's use of a library cataloging system for library tasks 2) Student's use of word processors and spreadsheets for course-related personal activities 4 dimensions [b], 12 items (response format not published)	Work Compatibility [c]	"The degree to which an innovation is perceived as being consistent with existing values, needs, and experiences of potential adopters" (Venkatesh, Morris, Davis, & Davis, 2003).	Using the new system fits well with the way I like to work The system is compatible with all aspects of my work I have ready access to the system when I need it	3	0.76
		Ease of Use [d]		The system is easy to use The system is user friendly It is easy to get the system to do what I want it to do	3	0.84
		Ease of Learning [e]		The system is easy to learn It is easy for me to become more skillful at using the system New features are easy to learn	3	0.92

Table 1 Continued

Source	Task Domain and Scale Properties	Scale Name	Scale Description (if provided)	Scale Measurement Items	No. of items	Cronbach's alpha
		Information Quality [f]		Do you think the output is presented in a useful format? Is the system accurate? Does the system provide up-to-date information?	3	0.82
(Klopping & McKinney, 2004)	Use of e-commerce sites for online shopping 1 dimension, 8 items (5-point agree-disagree scale)	TTF [g]		Sufficiently detailed product information is maintained on product websites. On the websites I visit, product information is either obvious or easy to find out. I can get product information quickly and easily from a website when I need it. The online product information that I use or would like to use is accurate enough for my purposes. The online product information is up to date enough for my purposes. The online product information that I need is displayed in a readable and understandable form. The online product information maintained at websites is pretty much what I need to carry out my tasks. The product information is stored in so many forms it is hard to know how to use it effectively.	8	0.85

Table 1 Continued

Source	Task Domain and Scale Properties	Scale Name	Scale Description (if provided)	Scale Measurement Items	No. of items	Cronbach's alpha
(Dishaw & Strong, 1998a)	Programmers' use of software maintenance tools for software maintenance 4 dimensions, 27 items (7-point agree-disagree scale)	Intrinsic Fit		Combined items from Goodhue's (1992, 1995) Accuracy and Reliability scales	4	0.57
		Contextual Fit		Combined items from Goodhue's (1992, 1995) Currency and Level of Detail scales	5	0.70
		Representational Fit		Combined items from Goodhue's (1992, 1995) Compatibility, Meaning, Presentation, and Lack of Confusion scales	9	0.68
		Accessibility Fit		Combined items from Goodhue's (1992, 1995) Accessibility, Assistance, Ease of Use, and Locatability scales	9	0.91

[a] These definitions were also used as questions for the corresponding scale. However, they were presented to respondents on a separate page, where respondents were asked to indicate on 10-point scale (0 = Not at All Important to 10 = Extremely Important) "... how important in meeting your needs each aspect of the data environment is to you." This was done to satisfy respondents who wanted to rate the dimension as a whole.

[b] The authors subsequently combined these four dimensions into a second-order factor.

[c] All items from Moore and Benbasat (1991)

[d] First two items from Doll and Torkzadeh (1988); third item from Moore and Benbasat (1991)

[e] All items from Davis (1989) [f] All items from Doll and Torkzadeh (1988) [g] All items adapted from several of Goodhue's (1995) subscales

Individual Characteristics. Individual characteristics refer to characteristics of the computer user that could affect "how easily and well he or she will utilize the technology" (Goodhue & Thompson, 1995, p. 216). Examples include computer training (general or specific to the technology), computer experience (general or specific), cognitive or decision-making style, and motivation. For example, workers with more experience with the CWIS may be aware of functionality that fits the needs of the task, whereas workers with less experience may be unaware of the functionality. Consequently, the experienced worker may perceive good fit between the CWIS and her task while the inexperienced worker perceives poor fit. Individual characteristics has received little attention in the TTF literature, despite its hypothesized role in the framework. Goodhue (1995) measured individual characteristics with a single question about computer literacy which he developed based on Rockart and Flannery's (1983) categorization of end users (Table 2). Dishaw and Strong (2003) measured individual characteristics with one three-item scale that assessed the user's experience with the technology being studied (Table 2).

Tasks Characteristics. Tasks are the "... the actions carried out by individuals in turning inputs into outputs" (Goodhue & Thompson, 1995, p. 216). Task characteristics refer to the general characteristics of the individual's task portfolio – i.e., the nature of the tasks the individual must perform in order to carry out his or her job. Goodhue and Thompson (1995) measured tasks characteristics with two scales, one that measured the complexity (i.e., routineness) of the user's typical tasks, and one that measured the extent to which the tasks required involving other data sources or departments (i.e.,

Table 2

Measures of Individual Characteristics Used in the TTF Literature

(Goodhue, 1995)

Task Domain	Instrument Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
Managerial use of information for decision-making	1 dimension, 1 item (response format unclear)	Computer Literacy		Not published; adapted from Rockart and Flannery (1983)	1	NA

(Dishaw & Strong, 2003)

Task Domain	Instrument Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
Software maintainers' use of computer-aided software engineering (CASE) tools for software maintenance	1 dimension, 3 items (normalized 7-point scale)	Tool Experience [1]		How many total hours have you used this tool? (hours) How frequently do you use this tool? (seldom (1) – often (7)) How much experience do you have with this tool? (slight (1) – extensive (7))	3	0.72

[1] Because the items used different response scales, they were normalized to a 7-point scale before calculating a mean and alpha.

interdependence). Both were measured on a 7-point agree-disagree Likert scale. These authors also used job titles as a proxy measure of task characteristics, arguing that the kinds of tasks users engage in “should vary considerably from clerical staff to low-level managers to higher-level managers” (p. 222). Goodhue (1995) modified slightly Goodhue and Thompsons’s (1995) scales to measure tasks characteristics along the same two dimensions (Table 3).

***Technology Characteristics*.** In TTF, “technology” can be narrowly defined as the physical system being studied (e.g., the CWIS), or broadened to include software, discrete functionality, data, and user support services (e.g., training, help desk) provided to assist users (Goodhue & Thompson, 1995). In other words, “The model is intended to be general enough to focus on either the impacts of a specific system or the more general impacts of the entire set of systems, policies, and services provided by an IS department” (Goodhue & Thompson, 1995, p. 216). Technology characteristics are best measured using objective criteria, drawn either from system documentation, via self-report from an individual with extensive knowledge about technology(s), via consensus from a panel of individuals with extensive knowledge about the technology(s) (Goodhue, 1995), or any combination of the above. Using a source other than the users to measure technology avoids a possible “halo effect,” where an individual “biases his responses on characteristics of systems or services to be consistent with his responses on TTF” (Goodhue, 1995, p. 1835). In addition, users may not be knowledgeable about the full range of the systems’ functionality and features. Pendharkar, Khosrowpour, and Rodger (2001) erred by defining the technology construct with user evaluation

Table 3

Measures of Tasks Characteristics Used in the TTF Literature

(Goodhue & Thompson, 1995)						
Task Domain	Scale Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
Managerial use of information for decision-making	2 dimensions, 5 items (7-point agree-disagree scale); 1 proxy variable	Task Equivocality		I frequently deal with ill-defined business problems. I frequently deal with ad-hoc, non-routine business problems. Frequently the business problems I work on involve answering questions that have never been asked in quite that form before.	3	0.73
		Task Interdependence		The problems I deal with frequently involve more than one business function. The business problems I deal with frequently involve more than one organizational group.	2	0.76
		Job Title [a proxy, not a scale]	"... the kinds of tasks users in engage in (and the demands they make on their information systems and service providers) should vary considerably from clerical staff to low-level managers to higher-level managers" (p. 222)	What is your job title? [Authors used dummy variables to represent each department.]	1	NA

Table 3 Continued

(Goodhue, 1995)

Task Domain	Scale Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
Managerial use of information for decision-making	2 dimensions, 8 items (7-point agree-disagree scale)	Difficult or Nonroutine Tasks		I frequently deal with ad-hoc, non-routine business problems. Frequently the business problems I work on involve answering questions that have never been asked in quite that form before. I frequently deal with ill-defined business problems. [1] Please characterize the business issues or problems you deal with along the dimensions shown: (seven point scale with 1 = "not at all"; 3 = "to some extent"; 5 = "to a great extent"; 7 = "totally") [1]	4	0.73
		Interdependence [2]		The problems I deal with frequently involve more than one business function. The business problems I deal with frequently involve more than one organization group. Please characterize the business issues or problems you deal with along the dimensions shown: (seven point scale with 1 = "not at all"; 3 = "to some extent"; 5 = "to a great extent"; 7 = "totally") [1]	4	0.79

[1] These questions were not published in Goodhue (1995) but are available from his 1994 working paper (Goodhue, 1994).

questions that measured *use* of particular functionality, rather than existence of it. For example: "I frequently use Information Technology for Patient Scheduling." Responses to this question are multiply confounded: they will be influenced by a) the existence of the patient scheduling feature in the technology, b) user's awareness of this functionality, and c) user's use of this functionality, which is further affected by other factors (e.g., habit). Goodhue (1995) used consensus ratings from a panel of IT personnel to measure four dimensions of technology presumed to have some impact on the target task they studied (Table 4).

Because their study involved multiple technologies (25 within the same organization), Goodhue and Thompson (1995) measured technology characteristics with two (albeit crude) proxy measures, one for the user's primary system(s) and one for the user's department (Table 4). The latter assumes that certain departments will receive better IT support, either because of their physical proximity to IT support, their historical responsiveness, or their perceived value in the organization. In studies evaluating a single technology which has been implemented and is supported uniformly throughout an organization, the technology characteristic is a constant.

Individual Performance. Individual performance refers to "... the accomplishment of a portfolio of tasks by an individual. Higher performance implies some mix of improved efficiency, improved effectiveness, and/or higher quality" (Goodhue & Thompson, 1995, p. 218). Performance is presumably the most important construct of the TTF framework because it represents one of the main goals of most technology initiatives: to improve an individual's (or agency's) performance

Table 4

Measures of Technology Characteristics Used in the TTF Literature

(Goodhue, 1995)						
Task Domain	Scale Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
Managerial use of information for decision-making	4 dimensions, 4 items (a consensus rating by a panel of IT personnel)	Integrated, Common Systems	".. the extent to which the relevant major ... systems used by this group of users are common systems with integrated data" (p. 1832)	[A consensus rating by a panel of 4-6 knowledgeable IS personnel]	NA	NA
		Workstation Penetration	"... the number of terminals or PCs per user" (p. 1832)	[A consensus rating by a panel of 4-6 knowledgeable IS personnel.]	NA	NA
		Assistance Ratio	"... the ratio of assisters to users (assisters are individuals spending 75% or more of their time assisting users in locating, accessing, or using computer-based data)" (p. 1832)	[A consensus rating by a panel of 4-6 knowledgeable IS personnel.]	NA	NA
		Decentralization of Assistance	"... the fraction of assisters who report in a decentralized fashion to users rather than in a centralized fashion" (p. 1833)	[A consensus rating by a panel of 4-6 knowledgeable IS personnel.]	NA	NA

Table 4 Continued

(Goodhue & Thompson, 1995)

Task Domain	Scale Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
Managerial use of information for decision-making	2 dimensions, 2 items	Information system(s) used by respondent [a proxy, not a scale]		[Each respondent identified up to 5 systems they used in their organization. Authors used dummy variables to represent system use (1 = use of the system; 0 = no use). Where respondents used multiple systems, dummy variables were weighted (dividing 1 by the number of systems used).]	NA	NA
		Department of respondent [a proxy, not a scale]		[Authors used dummy variables to represent each department.]	NA	NA

(Goodhue, 1998). Despite its importance, individual performance is one of the least studied outcomes in information systems research, in part because of the methodological rigor and resources required to measure it objectively. This is especially true in settings where performance outcomes are less well defined, as is the case in human services (Measuring the *number of sales* per salesperson is much easier than measuring the *quality of decisions* made by a caseworker). To compensate, researchers have used self-reports of performance as surrogate measures of actual performance.[6] The ability of users to correctly assess their performance has some empirical support (Goodhue, Klein, & March, 2000), but more research is needed.

Goodhue and Thompson (1995) used two questions to measure individual performance and Staples and Seddon (2004) used seven questions, six of which were taken from other scales (Table 5).

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[6] Other common surrogate measures of IS success/impact include system use and user satisfaction (W.H. DeLone & McLean, 2003; William H. DeLone & McLean, 1992).

Table 5

Measures of Individual Performance Used in the TTF Literature

(Goodhue & Thompson, 1995)

Task Domain	Scale Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
Managerial use of information for decision-making	1 dimension, 2 items (7-point agree-disagree scale)	Performance Impact of Computer Systems	"... the accomplishment of a portfolio of tasks by an individual. Higher performance implies some mix of improved efficiency, improved effectiveness, and/or higher quality" (p. 218)	The company computer environment has a large, positive impact on my effectiveness and productivity in my job. IS computer systems and services are an important and valuable aid to me in the performance of my job.	2	0.61

(Staples & Seddon, 2004)

Task Domain	Scale Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Cronbach's alpha
1) Librarians' use of a library cataloging system for library tasks, 2) students' use of word processors & spreadsheets for course-related work and personal activities	1 dimension, 7 items (response format not published)	Performance Impact [1]	Net benefit of the system to the respondent, including efficiency and effectiveness issues, overall advantages versus disadvantages, cost-effectiveness, and overall satisfaction.	The system is a cost-effective solution to my needs. The advantages of using the system outweigh the disadvantages. The system is efficient. The system is effective. Overall I am satisfied with the system. The system is worthwhile. I would have no difficulty telling others about the results of my use of this system.	7	0.89

[1] Item 1 developed for this study; Item 2 from Moore and Benbasat (1991); remaining items from Seddon and Kiew (1996)

Table 5 Continued

(Iivari, 2005) * Not a TTF Study						
Task Domain	Scale Properties	Scale Name	Scale Description	Scale Measurement Items	No. of items	Average variance extracted[2]
NA. This study used the Delone and McLean Model of IS Success (2003) to examine the impact of a financial and accounting system	1 dimension, 6 items (7-point agree-disagree scale)	Individual Impact [1]		Using the system in my job enables me to accomplish tasks more quickly. Using the system improves my job performance. Using the system in my job increases my productivity. Using the system enhances my effectiveness in my job. Using the system makes it easier to do my job. I find the system useful in my job.	7	0.78

[1] All items adapted from Davis' (1989) 6-item instrument for perceived usefulness.
[2] Measure of internal consistency proposed by Fornell and Larcker (1981).

Propositions in the TTF Framework. Table 6 lists the six propositions of the TTF framework and a selection of studies which found support for each.

Table 6

Propositions of Task-Technology Fit and Supporting Studies

Proposition		Studies [a]
Proposition 1	Individual characteristics (e.g., skills, abilities) will affect user evaluations of TTF.	4, 6, 7, 8
Proposition 2	Task characteristics (e.g., complexity, interdependence) will affect user evaluations of TTF.	3, 4, 8, 9
Proposition 3	Technology characteristics (i.e., of systems and services) will affect user evaluations of TTF.	3, 4, 6, 9
Proposition 4	The interaction between individual and technology will affect user evaluations of TTF.	4 (but no support)
Proposition 5	The interaction between task and technology will affect user evaluations of TTF.	4
Proposition 6	User evaluations of TTF will be positively associated with Individual Performance.	1 – 3, 6 – 9

Note. Excluded from this list are studies which found support for some or all these propositions but measured TTF using an interaction approach (e.g., Dishaw & Strong, 1998b, 1999, 2003; Mathieson & Keil, 1998; Strong et al., 2006).

[a] Listed in order of publication date: 1 = Jarvenpaa (1989), 2 = Vessey (1991), 3 = Goodhue and Thompson (1995), 4 = Goodhue (1995), 5 = Goodhue, Littlefield, & Straub (1997), 6 = Goodhue, Klein, and March (2000), 7 = D'Ambra and Rice (2001), 8 = Pendharkar, Khosrowpour, & Rodger (2001), 9 = Staples and Seddon (2004).

Proposition 6 is the only directional proposition. This is because the direction of influence in Propositions 1 – 5 depend on how the constructs are operationalized and what theory suggests about their influence on TTF. Further, when TTF is multidimensional, each proposition can be further subdivided into a set of distinct hypotheses, one for each TTF dimension, assuming there is sufficient theory to do so.

For example, to test Propositions 1, 2, and 3, Goodhue (1995) regressed each of his measures for individual, task, and technology characteristics against each of 12 TTF dimensions.

Proposition 1: Individual characteristics will affect user evaluations of TTF. Goodhue (1995) hypothesized that individuals who are more computer literate (i.e., "more competent, better trained, or more familiar with their information system" [p. 1834]) will be better able to successfully perform tasks with the system, all other things being equal. These users will find that any given system more completely meets their needs and thus give higher evaluations of TTF. He found that computer literacy had both positive and negative effects on TTF. Computer literate users rated their systems as more *reliable* (i.e., a higher TTF ratings on this dimension), but found data harder to *locate* and the *meaning* of data harder to determine.[7] He reasoned that computer literate users probably interact with their systems at a higher level (i.e., they engage in more demanding tasks), and are thus more aware of problems related to data. An alternative explanation is that literate users "will have higher expectations and will not be so easily pleased" (Goodhue, 1995, p. 1834).

Proposition 2: Task characteristics will affect user evaluations of TTF. Goodhue (1995) hypothesized that users engaged in more routine (i.e., repetitive) tasks will give higher evaluations of TTF. These users require less demand of the system, will be less aware of its weaknesses, and will experience less uncertainty about what hardware or software to use. On the other hand, users engaged in more non-routine tasks will give

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[7] Words in italics reflect a TTF dimension. For definitions of each see the corresponding entry in Table 1.

lower evaluations of TTF: In other words, as tasks become more difficult fit will decrease. These users need to continuously use different and often unfamiliar aspects of the system, and they may become frustrated by the constant novelty. He found that users engaged in more non-routine tasks gave lower ratings for *11* of 12 TTF dimensions. For instance, non-routine users found their systems more *confusing*, data less *accessible*, and IT *assistance* less helpful. *System reliability*, which should affect users equally, was the same across all task types. Goodhue (1995) also hypothesized that users whose tasks are more dependent on other organizational units or data sources (i.e., interdependence) will give lower evaluations of TTF, most likely on dimensions of data *accessibility* and *compatibility*. (The relationship between task interdependence and compatibility was confirmed.)

Goodhue and Thompson (1995) found that users engaged in more non-routine tasks found data to be of less *quality*, less *compatible*, and harder to *locate*. They also expressed more problems with *ease of use/training* and obtaining *authority* to access data. Users engaged in more interdependent tasks found data to be less *compatible* and less *reliable*. Job title was also related to the *compatibility* and *authorization* dimensions of TTF. "Lower and middle-level staff and managers found the data least compatible" (p. 226), which is consistent with the notion that upper-level management is often "shielded from the hands-on difficulties of bringing together data from multiple sources and sees it only after the difficulties have been ironed out" (p. 226). Lastly, upper-level management found it much easier to obtain authorization to access data.

Proposition 3: Technology characteristics will affect user evaluations of TTF. Goodhue (1995) proposed informal hypotheses for each of his four dimensions of technology. First, users of common, integrated systems will rate data as more *compatible* and easier to use (*confusion*), understand (*meaning*), *locate*, and *access* (Instead, these users found systems more *reliable* and the data more *accurate*, at the *right level of detail*, and *presented* in an understandable way). Second, users with more PCs per user (i.e., a measure of workstation penetration) will have easier *access* to data, leading to higher evaluations on that dimension (Instead, these users perceived their systems as *easier to use* and more *reliable*, the data more *current* and at the *right level of detail*). Third, users with more IT technicians per user will give higher ratings for *assistance* and – due to the additional help they receive – *accessibility*, *locatability*, and *ease of use* (Instead, these users reported less *confusion* regarding what files or systems to use and the data easier to locate and its *presentation* more readable). Fourth, users in departments whose IT assisters report to users directly (i.e., decentralized) rather than through an IS group will give higher ratings of *accessibility*, *locatability*, and *ease of use*. This is because decentralized assisters are closer to users "physically, administratively, and conceptually" (p. 1833) and will likely resolve problems more quickly (This group of users found their systems *easier to use* and *assistance* more available).

Goodhue and Thompson (1995) found that user's department (a proxy for technology) significantly predicted evaluations of *production timeliness* and *ease of use/training*. The assumption here is that IS may provide better support for certain departments due to, for example, their strategic importance to the company. Their second proxy for technology (name of user's primary system) significantly predicted evaluations of data *locatability* and *reliability*.

Proposition 4: The interaction between individual and technology will affect user evaluations of TTF. (See Proposition 5.)

Proposition 5: The interaction between task and technology will affect user evaluations of TTF. The interactions in TTF suggest that the value a user ascribes to a system characteristic will depend on the importance of the characteristic given that task demands and user's abilities (Goodhue, 1995). In other words, individual and task characteristics will moderate the strength and direction of the link between technology and UE of TTF. For example, users engaged in tasks that require consolidating data from multiple sources like a caseworker who needs to regularly pull data from the state's Medicaid system, criminal record system, and so forth will give higher evaluations of TTF if the system can automatically link to these other sources. Caseworkers not engaged in such tasks will be indifferent to this aspect of the technology unless it interferes with their use of the system, and it should have no impact on their evaluations of TTF.

Goodhue's (1995) test of 192 interactions (four technology variables, three task variables, one individual variable x 12 TTF dimensions) yielded 22 significant interactions at the .01 level, 16 of which significantly predicted nine of the 12 TTF dimensions by at least .05 in hierarchical regressions. None of these significant interactions involved individual characteristics, thus Proposition 4 was not supported. However, substantial support was found for Proposition 5 (task * technology). For instance, in Proposition 3 (main effect of technology) users of common, integrated systems did not rate data as more *accessible*. However, when task interdependence was factored in, the "effect of common systems [on accessibility] was positive for some users, negative for others" (p. 1839). Evaluations of *accessibility* were also a function of the number of PCs per user, the extent to which IT support was decentralized, and the extent to which tasks were routine; all of these characteristics participated in an interaction effect. For details regarding the remaining interactions, see Table 3 (p. 1838) in Goodhue (1995).

Proposition 6: User evaluations of TTF will be positively associated with individual performance. Goodhue and Thompson (1995) found that TTF explained 14 percent of the variance in individual (perceived job) performance. The strongest TTF predictors of performance were data *quality* and *production timeliness*. Staples and Seddon (2004) found that TTF (modeled as a second-order factor) explained (perceived) job performance in settings where use of the technology was either mandatory (R^2 = 0.58) or voluntary (R^2 = 0.48). Goodhue, Klein, and March (2000) found that a 2-dimensional TTF construct explained 25% (adjusted R^2 = .17) of the variance in objective performance (time to complete a task), controlling for multiple individual characteristics (experience, skill, etc.). *Consistency* of data predicted performance but *adequacy* of training did not.

Caseworker Tasks and TTF

Caseworker Tasks. Workers will consider the tasks they perform when evaluating whether their CWIS meets their needs. Therefore, to measure the extent to which a CWIS supports child welfare tasks we must be specific in defining what those tasks are. Several states have tried to enumerate the job of a caseworker by creating detailed task inventories, usually as part of a workload study. Task inventories from four major workload studies are summarized next. These inventories were also used to create a list of core casework tasks used for this study (see Chapter 3, Aim 1, Stage 2: Review Definition of Casework).

Alaska's Workload Study. The Alaska Office of Children's Services ordered a workload study to determine workload standards for what they termed *intake*, *ongoing*, and *generic* caseworkers . The researchers used focus groups to define tasks performed by workers and conducted a random moment survey to document how workers spent their time. The work resulted in four broad task categories (Table 7).

Table 7

Caseworker Task Categories used in Alaska's Workload Study

Task Category	Definition
Case Specific	Includes tasks such as screening for history of abuse and neglect; conducting face-to-face contact with the child, parents and caregivers; completing structured decision making and conducting home studies for prospective foster and adoptive homes
Administrative	Includes reviewing policy manuals, attending supervisory meetings and providing community outreach
Training	Includes preparing for the delivery and receipt of training
Non-work (e.g., lunch breaks, vacation)	Includes breaks, lunches, vacations, sick time, family leave, and any other time spent not working during normal work hours.

Note. Source is Hornby Zeller Associates, Inc. (2006)

The researchers then expanded the four task categories into 38 case-specific and non-case specific tasks (Table 8).

Table 8

Caseworker Tasks Identified in Alaska's Workload Study

Case Specific Activities		Non-Case Specific Activities
Case Consultation	Participate in Court	Clerical / Reception
Case Reviews	Policy Review / Clarification	Community Outreach
Case Specific Activities	Prepare for Court [a]	Computers / ORCA
Clerical	Report Preparation	Federal / State Reviews
Computer Documentation [a b]	Screening	General Administration [a]
Conflicts / Appeals	Service Arrangement / Provision [a]	Non-work Time [a]
Eligibility Information	Service Planning	Special Studies
Face-to-Face Contact [a]	Structured Decision-Making	Supervisory Tasks
Intake Activities [a]	Supervised Visitation	Training [a]
Investigative Decision Making	Supervisory Tasks	Travel
Licensing and Monitoring	Team Meetings	Unit Statistics
Non-face-to-face Contact [a]	Transportation of Client	
Other Assessments	Travel [a]	
Paper Documentation		

Note. Source is Hornby Zeller Associates, Inc. (2006). For detailed definitions of each category see Appendix B of the Alaska Workload Study.
[a] Tasks where at least one type of caseworker (intake, ongoing, or generic) reported spending at least four percent of her time.
[b] "Computer Documentation" was not an exclusive measure of CWIS use. Instead, it was defined as "all case documentation in [Alaska's SACWIS] or other systems not covered in previous codes" [italics mine]. It also included time spent waiting for help desk support and waiting for the computer to respond.

Washington's Workload Study. In response to a legislative mandate to reduce the workload burden of social workers, Washington's Department of Social and Health Services, Children's Administration and the Washington Federation of State Employees compiled a list of 35 tasks performed by case-carrying social workers in their state

(Table 9) (Department of Social and Health Services, 2008). The list was based on feedback from agency staff and the task list developed in a 2007 Washington workload study.[8]

Table 9

Caseworker Tasks Identified in Washington's Workload Study

Caseworker Tasks	
Access and Coordination of State Cars & Equipment	Health and Safety Monthly Visits
	Home Studies
Background Checks	Internal Staffings and Meetings
Care of Children in Offices	Maintaining Relationships with Caregivers
Client Transportation for Services and Visits	Medical and School Records Search
Collateral Contacts	Parent / Child Visits
Communication and Correspondence	Parenting Plans Related to Custody Issues
Continuing Education and Training	Payment [Processing]
Coordinating Referrals for Services	Phone Consultation and Engagement with clients and families
Court Attendance	
Developing Child Information Packets for Specific Services	Placement Paperwork
	Preparation and Participation at Shared Planning Meetings
Discovery, Public Disclosure, and Adoption Disclosure	
	Relative Search
Documentation of Social Worker Activities, Decisions, and Findings	Reporting Monthly Statistics
	Returning Phone Calls
Due Diligence (i.e., contacting relatives)	Risk and Family Assessment & and Service Planning
Establishing Tribal Contacts	Safety Assessment and Planning
Face-to-Face Visits	Serving Notices and Petitions
Filing	Writing Petitions
Generate Child Protective Service (CPS) Referrals	

Note. Source is Department of Social and Health Services et al. (2008).

[8] The 2007 task list was developed using task inventories from workload studies in other states, and feedback from 27 focus groups of child welfare staff from across the state of California.

Utah's Workload Study. Utah's Division of Child and Family Services conducted a workload study to document time requirements for three types of cases: Out-of-Home Care (OHC), Home Based (HB), and Child Protective Services (CPS) (Utah Department of Human Services, 2007). Every caseworker was asked to record time spent on various tasks for one randomly selected case. A task list was created for each type of case (Table 10). These lists were condensed versions of lists used in a similar 2002 study by the Utah legislature.

Table 10

Caseworker Tasks Identified in Utah's Workload Study

Out-of-Home Tasks	In-Home Cases Tasks	Child Protective Services Tasks
Initiating Case	Initiating Case	Preparing for Investigation
Client Contact	Client Contact	Client Contacts
Other Contacts	Other Contacts	Other Contacts
Placement Activities	Child/Family Teaming Activities	Travel
Court Activities	Documentation	Documentation
Child and Family Team Activities	Court Activities	Removal Activities
Documentation	Travel	Setting up for Ongoing Services
ICWA Activities	Oversight Activities	Oversight Activities
Independent Living Services	Other	Other
Adoption Process		
Oversight Activities		
Travel		
Other		

Note. Source is Utah Department of Human Services (2007).

Task List from the Office of Child Abuse and Neglect. Another useful task list was developed by the Federal Office of Child Abuse and Neglect. Although the list was designed for CPS workers, several tasks are applicable to foster care and adoption workers and may therefore contribute to this study's conceptualization of TTF. The list divides CPS workers' tasks across seven stages of the CPS process (DePanfilis & Salus, 2003). These stages were described earlier as the core tasks of CPS workers. Table 11 lists these stages and the subtasks within them.

Table 11

Seven Stages of the CPS Process and Tasks of the CPS Worker

Stage	Task
Intake	Receive and evaluate reports of suspected child maltreatment, determine if the report meets state and agency guidelines for maltreatment, determine the urgency of response, decide whether to investigate, assign the report to an investigator
Initial Investigation or Assessment	*Investigation*: Determine if child maltreatment occurred *Assessment*: Evaluate child's immediate safety and future risk, determine whether and what services are needed
Family Assessment	Identify family strengths, address factors that place child at future risk, help children cope with effects of maltreatment
Case Planning	Develop safety plan (if risk is imminent), case plan (sets forth family goals, outcomes, and corresponding strategies), and concurrent permanency plan (identifies alternative forms of permanency or reunification options)
Service Provision	Implement the case plan (see above): arrange, provide, and coordinate the delivery of services to child and family
Family Progress	Evaluate and review progress toward goals and outcomes; determine adequacy of existing services
Case Closure	Determine if family has achieved goals and risk of maltreatment has been reduced or eliminated

Note. Source is DePanfilis and Salus (2003).

How Tasks Vary by Type of Caseworker. The amount of time a worker spends on the tasks just listed depends on her role(s). The core tasks of a CPS worker typically include *intake* (screen and accept reports of maltreatment), *initial investigation* (determine if maltreatment occurred) and *safety/risk assessment* (evaluate child's safety and risk), *family assessment* (assess strength and needs), *case planning* (develop plan that describes desired outcomes and goals), *service provision* (arrange, provide, and coordinate delivery of services), *evaluation of family progress* (assess progress toward goals), and *case closure* (DePanfilis & Salus, 2003). The core tasks of in-home protective service workers include *assessment*, *case planning*, and *service provision*. The core tasks of a foster care and adoption worker typically include *family assessment*, *case planning*, *post-adoption support*, and *service provision*, most of which involve coordinating foster care, adoption, and/or reunification services (American Public Human Services Association, 2005). Lastly, all forms of casework require extensive case management, a broad term that emphasizes tasks related to decision-making, coordination, and provision of services (DePanfilis & Salus, 2003).

Alaska's workload study (Hornby Zeller Associates, 2006) found that intake workers (a more specialized type of CPS worker) engaged in more face-to-face tasks with clients than ongoing and generic workers. These intake workers also reported spending 70 percent more time in computer documentation than did workers responsible only for case management and service provision (Hornby Zeller Associates, 2006). Utah's workload study (Utah Department of Human Services, 2007) showed that workers responsible for out of home cases (e.g. foster care and adoption) spent 19% of their time on travel versus 16% for CPS workers and 15% of their time on documentation versus 26% for CPS workers.

How Tasks Vary by State, Agency, County, and Case Characteristics. It is important to know what factors other than worker type might affect workers' tasks. As task demands change, so will a worker's assessment of what she needs from the CWIS (i.e., her evaluation of TTF). These factors represent possible control variables in the measurement of TTF. Prior studies suggest that workers' tasks can vary by county size, county poverty rates, urban/rural setting, whether child welfare services are state- or county-administered, and case characteristics. For instance, small versus large and rural versus urban counties are less likely to subcontract services such as family reunification, residential treatment, and adoptive placement (U.S. Department of Health and Human Services Administration for Children and Families, 2001)[9]. Workers in such counties will need more support from their CWIS to perform these services; they will evaluate fit very differently than workers in counties where such services are heavily outsourced. In smaller counties, an individual caseworker may provide child protective, foster care, *and* adoption services. In larger counties, workers are often more specialized and thus serve only one of these populations (U.S. Government Accountability Office, 2003b). The generic workers may demand more from their CWIS in terms of case coordination, and they will reflect these demands in their evaluations of TTF. Workers from poor counties

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[9] In this 2001 study, county size was based on the number of children under 15 years of age living in the county, according to 1990 Census data: Small = < 5,000 children, Medium = 5,000 to 24,999 children, Large = 25,000 children or more. Urban versus Rural was based on U.S. Census Bureau definitions: Urban = greater than 50% of the population living in an urban area; Rural = all other areas.

generally receive more training in child welfare work (i.e., spend more time on training-related tasks), presumably because of the greater federal funding to which these counties are entitled (U.S. Department of Health and Human Services Administration for Children and Families, 2001)[10]. Better trained workers may be more adept at case management, and therefore less reliant on the CWIS in supporting these tasks. Lastly, adoption rates are much higher in counties that are state-administered, non-poor, and urban (U.S. Department of Health and Human Services Administration for Children and Families, 2001). Workers in these counties likely spend more time on adoption-related tasks than workers in other counties, and will require greater functionality from the CWIS in this area.

Alaska's workload study found that workers in remote areas spent almost 50% more time on administrative tasks than workers in urban and mid-size regions, "presumably because the offices are not large enough for clerical support" (Hornby Zeller Associates, 2006, p. iii). Conversely, face-to-face contact with clients was lowest for generic workers, whose greater presence in small or remote areas meant smaller caseloads and more time engaged in travel (Hornby Zeller Associates, 2006). In Utah's workload study, the time needed to accomplish tasks differed by geographic setting and case characteristics (Utah Department of Human Services, 2007). Rural workers spent more time in travel than urban workers, but urban workers required more time for client contacts, child and family team activities, and court. Workers assigned to cases in

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[10] In this 2001 study, poverty level was defined as either Non-poor (5% or less of county families with children living below the 50% poverty level) or Poor (more than 5% of county families with children living below the 50% poverty level). 1990 Census data was used to assign poverty rates.

which delinquency was the reason for removal spent more time in travel, documentation, and court; new cases took more time than existing cases; and cases with substance abuse required more time for documentation and removal activities. Almost all activities took more time when domestic violence was involved (Utah Department of Human Services, 2007). In Alaska's study (Hornby Zeller Associates, 2006), permanency cases with multiple children required the most time (19.9 hours per family) and cases involving only information and referral or intake required the least amount of time (2.3 hours and 3.2 hours, respectively).

Translating Caseworker Tasks to a Measure of TTF. Although the four task inventories just reviewed help us understand what caseworkers do on a day-to-day basis, and they identify the outer bounds of the TTF construct, they are too specific to be of use in a TTF instrument designed for all caseworkers. For instance, asking workers to rate how well their CWIS supports specific tasks poses operational problems (Wood, 1986). Take for example this TTF question from D'Ambra and Rice's (2001) study of day-to-day web usage: "I can find information related to my hobbies and interests on the Web." How would an individual who does not use the web for hobby-related tasks answer this question? We can presume that all web users need to "find information," but we cannot presume they all need it for hobbies. The statement leads to a confounding of the technology/data environment (the "information") and the task environment ("hobbies and interests") (Wood, 1986). In doing so, the researchers have weakened the construct validity of their instrument by including items that lack meaning to some respondents (Bagozzi, 1979). If the researchers are concerned that hobby-related tasks affect assessments of fit, questions of "hobbyness" should be moved to the *task characteristics* construct, where they become moderators of fit. Here is another example from the same D'Ambra and Rice study: "I need to develop my skills more to use search engines on the Web better." This item leads to a confounding of *three* constructs: the individual ("my skills"), the task ("*using* search engines"), and the technology ("search engines"). One remedy would be to move questions about skill level to the *individual characteristics* construct and move questions about using search engines to the *task characteristics* construct. After that, it is difficult to determine what is left: the item even in its original state says nothing about how the web could support a user's need. Perhaps: "It is easy to find information on a particular issue."

The above two examples explain why it is important that this study not produce a TTF instrument containing items like, "The CWIS helps me screen in a report of child abuse" (not relevant to foster care or adoption workers) or "The adoption resource list in the CWIS helps me find homes for children" (not relevant to CPS workers). Although agencies are surely interested in whether the CWIS helps a CPS worker screen in a report of child abuse, this is a measure of *individual performance*, not TTF. Task-technology fit statements such as these – which describe discrete functionality and tasks – limit the relevance of the instrument across multiple CWIS and different types of workers. Such an instrument will show poor construct validity. What is desired is an operationalization of fit that is as independent of the task and individual environment as possible (Goodhue, 1988).

A solution to the task measurement challenge is to construct measurement items that reflect *needs* common to all caseworkers performing casework, rather than their physical tasks. These (task) needs are what the CWIS and services must support, and upon which workers will base their assessments of fit. A TTF measure that takes this approach might include items like this one from Goodhue's (1998) TTF instrument: "The data that I use or would like to use is accurate enough for my purposes." Generating items that span the full range of needs common to casework tasks is more likely to yield an instrument that has construct validity across multiple types of workers. If these needs can be grouped into distinct but related categories (e.g., needs related to data accuracy, system reliability, etc.), the instrument will still provide the level of specification necessary to isolate the specific aspects of the CWIS that need improvement.

Thus far, the literature review has described characteristics of the child welfare system, child welfare caseworkers, CWIS, and TTF. The next two sections focus on commonly used evaluation techniques in the social sciences, with a focus on methods for developing and evaluating items and creating valid and reliable subscales to measure latent constructs like TTF.

Measurement Validity of a New Instrument

A number of researchers have proposed frameworks for thinking about the measurement validity of a new instrument. This study uses the framework first proposed by Loevinger (1957) in her classic monograph on test construction. Although more than 50 years old, her framework is still in use today (Clark & Watson, 1995;

Graham, Naglieri, & Weiner, 2003; Sechrest, 2005). Loevinger's framework assumes that all aspects of "test construction, validation, and use be evaluated from the construct point of view" (John & Benet-Martinez, 2000, p. 351). In this view, the central concern of measurement is *construct validity,* or the degree to which a scale measures the construct it is supposed to measure. Construct validity subsumes all categories of validity.[11] In Loevinger's framework, construct validity consists of three components: *substantive validity*, *structural validity*, and *external validity* (Loevinger, 1957). Measures of each provide evidence about the construct validity of an instrument.

Substantive validity refers to the extent to which an instrument's items adequately represent the construct. It is an analog to the more common term, content validity. Structural validity refers to the extent to which structural relations between instrument items parallel and adequately measure the internal structure of the construct being measured. This component is most relevant when the construct being measured is, like TTF, assumed to be multidimensional. Structural validity incorporates measures of scale reliability, factor loadings, and factor solutions, which are all components of the measurement model in factor analysis. External validity refers to the extent to which scores on the construct correlate with other variables, constructs, or external criterion in accordance with theory. Of interest here is evidence of concurrent validity (i.e., the instrument can distinguish among groups that should differ on the construct), convergent validity (i.e., the measure relates strongly to other measures of the same construct), discriminant validity (i.e., the measure relates modestly to other

[11] Messick (1995a) proposed a similarly broad conceptualization of construct validity.

measures of different constructs), and nomological validity (i.e., the construct behaves in expected ways in relation to other constructs, as suggested by a broader theoretical framework) (Loevinger, 1957).

There are specific development techniques that can maximize and establish an instrument's substantive, structural, and external validity. The remainder of this section provides of a review of these techniques from the psychometric and concept mapping literature and describes the stages necessary for the development of instruments in accordance with established psychometric principles. The review is organized around three stages of the instrument development process as articulated by Schwab (1980). The three aspects of validity previously discussed relate closely to these three stages:

1. Stage 1: Item Pool Development (Substantive Validity),
2. Stage 2: Scale Development (Structural Validity; i.e., development and psychometric evaluation of the scales), and
3. Stage 3: Scale Evaluation (External Validity; e.g., the correlation of scale scores with other variables or criteria).

The following review also examines how each stage and its corresponding techniques were applied in six studies from the TTF literature (Dishaw & Strong, 1998a; Goodhue & Thompson, 1995; Goodhue, 1995, 1998; Klopping & McKinney, 2004; Staples & Seddon, 2004).

Stage 1: Item Pool Development. This stage involves developing items that are directly linked to the underlying theoretical construct. The goal is to produce an item pool that represents all facets of the construct yet contains no extraneous content

(Clark & Watson, 1995). The extent to which this goal is achieved is a measure of the instrument's content validity. Clark and Watson (1995) outline three steps for item pool development: *Conceptualization*, *Item Generation*, and *Item Selection* and *Refinement*.

Step 1. Conceptualization. In conceptualization, researchers use theory and a review of the literature "to develop a detailed conception of the target construct and its theoretical context" (Clark & Watson, 1995, p. 310). The review is used to see how others have defined the same or closely related constructs. Researchers may also conceptualize the construct by soliciting input from subject matter experts or members of the target population. The conceptualization step establishes the conceptual boundaries of the construct and guides the generation of items. In the context of TTF, this step is where the task domain is fully established. In concept mapping (discussed in the previous section), conceptualization begins in the preparation stage with discussion and refinement of the focus statement.

Step 2. Item Generation. In item generation, researchers develop items from rational deduction, clinical experience, literature relevant to the construct, other instruments, suggestions by experts, or suggestions by members of the target population (Haynes, Richard, & Kubany, 1995). In concept mapping, most item generation is done by members of the target population in the brainstorming stage. The conceptualization of the construct often dictates how items are generated. If the construct was conceptualized to be multidimensional, and those dimensions were identified a priori, the researcher explicitly generates items for each dimension. This reflects a deductive approach to item generation (see e.g., Goodhue, 1998). In an inductive approach, items are generated without a classification schema, but later sorted into categories based on similarities in content (again, with the expectation that the construct is multidimensional) (Hinkin, 1995). The inductive technique is akin to the sorting step in concept mapping. In either case, the apportioning of items into groups represents an early stage of subscale development.

Studies on item writing and formatting suggest the following best practices: items should be written to ensure variability in responding (to avoid ceiling and floor effects), should not assess more than one characteristic (i.e., double-barreled), and can be reliably evaluated using a 5- to 7-point Likert-type scale (Clark & Watson, 1995). Also, the researcher should avoid the temptation or suggestions by others to eliminate redundant items from the pool; redundancy is an integral feature of internal consistency and thus should be encouraged at this stage of instrument development (DeVellis, 2003). Lastly, if the items are apportioned into scales, Goodhue (1998) and others (e.g., Spector, 1991) suggest the items be randomly ordered so that no two same-scale questions are adjacent. Placing questions from the same scale adjacent to each other can lead to anchoring and adjusting biases, wherein respondents answer one question based on their answer to another one. This practice can lead to artificially high Cronbach's alphas (Budd, 1987).

Step 3. Item Selection and Refinement. In item selection and refinement, researchers subject the item pool to closer scrutiny in order to improve item clarity, identify new items, and eliminate items that are unrelated to the construct. In concept mapping, this process can be done with the rating step, in which respondents are asked for example to rate the importance of each item in measuring the construct. Items with low ratings may be candidates for removal or revision. Quantitative ratings, along with panelists' comments regarding missing or poorly worded items (if solicited), may suggest additional dimensions and construct refinement (Haynes et al., 1995). As in the item generation step, some level of redundancy in the item pool should be permitted. If reviewers suggest eliminating redundant items, the researcher needs to consider if doing so will jeopardize the chances of creating internally consistent scales in later stages (DeVellis, 2003).

In deciding on the final number of items, the researcher must balance concerns regarding adequate domain sampling (i.e., too few items) and parsimony (i.e., too many items) (Hinkin, 1995). Scales with too few items may lack content validity, construct validity, and internal consistency (Nunnally & Bernstein, 1994). In factor analysis, scales with fewer than three items can lead to measurement errors (Kline, 2004). On the other hand, scales with too many items can lead to respondent fatigue, response biases (Anastasi & Urbina, 1997), artificially high estimates of internal consistency (Clark & Watson, 1995), and, in factor analysis, correlated errors (Floyd & Widaman, 1995). Insufficient or disproportional scale lengths may mean that one or more of the dimensions will be underrepresented or overrepresented in the final instrument, which can lead to biased scores (Anastasi & Urbina, 1997; Clark & Watson, 1995). Hinkin (1995) recommends scales contain five or six items, but notes that adequate internal consistency reliabilities can be obtained with as few as three items, which is the minimum recommended by Kline (2004).

At this stage, researchers should err on the side of over-inclusiveness when generating items and deciding which items to keep or discard. The logic underlying this principle is simple: "Subsequent psychometric analysis can identify weak, unrelated items that should be dropped from the emerging scale but are powerless to detect content that should have been included but was not" (Clark & Watson, 1995, p. 311). This subsequent analysis occurs in the Scale Development stage and reinforces the idea that item generation and refinement is an iterative process that occurs in several stages.

Item Generation (Stage 1) in TTF Studies. Goodhue (1998) used the literature and interviews from members of the target population to develop TTF items to measure the fit between quantitative data stored in a computer system (the technology) and managerial decision-making (the task). Based on his review of literature on organizational decision-making, Goodhue took a deductive approach and determined a priori that managers' use of information for decision-making involves three steps: *identification*, *acquisition*, and *interpretation.* He then developed from the literature 15 dimensions of TTF that could inhibit or facilitate a manager's execution of each step, and used rational deduction to develop items for each dimension. To reduce and refine his items, Goodhue pretested his item pool with 360 individuals and conducted over 100 interviews with members of the target population. The resulting instrument included 47 items for 16 dimensions (1 which emerged from the pretest) of TTF.

Staples and Seddon (2004) measured TTF in two settings: a mandatory setting in which librarians used a library cataloging system (the technology) to perform general library tasks, and a voluntary setting in which students used word processors and spreadsheets (the technology) for "course-related work and personal activities" (p. 23). The authors conceptualized TTF as consisting of four dimensions which they borrowed from previous (non-TTF) studies: work compatibility (Moore & Benbasat, 1991), ease of use (Doll & Torkzadeh, 1988; Moore & Benbasat, 1991), ease of learning (Davis, 1989), and information quality (Doll & Torkzadeh, 1988). Each was measured using a subset of items from existing scales, although the authors did not explain why they choose these particular items. They also did not explain their rationale for choosing these four dimensions. Their final item pool consisted of 12 items measuring four dimensions of fit. There is no indication that the item pool was subjected to any form of item selection or refinement.

Klopping and McKinney (2004) developed a measure of TTF to assess fit between e-commerce sites and the task of online shopping. They conceptualized TTF as a single dimension and measured it with eight items taken from subscales developed by Goodhue (1995), but they gave no rationale for these decisions. They pilot tested the item pool with 51 students but provided few details regarding their methods and results, other than "some questions were reworded and/or deleted" (p. 40) based on students' feedback.

Dishaw and Strong (1998a) developed a measure of TTF to assess fit between software maintenance tools and software maintenance tasks. They conceptualized TTF by grouping (based on definitional similarities) Goodhue's (1995) 12 dimensions of fit into four higher-level constructs: intrinsic fit, representational fit, contextual fit, and accessibility fit. These constructs were derived from a Fitness For Use (FFU) model developed by one of the authors (Strong), in which high quality data is considered "*intrinsically* good, *contextually* appropriate for the task, clearly *represented*, and *accessible* ..." (Wang, Strong, & Guarascio, 1996, p. 6). Their rational for conceptualizing fit as four higher-level constructs was both conceptual and statistical. "Conceptually, it provides further understanding of the nature of the 12 TTF dimensions ..." (p. 159). Statistically, evaluating fit with four variables instead of 12 bought them extra degrees of freedom and reduced multicollinearity concerns in subsequent regression models. The authors operationalized the four constructs using 27 items associated with the corresponding TTF dimensions, as measured by Goodhue (1992, 1995). They argued that Goodhue's operationalization is "sufficiently general to apply to a broad set of technologies and tasks ..." (Dishaw & Strong, 1998a, p. 156). They pretested their item pool with a sample of programmers which resulted in "minor wording changes to some questions" (Dishaw & Strong, 1998a, p. 156) (Dishaw & Strong, 1998a, p. 163). No additional details for this pretest were reported.

Stage 2: Scale Development. This stage involves administering the item pool to a sample of respondents, and using the resulting psychometric properties to develop scales that are empirically distinct and reliable. Achieving this goal usually requires further refinement to items, scale composition, and even the conceptualization of the construct. This stage involves three steps:

1. design of the developmental study,
2. scale construction, and
3. reliability assessment (Hinkin, 1995).

Step 1. Design of the Developmental Study. The researcher must choose a sample that is representative of the population for which the measure is intended. This is best achieved by randomly sampling from the population. Representativeness of the sample, including non-response bias, can later be confirmed by comparing characteristics of the sample to the known percentages in the population. The sample must also be large enough to conduct tests of statistical significance. Minimum sample size recommendations depend on the analysis techniques to be conducted. For factor analysis, a minimum sample size of at least 200 is considered “large” and will be adequate for most models (Kline, 2004). If the population parameters are known, a power analysis can be used to determine the minimum sample size needed to minimize Type I and II errors (Brown, 2006).

Step 2. Scale Construction. In scale construction the researcher examines patterns in item responses to confirm hypothesized or discover new underlying dimensions in the item pool. These dimensions represent various facets of the construct and are termed factors. The goal is to identify which items most accurately represent each factor and should therefore constitute a scale. The best known statistical procedures for doing this are confirmatory and exploratory factor analysis (Byrne, 2006).

Factor Analytic Techniques for Scale Development. Confirmatory factor analysis (CFA) is used when researchers propose ahead of time that certain items tap certain underlying dimensions of the construct. These *a priori* propositions constitute a hypothesized model, and CFA assesses the model’s ability to adequately describe or “fit” the sample data (Byrne, 2006). By estimating the extent to which the items are linked to their target factor, CFA can identify items that contribute to lack of fit and therefore guide decisions regarding item retention and scale composition. Confirmatory factor analysis can also be used to suggest changes to the hypothesized factor structure, such as having one item measure more than one factor. Lastly, CFA can be used to test the relative fit of alternative models, such as one that posits a one-factor solution instead of a multi-factor one (Byrne, 2006; Kline, 2004). Byrne (2006) makes the point that most researchers use CFA in an exploratory fashion, in which they use CFA results to continually re-estimate models or test alternative models until the best-fitting model is chosen.

Because the CFA model focuses on the link between factors and their measured variables (the items), it is termed a "measurement model." In addition, factors are called latent (or unobserved) variables and items are called observed variables or indicators (Byrne, 2006).[12] CFA involves five steps:

1. model specification,
2. model identification,
3. assumption testing,
4. assessment of fit, and
5. model respecification.

Model Specification. In this step the researcher uses a CFA software program (e.g., Arbuckle, 2009a) to specify the parameters of the hypothesized model. In a simple

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[12] To maintain consistent terminology across all sections of this study, the terms "factors" and "items" will be used.

first-order CFA model, these parameters typically include: a) factor loadings (i.e., the relationship of items to factors), b) factor covariances (i.e., the relationship among factors), c) factor variances, d) error terms (i.e., measurement error associated with each item),[13] and f) error variances. Barring theoretical reasons to the contrary, all of these parameters are specified to be freely estimated with the exception of error terms and one factor loading for each factor; both of these are usually fixed to an arbitrary value of 1.0 and are therefore not estimated. These are fixed because they allow the model to be statistically identified (Kline, 2004), a topic which is addressed next.

Model Identification. "A model is said to be identified if it is theoretically possible to derive a unique estimate of each parameter" (Kline, 2004, p. 105).[14] A model that fails to meet this criterion is said to be nonidentified and cannot be tested. The aim in CFA is to specify a model that is overidentified. An overidentified model has two requirements (Kline, 2004):

1. There are more data points (i.e., variances and covariances of the observed variables) than parameters to be estimated (i.e., $df_M > 0$).[15]
2. Every unobserved variable, including the measurement errors and factors, must have a scale.

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[13] Measurement error reflects the item's adequacy in measuring its underlying factor. It is a function of random measurement error and error unique to the item (Byrne, 2006).
[14] For a detailed description of Model Identification see MacCallum (1995).
[15] A model in which the number of data points *equals* the number of estimable parameters (i.e., $df_M = 0$) is just-identified. Although a just-identified a model will produce a unique solution for its parameters, "it is not scientifically interesting because it has no degrees of freedom and therefore can never be rejected" (Byrne, 2006, p. 31).

Regarding the first requirement: The number of data points equals v (v + 1)/2, where v is the number of observed variables (i.e., items). So, a model with 15 items means there are 120 data points (i.e., 15 (15 + 1)/2). Calculating the number of estimable parameters in the model is simply a matter of tallying the number of factor loadings, variances (for errors and factors), and factor covariances (Kline, 2004). If the number of data points exceed the number of estimable parameters, the model is overidentified. The difference between the two numbers represents the degrees of freedom.

Regarding the second requirement: "This [scaling] requirement arises because latent variables [the factors and item errors] are unobserved and, therefore, have no definite metric scale" (Byrne, 2006, p. 32). Their scales can be established by fixing their unstandardized path coefficients to 1.0 (or any nonzero value). In the case of an error, this is the path between the error and its item; in the case of a factor, this is the path between the factor and one of its items. In both cases, the scale it assigns is related to the unexplained variance of the corresponding item (Kline, 2004).

Once the specified model has been identified, the researcher "runs" it against the sample data to generate estimates for all of the freely estimated parameters. Several methods of estimation are available; the default method for most programs is Maximum Likelihood Estimation (MLE) and is acceptable in most situations (Byrne, 2006). The first set of output allows the researcher to examine whether the data meet the assumptions of CFA.

Assumption Testing. Confirmatory factor analysis has certain assumptions which must be considered when interpreting the results. One assumption for the MLE method is that the data be multivariately normally distributed and free from significant outliers. The CFA program Amos (Arbuckle, 2009a) assesses multivariate normality using Mardia's coefficient of multivariate kurtosis (Mardia, 1970, 1974). Values > 5.00 are indicative of data that are non-normally distributed (Bentler, 2005). Likely sources of multivariate non-normality are items with highly skewed distributions, as evidenced by significant nonzero[16] univariate kurtosis (Byrne, 2006). With Likert scales, these are items to which almost all respondents responded in one extreme (e.g., "strongly disagree" or "strongly agree"). The researcher should consider deleting such items: they convey little information and are likely to correlate weakly with other items in the pool (Clark & Watson, 1995). Univariate[17] and multivariate outliers[18] can also contribute to non-normality and should be resolved before proceeding.

If problems with non-normality persist, the researcher should consider transforming the data (Kline, 2004) or using robust statistics which correct for non-normality to assess fit.[19] Another strategy is to weigh the findings regarding univariate kurtosis and outliers against the sample size and the estimation method. As stated in the Amos 18.0 Reference Guide, "A departure from [multivariate] normality that is big

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[16] Kline (2004) suggests that absolute values of kurtosis > 10.0 may suggest a problem.
[17] An item score more than three standard deviations above the mean (Kline, 2004).
[18] A case that has an extreme pattern of response values across all items; can be identified by calculating Mahalanobis distance scores for all cases (Kline, 2004).
[19] Examples of robust statistics include the Satorra-Bentler scaled statistic (S-BX2, Satorra & Bentler, 1994), robust standard errors for parameters (Bentler & Dijkstra, 1985), and robust versions of the Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA).

enough to be significant could still be small enough to be harmless."(Arbuckle, 2009b). For example, in large samples (> 100), MLE is fairly robust to kurtotic violations of multivariate normality, and in such conditions parameter estimates are still fairly accurate (Brown, 2006; Diamantopoulos, Siguaw, & Siguaw, 2000; Kline, 2011).

One final assumption worth noting concerns multicollinearity, which "occurs when intercorrelations among some variables are so high (e.g., > .85) that certain mathematical operations are impossible or unstable ..." (Kline, 2004, p. 56). This usually occurs when two items are so similar they actually measure the same thing. The researcher should either eliminate one from the analysis or combine their scores into a composite variable (Kline, 2004). Evidence of pairwise multicollinearity can be seen by inspecting the correlation matrix.

Assessment of Fit. Assessing fit is the central task of CFA. The CFA program creates matrices of the estimated relationships between items in the hypothesized model and items in the actual data. It then assesses the similarity of the predicted and actual matrices using various criteria. The degree of similarity is assessed empirically using various indexes of model fit. The criteria for model fit focus on a) the model as a whole and b) the individual parameter estimates (Byrne, 2006).

Model as a Whole. Assessing the model as a whole involves examining residuals and goodness of fit statistics. Residuals represent the discrepancy between the hypothesized model and the observed data. The researcher wants the unstandardized residuals to be as close to zero as possible and the frequency distribution of standardized residuals to be symmetric and centered around zero (Byrne, 2006).

Deviations from these qualities are usually due to variable pairs with large standardized residuals (> 2.58, Jöreskog, Sörbom, & Inc, 1988); they indicate possible misspecification and will need to be examined in the context of other misfitting parameters (described later via the Lagrange Multiplier test).

Goodness of fit statistics help the researcher assess how well the proposed model accounts for the covariance among all the items (i.e., the correlation among items and their variabilities) (Kline, 2004). Because different measures of fit capture different aspects of a model, researchers typically use a selection of fit measures. The first of these fit measures is the Independence Chi Square (χ^2) statistic. It represents the base model (a.k.a., null model) against which respecified models can be compared to evaluate improvements in fit. The chi-square statistic (not to be confused with the *Independence* Chi Square statistic) tests the extent to which all residuals are zero (i.e., the null hypothesis that the proposed model corresponds perfectly to the data). A large and significant χ^2 suggests a poor fit between the sample data and the hypothesized model (Byrne, 2006). Because the χ^2 is sensitive to sample size (e.g., it will almost always be large in large samples) researchers have proposed additional indices to guide assessments of fit. The most commonly used fit indices are the Comparative Fit Index (CFI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA) (Byrne, 2006). The CFI assesses the relative improvement of fit (of the researcher's model) compared to the baseline model. Values for the CFI range from zero to 1.00 with values ≥ 0.95 indicating good fit (Hu & Bentler, 1999). The SRMR represents the difference between the observed and predicted correlations. It ranges from zero to 1.00 with smaller values (< .10) suggesting good fit (Kline, 2004). The RMSEA, which takes into account model complexity, also ranges from zero to 1.00 with values < .05 suggesting good fit and values .05 to .08 suggesting reasonable fit (Hu & Bentler, 1999). Confidence intervals can be calculated around the RMSEA, which makes it one of the most recommended fit indexes (MacCallum & Austin, 2000). After assessing the fit of the whole model, the researcher turns to the fit of the individual parameters.

Individual Parameter Estimates. Of primary interest in CFA are the factor loadings, which estimate how well each item measures its underlying factor. Factor loadings are interpreted as regression coefficients in either unstandardized or standardized form. In standardized form, the estimate is interpreted as a Pearson correlation when the indicator loads onto only one factor and lacks a correlated error or a standardized regression weight (i.e., beta) when the indicator loads onto more than one factor. The beta controls for the correlations among other factors (Kline, 2004). Parameter estimates should have two features. First, they "should exhibit the correct sign and size and be consistent with the underlying theory" (Byrne, 2006, p. 103). Examples of unreasonable estimates are correlations > 1.00 and negative variances. Second, standardized parameter estimates should be large (≥ .40)[20] and statistically significant ($p < .05$). Assuming an adequate sample size, nonsignificant parameters should be deleted from the model. Lastly, to assess the relative importance of each item

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[20] ≥ .40 is a commonly-accepted rule of thumb (Hinkin, 1995). However, with small samples (e.g., < 100), Marsh and Hau (1999) recommend loadings exceed .60.

to its factor the researcher can use R^2 values (i.e., the square of standardized factor loadings). These values range from 0 to 1 and assess the proportion of variance for each item accounted for by its factor (Byrne, 2006). Another parameter of interest concerns the correlations between factors. In a multidimensional construct, factors should be correlated because they represent related but distinct facets of the construct. But a very high correlation (> .90) between two factors could be a sign of poor discriminant validity. Such factors either represent one construct and should be combined or are components of a higher order construct (John & Benet-Martinez, 2000). Either scenario can be tested in a respecified model.

Given findings of poor fit, the next step is to detect the source of the misfit. For each possible parameter in the model, Amos reports a modification index (MI) and parameter change value to assess how the parameter – if specified – would contribute to a drop in χ^2 and possibly a better fitting model (Byrne, 2006).[21] The researcher should examine parameters whose MI and parameter change values stand apart from the rest. Such parameters usually suggest the presence of factor crossloadings[22] or correlated errors[23] (Byrne, 2006). The researcher should consider freely estimating these parameters often sequentially, assessing improvement in fit each time, assuming it makes theoretical sense to do so; if not, another option is to drop the items.

The researcher should also consider assessing the fit of alternative and theoretically plausible models. For instance, Kline (2004) recommends always

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[21] The modification indices produced in Amos are based on work by Joreskog and Sorbom (1984).
[22] The loading of an item on a factor other than the one on which it was hypothesized to load.
[23] Correlated errors are often caused by content overlap (i.e., two very similar items).

determining whether the fit of a simpler, one-factor model is comparable to a multi-factor model, regardless of what theory suggests. Another example is testing if responses on the instrument are better explained by multiple first-order factors (Model 1) or one second-order factor (Model 2), which is presumed to cause all lower-order factors (Byrne, 2006; Kline, 2004). In both examples, the model with the lower χ^2 provides a better fit. [24]

Model Respecification. Once the researcher identifies sources of misfit, he or she can modify and re-estimate the model, using the aforementioned fit statistics to assess whether fit improves. For example, a respecified model that leads to a significant decrease in χ^2 over the original model provides a better statistical fit to the data. Higher CFI values and lower SRMR and RMSEA values would be further evidence of improvement. The goal is to develop a model that better describes the sample data yet remains theoretically consistent (Byrne, 2006; Kline, 2004). In making decisions about model respecification, including which items to retain or delete, both theoretical and empirical decisions should be brought to bear. This is because CFA does not produce a uniquely correct factor solution; it merely produces "plausible solutions, of which there may be many" (DeVellis, 2003, p. 132). For example, refitting a model with additional factors often improves model fit, but "some statistically significant factors may account for uninterestingly small proportions of variance" (DeVellis, 2003, p. 131). Also, model

[24] This use of χ^2, known as the χ^2 difference test, assumes the models being compared are nested, where one is a subset of the other (e.g., parameter estimates are freely estimated in one model but fixed to zero in a second model). To compare nonhierarchical models, the researcher should use predictive indexes of fit, such as the AIC or CIC; smaller values represent better fit (Kline, 2004).

fit can be improved by correlating or uncorrelating factors, or allowing items to load onto multiple factors, but doing so may make little theoretical or substantive sense. Lastly, improvements to model fit – by adding more factors or items or freely estimating more parameters – can lead to a less parsimonious model or longer instrument which may be contrary to the researchers' goals (DeVellis, 2003). In Byrne's (2006) words: "Assessments of model adequacy must be based on multiple criteria that take into account theoretical, statistical, and practical consideration" (p. 102).

A final concern with model respecification is that, with each respecification, there is a risk of capitalizing on chance factors due to characteristics of the sample on which the models are being tested (Byrne, 2006). In other words, factor analytic techniques may result in a measurement model that is sample specific and lacks generalizability (Hinkin, 1995).[25] One way to address this problem is to test the final respecified model on a second independent sample from the same population for the purpose of replicating the factor solution and scale properties. Barring the availability of separate samples, the researcher can randomly split the existing sample into two parts, assuming the full sample is sufficiently large (e.g., 400 – 600) (Byrne, 2006; Floyd & Widaman, 1995). Both strategies are a form of cross-validation: Sample A serves as the calibration sample, and Sample B serves as the validation sample.

[25] This concern applies to every stage of the scale development process. For instance, Smith and McCarthy (1995) recommend four independent samples be used across all stages: One sample for item generation, a second sample for initial item evaluation (e.g., content validity check), a third sample for the scale development study (e.g., dimensionality analyses with CFA), and a fourth sample for replication.

Non-Factor-Analytic Techniques for Scale Development. To develop scales some researchers use item-level analyses as an alternative to factor analysis. Examples include deleting items that lower a scale's alpha (i.e., using an 'alpha if item deleted' index), have low item-total correlations, or low inter-item correlations (Smith & McCarthy, 1995).[26] The researcher may also use non-factor techniques to confirm that subscales are factorially distinct. One technique is to revise scales until the "intrasubscale item correlations (i.e., among the items that make up each subscale) are systematically higher than the intersubscale item correlations (i.e., between the items of different subscales)" (Clark & Watson, 1995, p. 318).[27]

The problem with these non-factor analytic techniques is that they are affected by scale length, item redundancy, and measurement error (Cortina, 1993; DeVellis, 2003; Kopalle & Lehmann, 1997). Thus, they are ambiguous and imperfect indicators of a scale's internal consistency and dimensionality. These techniques are also inefficient. Because they rely exclusively on correlations the process becomes unwieldy as the pool of candidate items increases. As Clark and Watson (1995) point out: "... a pool of only 30 items generates 435 individual intercorrelations to be inspected and evaluated, and ... a pool of 40 items produces nearly 800 item intercorrelations" (p. 317). Consequently, when the target construct is conceptualized as multidimensional the use of non-factor

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[26] The goal with such techniques is to produce a scale that meets an acceptable level of reliability, as defined by some accepted rule of thumb, like an alpha > .70 (Nunnally, 1978) or an average inter-item correlation of .40 to .50 (Clark & Watson, 1995).

[27] Comparing intra- and interscale correlations is a variation of Campbell and Fiske's (1959) multitrait-multimethod (MTMM) approach to assess convergent and discriminant validity of a construct. It is simply MTMM without a methods factor. For a discussion of this technique, see Trochim and Donnelly (2006, p. 71).

techniques to develop subscales is not recommended (DeVellis, 2003; John & Benet-Martinez, 2000).

Step 3. Reliability Assessment. In this step the researcher assesses the reliability of the scales developed by factor analysis. Reliability refers to the precision or consistency of a scale, which is a function of the amount of error present in the items.[28] Unreliable scales can create problems estimating effect sizes across variables or studies and testing hypotheses relating one latent variable with another. Scale reliability is usually estimated by Cronbach's alpha (α) (Cronbach, 1951), a measure of internal consistency that estimates the degree to which items in a scale are intercorrelated (DeVellis, 2003). Despite some limitations,[29] the use of Cronbach's alpha to measure scale reliability remains widespread.

Scale Development (Stage 2) in TTF Studies. To develop subscales for his TTF instrument Goodhue (1998) used Cronbach's alpha, inter-item correlations, a comparison of inter- and intrasubscale correlations, and CFA. His sample included approximately 500 non-IS managers and staff who used data in their business tasks. These 500 subjects were randomly sampled from within 24 selected groups (N ≈ 20 per

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[28] The source of errors depends on the theoretical framework in which reliability is defined. In classical test theory, reliability is affected by one type of error: random measurement error. This view of reliability remains popular but is considered outdated by several leaders in the field of measurement (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999; John & Benet-Martinez, 2000). In generalizability theory, however, reliability can be due to multiple sources of error (e.g., measurement procedures) and "concerns the extent to which we can generalize across items, instruments, contexts, groups, languages, and cultures" (John & Benet-Martinez, 2000, p. 349; Messick, 1995b).

[29] In several studies, Cronbach's alpha has been shown to either over- or underestimate reliability in multiple-item measures (Green & Hershberger, 2000; Komaroff, 1997; Raykov, 1997), and has since fallen out of favor with several leading psychometricians, including Cronbach (Cronbach & Shavelson, 2004).

groups)[30] across 10 organizations. He received 357 usable replies thus exceeding the minimum recommended sample size of 200 to 300 for factor analysis. He dropped two of his 16 *a priori* dimensions containing two questions each due to low reliabilities (Cronbach's $\alpha < .70$) and dropped one item in another dimension to improve its reliability (from .73 to .77). He dropped two more items due to low inter-item correlations (< .40), and dropped one dimension consisting of 4 items because its items failed to correlate more highly with each other than with items from other scales. Lastly, the results from a CFA led Goodhue to drop one more dimension consisting of another 4 items which failed to discriminate from a similar factor according to a χ^2 difference test. He tested his final model against four competing models and concluded that a 12 factor model ($\chi^2 = 722$, Normed Fit Index = .90) [31] with 32 items best fit the data.

Staples and Seddon (2004) administered their item pool to a sample of 250 librarians and 600 undergraduate students, receiving 140 and 60 usable responses, respectively. They tested for non-response bias (i.e., representativeness) in each sample and found none. To confirm their hypothesized, four-factor model of TTF and validate the stability of their scales the authors used Cronbach's alpha, inter-correlations between subscales, and factor loadings from a Partial Least Squares (PLS)[32] analysis. All

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[30] The method for selecting these groups was not described.

[31] The NFI has been shown to underestimate fit in small samples and was later revised with the CFI (Byrne, 2006). At the time of Goodhue's paper, an NFI of > .90 was considered representative of a well-fitting model (Bentler, 1992), but more recently psychometricians recommend a value of at least 0.95 (Hu & Bentler, 1999).

[32] PLS is a Structural Equation Modeling technique that uses a principal components measurement model rather than a factor analytic model (like in CFA). It makes no assumptions about the distribution of the variables and can be used with smaller sample sizes than CFA. However, it's primary purpose is to

of these indexes were acceptable ($\alpha > .70$; cutoff for factor loadings not given) so the authors made no changes to their items and scales.

Klopping and McKinney (2004) administered their item pool to 429 undergraduate students and received 263 usable responses. Although they collected demographic data that would presumably be available for the entire population of students (sex, age, and grade), they did not check for non-response bias. Instead, they argued that their student sample is representative of the typical online shopper (the TTF task domain), citing studies which show students represent one of the most active online shopping segments. The authors used EFA to confirm the unidimensionality of their 8-item TTF construct, and Cronbach's alpha (> .70) to verify the scale's reliability. EFA showed one item had a weak factor loading (< .50). Interestingly, they chose to keep the item in the model because they still considered the factor a good measure "for online shopping activities in aggregate" (p. 41).

Dishaw and Strong (1998a) administered their TTF items to software programmers in three organizations. They received 74 responses but did not indicate how many surveys were administered, nor did they report any demographic information about their sample. Recall that these authors wanted to test two conceptualizations of fit: Goodhue's original 12-factor solution and the authors' proposed four-factor solution based on Fitness For Use [FFU] theory. The authors made no attempt to confirm the factorial structure of either model. They did not conduct any form of factor analysis, nor

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maximize and test the predictive power of a model (e.g., how well one construct predicts another) and therefore is not useful for estimating fit or testing alternative models.

did they use non-factor analytic techniques to guide item and scale development. The only scale properties they reported were Cronbach's alphas and intersubscale correlations. Five of the 12 TTF scales and two of the four FFU scales had reliabilities < .70, but the authors made no comment about the implications of these low reliabilities.

Stage 3: Scale Evaluation. Once the structural validity (i.e., measurement quality) of the scale has been established, the researcher then examines its external validity. The typical scale-validation strategy involves testing hypothesized relationships between the scale and other variables, usually to examine causes, effects, and correlates of the construct (Spector, 1991). This may include tests of how well the scale 1) predicts some future, external criterion (predictive validity), 2) distinguishes among groups known to differ on the construct (concurrent validity), 3) correlates with other measures that do and do not measure the construct (convergent and discriminant validity, respectively), or 4) behaves in expected ways in relation to other constructs, as suggested by a broader theoretical framework (nomological validity). Empirical support for these hypotheses increases confidence in the scale's construct validity (Hinkin, 1995; Spector, 1991).

Hypotheses bearing on the external validity of a construct are best tested using Structural Equation Modeling (SEM). An SEM model is simply a measurement (i.e., CFA) model with a structural component that specifies directional relations among the latent variables. SEM can test multiple relationships simultaneously, including direct and indirect effects, all while accounting for measurement error. Such features are not possible with other multivariate hypotheses testing techniques such as multiple regression and path analysis (Kline, 2004).

The steps for specifying and evaluating an SEM model are very similar to that of a CFA model.[33] The only additional step is to specify the hypothesized relationships (i.e., parameters) among the factors. In addition, the researcher must specify an error term called the Disturbance for any factor being predicted. This disturbance represents the error in the prediction of the factor. As with error paths for items, the disturbance paths are usually fixed to 1.0 (Byrne, 2006). A key assumption is that the researcher has already established the measurement validity of these newly specified factors via separate CFA models (Byrne, 2006; Kline, 2004); doing so will help disentangle problems of measurement from problems of structure.

Assessing the fit of a SEM model involves the same fit criteria used in CFA. An SEM model with adequate goodness of fit and statistically significant parameters among factors provides support for the construct's external validity. As in CFA, modification indices and parameter change values can be used to identify paths among factors and disturbances that were not specified but should be, given theoretical justification (Byrne, 2006). A respecified model that freely estimates these paths will confirm if their addition leads to a significant improvement in model fit.

Scale Evaluation (Stage 3) in TTF Studies. Goodhue (1995) tested the nomological validity of his TTF scale by assessing the extent to which user evaluations of TTF are affected by: 1) Technology Characteristics (four dimensions), 2) Task

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[33] The procedures for model identification and assumption testing are identical.

characteristics (three dimensions), 3) Individual characteristics (one item about computer literacy), and 4) the interaction between Task Characteristics and Technology Characteristics, and between Individual Characteristics and Technology Characteristics. He used responses from 259 business managers and staff across 9 organizations and 9 types of technology.[34] The measurement validity of Task Characteristics and TTF was established with CFA.[35] Goodhue tested the propositions with two multiple regressions.[36] The first regression tested main effects (Propositions 1 through 3), in which he regressed scores for each dimension of Technology, Task, and Individual against the 12 dimensions of TTF. Strong support for each proposition required that a) each regression be significant and b) in each regression at least one dimension of Technology, Task, and Individual be a significant predictor. To test the interaction terms, he first tested them for significance individually (192 interactions: 12 TTF variables x four technology variables, three task variables, and one individual variable). Twenty two were significant at the .01 level. These were then combined by adding them hierarchically to the main affects model "until the F test comparison of the regressions with and without the last interaction added was significant at 0.05" (p. 1837). Sixteen interaction terms significantly predicted TTF by at least .05.

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[34] This is a subset of the sample Goodhue used for his 1998 TTF measurement paper which was described in the previous section.

[35] Technology characteristics was measured by asking a panel of IS personnel in each company to generate a consensus rating (for their company's technology environment) on the four dimensions of systems and services. These panel ratings were then assigned to all individuals within that company.

[36] He used the moderated regression analysis approach suggested by Venkatraman (1989) and Sharma, Durand, and Gur-Arie (1981).

In another test of nomological validity, Goodhue and Thompson (1995) examined the impact of 1) Technology Characteristics on TTF, 2) Task Characteristics on TTF, and 3) TTF on Utilization. A fourth proposition tested if TTF predicted Individual Performance better than Utilization alone. They used survey responses from 662 users working in 26 non-IS departments in two organizations. The measurement validity of the Task, TTF, and Performance constructs was established separately using principal components factor analysis. The authors tested the propositions with multiple regression, arguing that the research was still early in the theory generation phase and therefore not suitable for SEM, which requires more precise *a priori* hypotheses. To test the impact of Technology and Task on TTF, Goodhue and Thompson ran four regression models: a full regression with all dummy variables included and three restricted models, in which the three groups of dummy variables were dropped one at a time.

Staples and Seddon (2004) tested whether TTF is positively related to three unidimensional constructs: Expected Consequences of Use, Affect Toward Use, and Performance Impacts.[37] Task-technology fit was modeled as a second-order factor explained by four first-order factors. PLS was used to test both the measurement and structural models.

Klopping and McKinney (2004) used path analysis to examine if adding the TTF construct to the Technology Acceptance Model (TAM) better predicted Behavioral Intention to Use and Actual Usage of the internet for online shopping.

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[37] This model also examined the impact of four factors on Utilization: Expected Consequences of Use, Affect Toward Use, Social Norms, and Facilitating Conditions.

Dishaw and Strong (1998a) examined the impact of TTF and Behavioral Control on two dependent variables: intention to use software tools (Intention to Use) and actual use (Utilization). They tested three hypotheses: 1) TTF is positively related to Intention to Use and Utilization, 2) TTF *plus* Behavioral Control explain Intention to Use and Utilization better than TTF alone, and 3) Behavioral Control and TTF explain Intention to Use better than they explain Utilization. Hypotheses 1 and 2 were each tested with four regressions, but interpretation – and thus a decision to support or reject the hypotheses – was hindered due to multicollinearity, mixed signs on the betas, and a significant correlation between Intention to Use and Utilization.

Concept Mapping

Overview of concept mapping. Concept mapping is a technique that combines group processes (brainstorming, sorting, and rating items) with multivariate statistical analyses to develop conceptual representations (or maps) of a given topic (Kane & Trochim, 2007; Trochim, 1989). Traditionally, the technique has been used to develop conceptual frameworks to guide program planning and evaluation (Caracelli & Riggin, 1994; Trochim, 1989). More recently, however, concept mapping has been used in combination with traditional scale-development techniques to develop measures and scales (Rosas & Camphausen, 2007). In this application, the researcher uses concept mapping to develop the content domain (items) and constructs (scales), and then subjects the items to factor analysis. The following review focuses on the use of concept mapping in scale development, although the steps are the same regardless of the application. Concept mapping involves six steps: preparation, generation of statements, structuring of statements, representation of statements, interpretation of maps, and utilization of maps (Kane & Trochim, 2007).

Steps in concept mapping. In *preparation*, the researcher selects the participants and guides them in developing a focus statement for the subsequent brainstorming step. The focus statement is usually a single statement or prompt to which participants are asked to respond. For example: "Generate statements which [sic] describe the issues, problems, concerns, or needs which [sic] the elderly have in York county" (Trochim, 1989, p. 4). Generally, participants should have a broad range of experience and perspectives regarding the topic. Kane and Trochim (2007) recommend 10 – 40 participants for a concept mapping project.

In *generation of statements* (also called brainstorming), participants are asked to generate short sentences in response to the focus statement. The typical rules of brainstorming apply: people should be encouraged to generate many statements and withhold criticism of others' statements. When brainstorming is over, the researchers, either alone or in collaboration with participants, usually edit the item pool to ensure that the people scheduled to sort and rate items are presented with a clear, understandable, and relevant list of ideas. Kane and Trochim (2007) recommend reviewing the list to ensure that each statement reflects only one idea, is relevant to the focus, and is comprehensible. If the session generated more than 100 statements, it may be prudent to avoid sorter burden to reduce the set to 100 or fewer by eliminating or combining "redundant or near redundant" statements (Jackson & Trochim, 2002, p. 331). Some researchers report eliminating or combining redundant items prior to sorting regardless of the number of statements (Burke et al., 2005), although the criteria of what constituted redundancy is rarely specified. Once concern is that eliminating redundant items prevents the researchers from making inferences about their importance or frequency (Jackson & Trochim, 2002). The 38 projects Trochim (1993) reviewed had a median of 93 statements (range: 39 to 99).

In *structuring of statements*, participants are asked to sort the statements into piles "in a way that makes sense to you" (p. 12) and then rate the statements on one or more characteristics (Kane & Trochim, 2007). The sorting task should occur *before* the rating tasks. This is because the sorting process encourages participants to focus on "the semantic similarities between statements" (p. 75) regardless of how they feel about the importance of each statement. If the rating occurs before sorting, participants are likely to "sort their top-priority items together, their low priority items together, and so on, negating semantically meaningful similarities among the items" (Kane & Trochim, 2007, pp. 74–75). The only restrictions to the sorting task are that there cannot be 1) *N* piles (i.e., *N* piles of one item each), 2) one pile consisting of all *N* items, and 3) a "miscellaneous" pile (any item thought to be unique should be put in its own separate pile) (Trochim, Cook, & Setze, 1994). The 38 concept mapping projects Trochim (1993) reviewed had an average of 14.6 sorters per project (range: 7 to 32), but the a minimum of 10 to 12 sorters is sufficient to produce reliable a reliable map (Jackson & Trochim, 2002).

The rating step instructs participants to rate statements according one or more criteria, such as importance, relevance, feasibility, and so on. For example: "Rate each potential outcome on a five point scale in terms of its importance to the program, where '1' means 'Not at all important,' '3' means 'Moderately important,' and '5' means 'Extremely important.'" (Kane & Trochim, 2007, p. 10).

Representation of statements involves creating concept maps based on similarities in how items were rated and sorted. Representation is best done with concept mapping software (e.g., Concept System® Version 4; Concept Systems, 2011a) which analyzes the data in three stages. First, the software generates an N x N similarity matrix for each sorter, where N is the number of statements. For any two statements, if the participant sorted them into separate piles the cell for those two statements contains a 0; if sorted into the same pile, the cell contains a 1. The software then sums each participant's similarity matrix to form a similarity matrix for the entire group (i.e., the total similarity matrix). The value in the matrix for any two statements indicates how many participants placed the two statements together in a pile (Kane & Trochim, 2007).

In the next stage, the software subjects the total similarity matrix to multi-dimensional scaling (MSD) analysis (Kruskal & Wish, 1986). This procedure generates x and y coordinates for each statement based on its mathematical similarity to other statements. The result is a two-dimensional "map" of the points, with each point representing a statement. Items that are closer to each other on the map were sorted together more frequently, and therefore judged to be similar to each other (Trochim, 1989). "The position of each point on the map (e.g., top, bottom, right, left) is not important—only the distance or spatial relationship between the points" (Jackson & Trochim, 2002, p. 316). The goodness of fit of the point map to the original similarity matrix can be assessed by calculating a stress value (Kruskal & Wish, 1986; Trochim, 1993). A lower stress value indicates a better fit. The average stress value across 33 projects reviewed by Trochim (1993) was .285 (range: .155 to .352).

In the final stage, the software uses hierarchical cluster analysis (HCA) to group statements into mutually exclusive clusters and displays them graphically on a cluster map. The Concept System® software (Concept Systems, 2011a) uses the MDS X-Y coordinate values and Ward's algorithm (Everitt, Landau, & Leese, 2001) as the basis for defining a cluster, but the researcher must specify the number of clusters into which the statements should be grouped. There is no mathematical way to select a "correct" number of clusters because the "solution depends on the level of specificity desired and the context at hand" (Jackson & Trochim, 2002, p. 316). Kane and Trochim (2007) recommend the researcher first decide on the highest and lowest number of clusters desired based on the degree of specificity desired for each cluster, and then review what statements are being merged as he or she moves through cluster levels beginning with the highest number of clusters. With each new cluster solution, the researcher needs to determine if it makes sense to keep the newly merged statements together or separate. The goal is to find the cluster level "that retains the most useful detail between clusters while merging those that ... sensibly belong together" (Kane & Trochim, 2007, p. 103). Researchers can also work with participants to evaluate different cluster solutions, working collectively "to determine which arrangement of items and cluster domains most accurately reflects participant perceptions" (Burke et al., 2005, p. 1401).

The HCA output, however, provides two tools that "together provide a statistical basis to guide human judgment about the goodness of fit for the final cluster solution" (Jackson & Trochim, 2002, p. 316). The first tool is a bridging value assigned to each statement within a given cluster. The bridging value indicates how often that statement was sorted together with statements from the same or other clusters. Values range from 0 to 1. Statements with lower bridging values were sorted with other statements in the cluster more often (i.e., more agreement among sorters) and are thus more representative of the cluster (Baldwin, Kroesen, Trochim, & Bell, 2004). Statements that are difficult to sort will have high bridging values (Concept-Systems, 1999; Jackson & Trochim, 2002). In their study, Baldwin and colleagues described bridging values of .12 to .24 as "low" (i.e., good) and .60 and .54 as "high." While choosing the final cluster solution, "the decision makers can examine bridging values of each statement as a guide to whether that statement should be included in a different cluster" (Jackson & Trochim, 2002, p. 329). The average bridging values of all states in a cluster can also be used as an indicator of the cohesiveness of the statements in that cluster (Concept-Systems, 1999; Jackson & Trochim, 2002). The second tool is a text version of a dendrogram that indicates which clusters were merged at each map iteration.

Interpretation of maps involves naming the clusters and examining the statement list, cluster list, point and cluster maps, and rating data. The concept mapping software uses centroid analysis to select a "top-10" list of pile names for each cluster using the pile names created by sorters, but it is up to the researcher to decide on the final name (Jackson & Trochim, 2002).[38] To facilitate interpretation, the cluster map is often superimposed onto the point map to show how the statements (i.e., MDS points) were grouped by the cluster analysis. The result is a cluster point map, which Jackson and Trochim (2002) describe as follows:

> "The proximity of the clusters represents how similar the statements in them were judged to be by the coders/sorters. Clusters that are farther apart on the map contain, in general, statements that were sorted together less often than those that are closer together. The position of each cluster on the map (e.g., top, bottom, right, left) is not meaningful—only the distance or spatial relationship between them. The breadth or tightness (i.e., shape and size) of a cluster generally represents whether it is a broader or narrower conceptual area." (p. 321).

The average ratings for each statement and cluster can be overlaid onto the point and cluster maps, respectively, and thus represent graphically the relative importance given to each item and cluster (Kane & Trochim, 2007). Pattern matching techniques and correlation coefficients (e.g., Pearson) can also be used to measure the level of agreement in cluster ratings between groups, across rating scales, or over time (Burke et al., 2005). Ladder graphs can be used to visually depict how average cluster ratings vary by the categories being compared.

Utilization of maps. In a scale development project, the researcher typically creates subscales based on the clusters and the statements they contain. The cluster name becomes the scale name and the statements within the cluster usually reworded and assigned a Likert response scale constitute the scale's items. If the instrument is too long, participants' rating data can be used to identify and omit items viewed as less

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[38] For details of centroid analysis, see Afifi and Clark (1996) and Jackson and Trochim (2002).

important. The result is a multidimensional instrument that can be administered to subjects and its validity and reliability examined using traditional scale development techniques. For example, CFA was used in several studies to confirm and improve the factorial validity of an instrument developed with concept mapping (see p. 169 in Kane & Trochim, 2007; Rosas & Camphausen, 2007).

Reliability and Validity. The reliability of the total similarity matrix (i.e., the consistency with which the sorters sorted statements) can be assessed by calculating the equivalent of a split-half reliability coefficient. To do this, the researcher randomly divides the sorters into two equal subgroups, calculates a similarity matrix for each, and correlates the two matrices. The traditional rule of thumb for split-half reliability applies: a coefficient ≥. 80 indicates adequate reliability and ≥ .90 indicates good reliability. The average split-half total matrix reliability of 33 projects reviewed by Trochim (1993) was .833 (range: .725 to .933).

Reliability can also be assessed by correlating each person's similarity matrix with the total similarity matrix and then averaging the correlations. This procedure yields an individual-to-total reliability coefficient that is similar to item-total reliability. A coefficient ≥. 40 is considered very good reliability (Nunnally & Bernstein, 1994) and indicates statistical consistency in the sorting patterns across all sorters. The average individual-to-total reliability in Trochim's (1993) review of 33 studies was .929 (range: .882 to .974). Because these reliability coefficients rely on calculations involving only part of the total available sample, and are further affected by the number of sorters, they are imperfect estimators of what correlational values would be for the entire sample. To correct for this the researcher should always apply the Spearman-Brown prophecy formula (Nunnally & Bernstein, 1994; Trochim, 1993).

CHAPTER 3

METHODS

There are four aims to this study. Each aim corresponds to one of Schwab's (1980) three stages of instrument development and one of Loevinger's (1957) three levels of instrument validity. Table 12 lists the four aims and the corresponding methods, data collection strategy, and step in Schwab's and Loevinger's frameworks. The methods for each aim were approved by the Eastern Virginia Medical School and Old Dominion University Institutional Review Boards (IRB).

Virginia's Child Welfare Information System

The study is limited to users of Virginia's CWIS, the Online Automated Services Information System (OASIS), which is used by the Department of Social Services (DSS) to manage child welfare programs across the state. These child welfare programs, including foster care, adoption and child protective services (CPS) are overseen at a local level by 120 social service agencies (Virginia Department of Social Services, 2013).[39] OASIS was based on Oklahoma's SACWIS, which was transferred to Virginia in the summer of 1997 after efforts to develop a new system were not realized. The transfer of the system was seen as the best option in order to meet the adoption and foster care federal deadline for reporting on October 1, 1997. OASIS was deployed in local agencies throughout the state in October 1997, and has been continually modified by DSS, including the addition of a CPS module in July of 1999.

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[39] Virginia is one of nine states whose child welfare system is county-administered (Child Welfare Information Gateway, 2012).

Table 12

Study Aims, Methods, Data Collection Strategy, and Correspondence to Schwab's Stages of Instrument and Loevinger's Types of Measurement Validity

Aim	Stage of Instrument Development (Schwab, 1980)	Type of Measurement Validity (Loevinger, 1957)	Methods	Data Collect. Strategy
Aim 1 *Develop a pool of items to measure task-technology fit (TTF), or the degree to which CWIS meets the needs of frontline caseworkers performing case management.*	**Item Pool Development**	**Substantive Validity**	**Concept Mapping – Brainstorming Step** (Content Analysis)	**Focus Groups**
Aim 2 *Identify from the item pool preliminary dimensions of TTF and the subscales to measure each dimension.*	**Scale Development** (development and psychometric evaluation of scales)	**Structural Validity**	**Concept Mapping – Sorting & Rating Step** (Multi-dimensional scaling, Hierarchical cluster analysis)	**Online activity**
Aim 3 *Establish the structural validity of the TTF measure by confirming or refining the preliminary TTF dimensions and subscales to achieve adequate levels of reliability and fit.*	**Scale Development** (development and psychometric evaluation of scales)	**Structural Validity**	**Exploratory and Confirmatory Factor Analysis**	**Online Survey**
Aim 4 *Establish the instrument's nomological validity by testing the hypotheses suggested by the TTF framework (i.e., that individual, task, and technology characteristics impact user evaluations of TTF, and that TTF impacts individual performance)*	**Scale Evaluation** (correlation of scale scores with other variables or criteria)	**External Validity**	**Structural Equation Modeling**	**Online Survey**

(Joint Legislative Audit and Review Commission, 2000). There are approximately 2,500 OASIS users serving more than 138,000 clients annually. OASIS utilizes an ORACLE database on a UNIX operating system, with PowerBuilder as the primary programming language. The Department of Social Services manages all development, implementation, and operations for OASIS; there are no outside contractors involved. The development and implementation of OASIS has cost over $17 million and requires an annual cost of $2 million to maintain (Joint Legislative Audit and Review Commission, 2000). As of this writing, Virginia is one of 13 states with a CWIS categorized by the Administration for Children and Families as a "Non-SACWIS Model" (U.S. Department of Health and Human Services Administration for Children and Families Division of State Systems, 2013b).

Methods Common to Two or More Study Aims

To avoid duplicating large sections of text, methods that were common to two or more of the study aims are described once in this section, and referenced as needed for the remainder of the document.

Collecting Data on Demographic Characteristics, Work-Setting, and OASIS Experience. In this study data were collected in three stages from three independent samples of caseworkers: focus groups for Aim 1, a random sample of workers for Aim 2, and a random sample of workers for Aims 3 and 4. To compare the characteristics of each sample a common set of demographic, work-, and OASIS-related questions were asked of each sample (see Appendix A for the Demographic Questionnaire). Data were collected on workers' background (sex, age, race, and education), social work practice (licensure; primary role: CPS, foster care, adoption, and/or other; years at agency and in career; and caseload size), and percent of time spent on 12 casework-related tasks. Five of these questions were taken or adapted from Whitaker, Weismiller, and Clark's (2006) nationally representative survey of licensed social workers in 2004. OASIS experience and use was assessed with four questions, three of which were adapted from existing scales related to tool experience and use: Seddon and Kiew's use question (1996) and Dishaw and Strong's (2003) 3-item Tool Experience Scale. Three additional questions asked about the extent to which workers are mobile, or away from the office, and were adapted from Gebauer and Tang's 3-item Mobility Scale (2008, p. 338).

Although it is desirable to compare the characteristics of the researcher's samples with those of the national population of front-line, non-licensed workers working in public agencies, national data on this population does not exist. Instead, the survey data was used to compare data across the three samples in this study to assess their similarities and differences. Categorical variables across samples were compared using the χ^2 statistic. Continuous variables across samples were compared using t-tests and ANOVAs or their non-parametric equivalents (Mann-Whitney U and Kruskal-Wallis). Variables were described using frequencies and percentages for categorical variables, means and SDs for normally distributed continuous variables, and medians and ranges for non-normally distributed continuous variables. The four questions assessing OASIS experience were analyzed as a scale, by calculating an overall mean and measure of reliability (Cronbach's alpha). Because the OASIS experience items use different response scales, they were normalized to a 7-point scale before calculating the mean and alpha, as was done by Dishaw and Strong (2003). The three questions that assess worker mobility were also analyzed as a scale, with an overall mean and alpha.

Use of Rural Urban Commuting Codes to Stratify Workers by County. Aims 2 and 3 involved a random sample of workers, stratified by worker type and county urban/rural setting. The county stratification was essential given that Virginia's child welfare services are administered at the county level by 118 local agencies. Although the median number of workers per county is 17, it ranges from a low of 1 in Martinsville county to a high of 107 in Fairfax county. This diversity in county size greatly influences workers' tasks. In small counties such as Martinsville, that lone caseworker likely provides child protection, foster care, and adoption services. In large counties like Fairfax, a caseworker is likely to be more specialized and provide only one of these services. The counties also vary in their urban/rural setting, a characteristic that can affect how child welfare services are delivered (see e.g., Chapter 2, *How Tasks Vary by State, Agency, County, and Case Characteristics*). Because county size and urban/rural setting may influence workers' task needs and thus assessments of fit, Rural-Urban commuting area (RUCA) codes were used to divide the counties into four stratum: metropolitan area, micropolitan area, small town, and rural area (USDA Economic Research Service, 2005).[40] Developed by the United States Department of Agriculture's Economic Research Service (USDA Economic Research Service, 2005), RUCAs are a Census tract-based classification scheme that combines commuting information with

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[40] More descriptive names for these last three strata would be large rural city or town (i.e. micropolitan), small rural town (i.e., small town), and isolated small rural area (i.e., rural area) (WWAMI Rural Health Research Center, n.d.).

Bureau of Census definitions for Urbanized Area and Urban Clusters "to characterize all of the nation's Census tracts regarding their rural and urban status" (WWAMI Rural Health Research Center, n.d.). A ZIP Code approximation of the RUCA codes based on an overlay of ZIP code areas on census tracts allows researchers to assign counties into RUCA groups based on zip code. Consistent with the classification used in the 2004 national survey of licensed social workers (Whitaker et al., 2006), the researcher defined a metropolitan area as a county with a RUCA code of 1,2, or 3; a micropolitan area as a county with a RUCA code of 4,5, or 6; a small town as a county with a RUCA code of 7,8, or 9; and a rural area as a county with a RUCA code of 10.

Obtaining Data on Virginia's Caseworker Population and File Preparation. Participation in Aims 2 and 3 was limited to workers who were employed full-time; in permanent positions versus emergency, restricted, seasonal, and temporary; worked primarily in CPS, foster care, adoption or any combination of three (i.e., generic workers);[41] had an active caseload; and had a designation of Social Worker I, II, III, or IV which in Virginia indicates a front-line, non-supervisory role. To obtain data on this population a request was submitted to Virginia's DSS to obtain a list of workers who met the aforementioned criteria. The list included approximately 1,400 workers along with their job functions, which were used to classify workers into one of four, mutually exclusive categories: CPS, foster care, adoption, or generic, where generic refers to a worker whose job function suggested they work in two or more of these areas. The list

[41] VA DSS often designates generic workers with the job function or case type of "Family Services Worker" or "Family Services Program."

also included workers' localities and county FIPS codes, but the localities did not always correspond to the county name associated with the given FIPS code. The few discrepancies occurred in smaller regions of the state, where a single agency might oversee several small, adjacent counties. County names were added to the list by merging in a file matched by FIPS containing Virginia counties and FIPS codes obtained from the National Institutes of Standard and Technology (http://www.itl.nist.gov/fipspubs/co-codes/va.txt).

The list provided by DSS also did not include the workers' zip codes, agency names, and agency mailing addresses. These items were added by merging in a file matched by County name containing address information for Virginia's 118 DSS agencies obtained from http://www.dss.virginia.gov/localagency/. Lastly, RUCA codes were added to the list by merging in a file matched by ZIP code containing RUCA codes and corresponding Virginia ZIP codes obtained from http://depts.washington.edu/uwruca/ruca-download.php. Each worker was then assigned an urban/rural designation (Metropolitan, Micropolitan, Small Town, or Rural) using the classification schema developed by the WWAMI Rural Health Research Center and described earlier. The full classification scheme is available at http://depts.washington.edu/uwruca/ruca-codes.php.

Strategy to Recruit Participants and Increase Participation Rates. Workers in Aims 2 and 3 were recruited through a multi-stage contact process known as the Tailored Design Method (Dillman, Smyth, & Christian, 2008). Used primarily in survey research, Dillman's method prescribes a schedule of pre- and post-notifications combined with token incentives provided to all eligible respondents. Studies have shown this method yields higher participation rates than single mailings which promise to reward participation with a future incentive. Eligible participants in both Aims were sent up to four mailings: 1) a pre-notification letter to inform them of the upcoming study, its purpose, and why they were deemed eligible ; 2) a study invitation letter that included details about the study, materials needed to participate, and a token incentive; 3) a follow-up reminder letter sent only to non-respondents; and 4) a second follow-up reminder sent only to non-respondents. The mailing schedule followed that suggested by Dillman and colleagues (2008): the study invitation letter was sent a few days after the pre-notification, the first follow-up reminder was sent a few days to a week after the study invitation letter, and the second follow-up reminder was sent approximately 2 to 4 weeks after the previous one. More specific details as they relate to each Aim will be described later.

The recruitment process for both Aims also incorporated these additional strategies recommended by Dillman and colleagues (2008):

1. correspondence should come from the study sponsor on stationary (all letters were printed on Virginia DSS letterhead, and were co-signed by a non-supervising DSS representative);
2. the request should subordinate the researcher to the respondent by asking for his or her help (the first two letters began with "We are writing to ask for your help …");

3. include logos and other visual reminders on the correspondence (the researcher develop a logo which incorporated the Virginia DSS logo and the tagline, "Helping OASIS Meet the Needs of Caseworkers");
4. use stamped self-address envelopes instead of a business reply envelopes; and
5. use a recognizable return address (used "**VA DSS OASIS Project**" followed by c/o the researcher's name and address).

Statistical Software. IBM® SPSS Statistics® version 20.0 (IBM Corp., 2011) was used for data management, basic descriptive and inferential statistics, and exploratory factor analysis. Concept System® Core, Version 4.0 (Concept Systems, 2011a) was used to analyze the sorting and rating data and generate concept maps. Amos version 18.0. (Arbuckle, 2009a) was used for confirmatory factor analyses and structural equation modeling.

Aim 1. Develop a pool of items to measure TTF, or the degree to which CWIS meets the needs of frontline caseworkers performing case management.

Sample. Eighteen caseworkers were recruited purposively from three Virginia jurisdictions (six workers per jurisdiction: two CPS, two foster care, and two adoption). Eighteen participants is within the range (10 – 40) recommended by Kane and Trochim (2007) for a concept mapping project. In order to reflect the geographic and sociodemographic diversity of Virginia, the jurisdictions included an urban, suburban, and rural city, and were selected based on consultation with representatives from Virginia's DSS. Participants were required to meet the following criteria:

1. provide direct services to children in families in CPS, foster care, and/or adoption;
2. have an active caseload;
3. use OASIS on a daily basis; and
4. represent a range of proficiency with using OASIS.

Procedures for Recruitment. A DSS representative asked the social services director in each of the selected counties to identify up to 18 workers who met the aforementioned criteria, and whose supervisors would permit their involvement in this study during work hours. Because the DSS does not collect data on workers' proficiency with OASIS, it was not possible to objectively assess ahead of time whether the selected participants represented "a range of proficiency with using OASIS." Instead, the directors were asked to assess this criterion subjectively based on their first or second-hand knowledge of the workers' facility with using OASIS. During the focus group, however, OASIS proficiency was assessed with a 4-item scale that measures OASIS use and experience (see Appendix A, questions 10-13) and the results will be covered in the next chapter.

A DSS representative provided the researcher with a list containing names, work numbers, and role (CPS, foster care, and/or adoption) of the identified workers, whom were contacted by phone to invite their participation. Recruitment continued until at least six workers (two from each role) from each list of 18 agreed to participate. A telephone content script (Appendix B) was used to structure phone calls. The script addressed the purpose of the study, why the worker was deemed eligible, what participation entails, that participation is voluntary, that responses are confidential, and that a $20 Amazon gift card will be provided to each participant as compensation. Workers who expressed interest in participating were asked to provide their preferred days and times to participate in a 60-minute focus group to be held at a location most convenient to all participants.

Procedures for Participation. The eighteen workers were assigned to three focus groups (six workers per group) based on their jurisdiction. Focus groups of six to eight participants are ideal when the goal is to extract detailed insights and experiences from participants, who are likely to have a lot to share about the topic (Krueger & Casey, 2000). A facilitator script (Appendix C) was used to introduce the study and each stage of the discussion. The financial incentive was provided at the beginning of the group.

Stage 1: Complete Demographic Questionnaire (20 minutes). Workers completed an anonymous questionnaire (described earlier; see Appendix A) that collected information about their background, social work practice, time spent on specific tasks, experience with OASIS, and mobility.

Stage 2: Review Definition of Casework (20 minutes). To establish a common definition of casework, participants were asked to review the list of casework tasks in Table 13 to determine if the list comprises the major tasks they associate with casework. These tasks should reflect the casework activities that their CWIS may or may not support, and upon which caseworkers are likely to base their assessments of fit. This list was developed by identifying commonalities across the workload studies and task lists reviewed in Chapter 2.

Table 13

Tasks that Comprise Child Welfare Casework

Task	Definition
Intake	screening and accepting reports of child abuse and neglect
Investigations	determining if child abuse and neglect occurred
Family Assessments	assessing family strengths and needs
Risk and Safety Assessments	evaluating a child's safety and risk
Case Planning	developing case plans; identifying goals and outcomes
Service Provision	arranging, providing, and coordinating delivery of services
Ongoing Case Monitoring, Evaluation, and Follow-Up	
Case Closure	
Administrative	e.g., supervisory meetings, staff meetings
Court-Related Activities	e.g., preparing reports, waiting in court, appearances
Training	
Traveling	time spent in vehicle carrying out tasks, such as going to and from visits, interviews, court, etc.
Other (specify)	

Stage 3: Brainstorm and Generate Items (40 minutes). Workers were first asked to discuss their experience with and use of OASIS when performing casework. They were encouraged to not limit the discussion to OASIS' technical features and performance, but to consider their experiences with aspects of the broader information technology (IT) and data environment, such as the quality of data in OASIS and the computer training and help desk support DSS provides them.[42] This discussion was designed to sensitize the workers to all aspects of the IT and data environment which may inhibit or facilitate their performance of case management. Participants were then

[42] This is consistent with the TTF definition of Technology Characteristics as comprising not just characteristics of the technology, but characteristics of the broader IT environment in which the technology is used.

asked to evaluate for clarity and scope the following draft focus statement:

> *"Generate short statements which describe the needs you have regarding OASIS and OASIS services when performing casework."*

Workers were invited to revise the statement as needed until the group reached consensus on its wording (Trochim & Kane, 2005).

The remainder of the session involved generating statements in response to the focus statement. The goal was to generate a set of statements which represent the entire domain of workers' concerns and needs regarding OASIS in support of case management (i.e., the TTF construct). To ensure total coverage of the construct, participants were encouraged to be comprehensive in creating the item pool (Clark & Watson, 1995). They were also discouraged from discounting or wanting to substantially revise items that looked redundant. As discussed in the literature on scale development, item redundancy is a principle of internal consistency and should not be discouraged at the item generation stage (DeVellis, 2003). Using a laptop and projector, an assistant recorded the statements as they were generated so that all members of the group could see the set of statements as they evolved. Once the final set of statements was generated, the group was asked to examine and edit them for clarity and relevance to the focus statement (Kane & Trochim, 2007).

Analysis. Demographic survey results were analyzed per the methods described at the start of this chapter (see Methods Common to Two or More Study Aims). In preparation for Aim 2, the statements generated by each group were combined into one list and purged of exact duplicates. Consistent with prior TTF instruments, the statements were also rephrased if needed to take the form of a declarative statement suggesting either that needs are or are not being met (e.g., "I can count on OASIS to be 'up' and available when I need it.") (Goodhue, 1998).

Aim 2. Identify from the item pool preliminary dimensions of TTF and the subscales to measure each dimension.

Research Questions. The research questions for this aim are shown in Table 14.

Table 14

Research Questions for Aim 2

#	Question Text
Question 2.1	To what extent does the item pool represent the TTF construct (i.e., content validity)?
Question 2.2	What dimensions of TTF are represented in the item pool?
Question 2.3	To what extent do the sorting and rating results (i.e., perceived TTF dimensions and perceived importance) vary by type of worker?

Sample. This sample included a random sample of 48 caseworkers from across Virginia, stratified by worker type (CPS, foster care, adoption, and generic) and county urban/rural setting. A sample size of 48 is at the top range (10 – 40) recommended by Kane and Trochim (2007) for a concept mapping project. Eligibility criteria and county urban/rural setting designations were described earlier (see the appropriate headings under Methods Common to Two or More Study Aims.

Procedures for Random Sampling. The Complex Samples feature of IBM® SPSS Statistics®, Version 20 (IBM Corp., 2011) was used to select a random sample of workers (from the list of all eligible workers), stratified by worker type (CPS, foster care, adoption, and generic) and RUCA designation (Metro, Micro, Small Town, and Rural), with equal numbers from each strata-pair. This would create a non-proportionate sample with three workers from each strata-pair for a total of 48 workers.

Procedures for Recruitment. The selected workers were recruited using the Tailored Design Method described earlier (Dillman, Smyth, & Christian, 2008). The pre-notification letter (Appendix D) informed them of the upcoming study, its purpose, and why they were deemed eligible. The study invitation letter (Appendix F) included a link to the online sorting and rating activity, a hard copy of the demographic survey and self-addressed stamped envelope, and a $5 bill. The two follow-up reminders, sent only to non-respondents, and shown in Appendix G and Appendix H. All but the pre-notification letter included a link to the URL of the project website, which ran a concept mapping application developed by Concept Systems, Inc. (2011b). The first page of the website included an informed consent page that provided details regarding the study, eligibility, participation, and confidentiality (Appendix I). Clicking an "Accept" button indicated consent to participate in the study.

Procedures for Participation. Participants were asked to complete and return the demographic questionnaire described earlier (Appendix A) and complete two online activities that involved sorting a list of statements into similar groups and rating the importance of each statement in measuring fit. The statements were those produced in the earlier focus groups (the brainstorming step of Aim 1) in which workers generated a list of statements that reflected their needs regarding OASIS and OASIS services. To reduce the effect of priming (Lavrakas, 2008), in which the order of the statements presented can influence a subject's response to the subsequent statement, the participants were invited in a staggered fashion, 10 participants at a time, randomly assigned. When the first 10 participants completed the sorting and rating process, the statements were randomly re-ordered before the next group of 10 were invited, and so on.

Sorting. The webpage for this task listed the statement on the left of the screen, with instructions to sort the statements into categories "in a way that makes sense to you" (Rosas & Camphausen, 2007). For the full text of sorting instructions see Appendix J. Items can be sorted by dragging and dropping them into empty boxes on the right. The instructions specified the following rules: 1) all items may not be put into a single group; 2) items may not be placed in two groups simultaneously, and 3) there may not be any "miscellaneous" groups (Rosas & Camphausen, 2007). Caseworkers were also required to provide a meaningful name for each box (i.e., category) in which they grouped items. Figure 5 provides a representative and annotated screenshot of the webpage for the sorting task.

Rating. After sorting was complete, workers were asked to rate the importance of each statement "when it comes to measuring how well OASIS and related services (e.g., training, tech support) meets caseworkers' needs." Respondents were instructed to use a 5-point scale, where 1 = Relatively Unimportant and 5 = Extremely Important. For the full text of the rating instructions see Appendix K.) Figure 6 provides a representative screenshot of the webpage for the rating task.

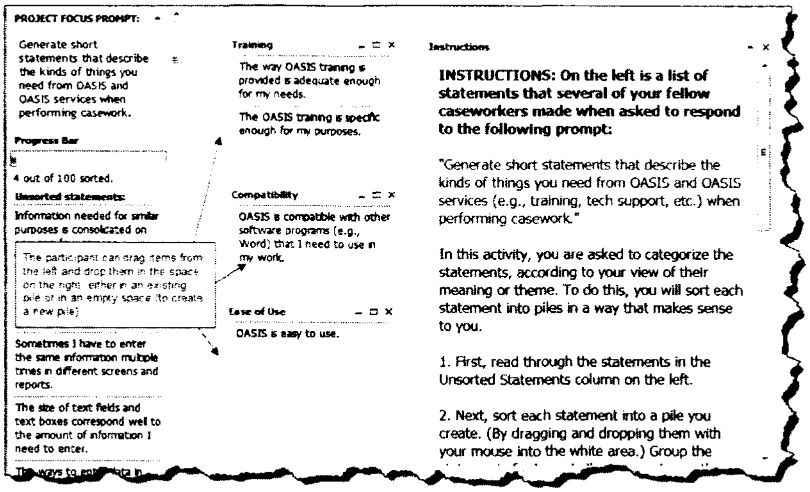

Figure 5. Representative Screenshot of Webpage for the Sorting Task, using Concept System ® CS Global Software, Version 4.0.

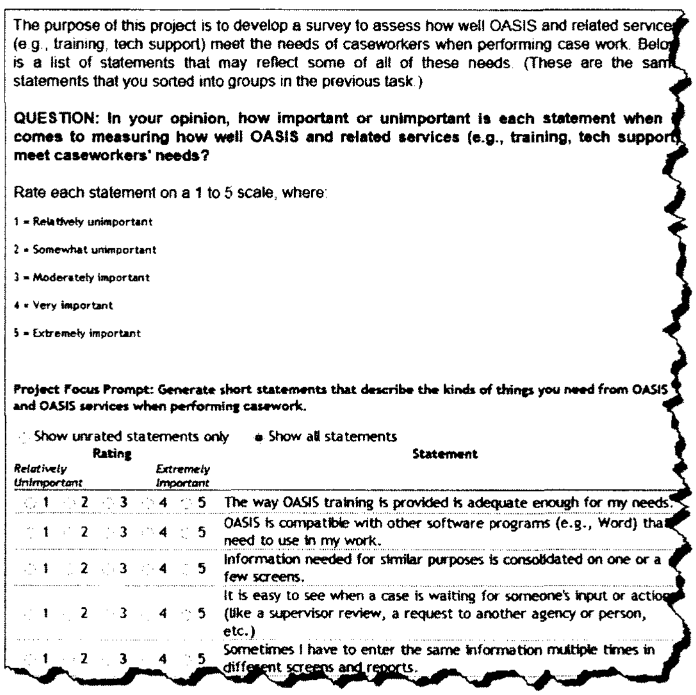

Figure 6. Representative Screenshot of Webpage for the Rating Task, using Concept System ® CS Global Software, Version 4.0.

Analysis.

Research Question 2.1. To what extent does the item pool represent the TTF construct (i.e., content validity)? The rating data was used to identify the degree to which the items generated in the focus groups were, according the panel of sorters and raters, important in measuring TTF. Items with scores of 1 or 2 (Relatively unimportant or Somewhat unimportant) were considered to have weak content validity. The content validity for the entire item pool was assessed by calculating the mean importance score across all of the statements, with a mean score less than 3.0 suggesting weak content validity.

Research Question 2.2. What dimensions of TTF are represented in the item pool? Concept System® Core, Version 4.0 (Concept Systems, 2011a) was used to analyze the sorting and rating data and generate concept maps. The literature review described this analysis, wherein the software identifies similarities in how items were sorted (similarity matrices), places these items on a map (multi-dimensional scaling), and groups them into clusters (hierarchical cluster analysis). The results of HCA were superimposed on the MSD results to create a map that shows how the MDS points were grouped by caseworkers. Guidelines recommended by Kane & Trochim (2007) and described earlier were used to determine the final number of clusters. Final cluster names were based on names suggested by the software and edited as needed to reflect the core theme.[43] These clusters reflect the initial hypothesized TTF dimensions that will be tested later with CFA.

The goodness of fit of the point map to the observed similarity matrix was assessed by calculating a stress value (Trochim, 1993). The reliability of the sorting data was assessed by calculating split-half and individual-to-total matrix reliability coefficients with a Spearman-Brown correction. Coefficients greater than ≥ .90 (for split-half) and ≥ .40 (for individual-to-total matrix) were considered good reliability.

Research Question 2.3. To what extent do the sorting and rating results (i.e., perceived TTF dimensions and perceived importance) vary by type of worker? Significant differences by worker type in perceived dimensionality (the sorting results) and item importance (ratings) may suggest that each group defines the fit construct differently. In such cases, it may be important to assess for multigroup invariance in the subsequent (CFA) measurement models and create a separate measurement model for each worker type. To determine if perceived dimensionality varied significantly by worker type, the plan was to create separate maps for each category of worker (CPS, foster care, adoption, and generic) and examine them for similarities and differences. Differences in mean ratings by worker type would be assessed by analysis of variance (ANOVA). As will be discussed in the Results section, these analyses were not possible due to having too few workers of each type.

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[43] Recall from Chapter 2 that the Concept System® Core software uses centroid analyses and workers' own labels to produce a "top-10" list of pile names for each cluster, but it is up the researcher to decide on the final name (Jackson & Trochim, 2002).

Aim 3. Establish the structural validity of the TTF measure by confirming or refining the preliminary TTF dimensions and subscales to achieve adequate levels of reliability and fit.

Hypotheses. The hypothesis and research questions for this aim are shown in Table 15.

Table 15

Hypotheses for Aim 3

#	Hypothesis
Hypothesis 3.1	TTF is an N-dimensional construct as suggested by the point-cluster map produced from the concept mapping study.
Hypothesis 3.2	TTF is an N-dimensional construct as suggested by exploratory factor analysis.
Hypothesis 3.3	TTF is a one-dimensional construct. *This hypothesis assess whether a model that assumes a single dimension of TTF provides a better fit to the data than a model that assumes N separate dimensions. This is a routine test of a one-factor competing model recommended by Kline (2004).*
Hypothesis 3.4	TTF is an N-dimensional construct with one or more higher-order factors. *This hypothesis assesses whether a model with multiple first-order factors of TTF provides a better fit to the data than a model that assumes one second-order factor.*

Questionnaire Assembly and Scales. The questionnaire used for this Aim was hosted on a website using SurveyMonkey®. Questions were grouped into three sections. The first section included the demographic and work-related questions asked of every sample (Appendix A). The second section included four scales from the literature to measure the other constructs in the TTF framework: individual characteristics, task characteristics, technology characteristics, and individual performance. The third section included the TTF statements produced in Aim 1. The TTF questions were all subsumed under a broad question, "To what extent do you disagree or agree with the following statements?," followed by a 7-point scale from Strongly Disagree to Strongly Agree (Goodhue, 1998). To avoid anchoring and adjustment biases, the items for existing scales and the TTF statements were ordered randomly such that no two items that appeared in the same scale or concept mapping cluster were adjacent (Budd, 1987; Goodhue, 1998; Spector, 1991). The complete survey is shown in Appendix L.

Individual Characteristics. Individual characteristics was measured across two dimensions, using scales for OASIS experience (4 items) and work compatibility (3 items) (Table 16).

Table 16

Scales and Items used to Measure Individual Characteristics

Scale	Scale Item
OASIS Experience [a]	1. Approximately how long have you been using OASIS? (Years: __ Months: __)
	2. How frequently do you use OASIS for casework-related tasks? (None of the time [1] – All of the time [7])
	3. How much experience do you have with OASIS (Very little experience [1] – Very much experience [7])
	4. Approximately what percent of your time do you spend on OASIS? (Percent of your time: __)
Work Compatibility [b]	1. Using OASIS is compatible with all aspects of my work.
	2. I think that using OASIS fits well with the way I like to work.
	3. Using OASIS fits into my work style.

[a] Items 1 - 3 adapted from Dishaw and Strong's (2003) 3-item Tool Experience Scale; item 4 adapted from Seddon and Kiew's (1996) use question. Because the items use different response scales, they were normalized to a 7-point scale before calculating a mean and alpha.
[b] All items adapted from Moore and Benbasat's (1991) 3-item Work Compatibility scale. All items measured on a 7-point scale from Strongly Disagree (1) to Strongly Agree (7).

Task Characteristics. Task Characteristics was measured across three dimensions: task difficulty (3 items), task interdependence (2 items) and worker type (CPS, foster care, adoption, or generic) (Table 17).

Table 17

Scales and Items used to Measure Task Characteristics

Scale	Scale Item
Task Difficulty [a]	1. I frequently deal with ill-defined case management problems. 2. I frequently deal with ad-hoc, non-routine case management problems. 3. Frequently the case management problems I work on involve answering questions that have never been asked in quite that form before.
Task Interdependence [b]	1. The problems I deal with frequently involve more than one business function. 2. The business problems I deal with frequently involve more than one organizational group.
Worker Type [c]	1. In what area of child welfare do you primarily work? (CPS, Foster Care, Adoption, or Other: _____)

[a] All items adapted from Goodhue and Thompson's (1995) 3-item Task Equivocality Scale. All items measured on a 7-point scale from Strongly disagree (1) to Strongly Agree (7).
[b] All items adapted from Goodhue and Thompson's (1995) 2-item Task Interdependence Scale. All items measured on a 7-point scale from Strongly Disagree (1) to Strongly Agree (7).
[c] Dummy variables were used for each worker type, with Generic serving as the reference group. Generic was assigned to workers who indicated that their primary work involved two or more distinct practice areas (e.g., CPS and Foster Care, CPS and Adult Protective Services, Adoption and Adult Protective Services).

Technology Characteristics. Technology characteristics was measured with a dichotomous variable that indicated if the worker works in a county classified as metropolitan/micropolitan (0) or small town/rural (1). The use of urban/rural setting to measure technology characteristics even though there is only one system being evaluated assumes that users in different regions of the state may evaluate TTF differently, because of their physical proximity to IT support or DSS headquarters, their historical responsiveness, or their perceived value in the broader DSS organization. This is consistent with how Goodhue and Thompson (1995) measured technology characteristics when they surveyed employees in a large organization with multiple departments; the employee's department was represented by a dummy code. (See Chapter 2, *TTF Constructs – Definitions and Existing Scales, Technology Characteristics*.)

Individual Performance. Individual performance was measured with a 6-item scale adapted from Davis' (1989) 6-item instrument for perceived usefulness (Table 18).

Table 18

Scales and Items used to Measure Individual Performance

Scale	Scale Item
Individual Performance [a]	1. Using OASIS enables me to accomplish my tasks more quickly. 2. Using OASIS improves my job performance. 3. Using OASIS increases my productivity. 4. Using OASIS enhances my effectiveness in the job. 5. Using OASIS makes it easier to do my job. 6. Overall, I find OASIS useful to my job.

[a] All items adapted from from Davis' (1989) 6-item Perceived Usefulness scale. All items measured on a 7-point scale from Strongly Disagree (1) to Strongly Agree (7).

Sample. This sample included a random sample of 500 caseworkers from across Virginia, stratified by worker type (CPS, foster care, adoption, and generic) and county urban/rural setting (metropolitan, micropolitan, small town, and rural). Assuming at least a 50% response rate,[44] a sample size of 250 exceeds the recommended minimum of at least 200 for factor analyses (Kline, 2004). Eligibility criteria and county urban/rural setting designations were described earlier (see the appropriate headings under Methods Common to Two or More Study Aims).

Procedures for Random Sampling. The Complex Samples feature of IBM® SPSS Statistics®, Version 20 (IBM Corp., 2011) was used to select a random sample of approximately 500 workers (from the list of all eligible workers), stratified by worker type (CPS, foster care, adoption, and generic) and RUCA designation (metropolitan, micropolitan, small town, and rural), with equal numbers from each strata-pair. This would create a non-proportionate sample with approximately 31 workers from each strata-pair.

Procedures for Recruitment. The selected workers were recruited using the Tailored Design Method described earlier (Dillman, Smyth, & Christian, 2008). The pre-notification letter (Appendix M) informed them of the upcoming study, its purpose, and why they were deemed eligible. The study invitation letter (Appendix N) included a link to the online survey and a $1 bill. The two follow-up reminders, sent only to non-

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[44] This 50% estimated return rate is based on return rates obtained by the National Association of Social Workers (NASW) with similar populations. For example, Whitaker et al. (2006) achieved a 49% response rate in their 2004 national survey of 10,000 social workers (using two subsequent mailings to nonrespondents). Whitaker, Reich, Reid, Williams, & Woodside (2004) achieved a 75% response rate in their 2003 survey of 716 Child Welfare Specialty Practice Section members. Lastly, in its biannual survey of a sample of 2,000 NASW members, NASW's Practice Research Network received response rates of 81% (2000), 78% (2002), and 70% (2004) (Weismiller, Whitaker, & Smith, 2005). In the latter two survey projects, the only incentive NASW provided was a $1 bill included with each survey (i.e., Dillman's method of sending a token incentive).

respondents, are shown in Appendix O and Appendix P. All but the pre-notification letter included a link to the online survey.

Procedures for Participation. Participants were asked to complete the online survey per the instructions in the study invitation letter and follow-up reminders. For a description of the survey see the earlier section, Questionnaire Assembly and Scales, as well as Appendix L.

Analysis.

Data Preparation and Screening. Survey data was exported from the SurveyMonkey® software and stored in a password protected SPSS file. First, I excluded surveys with responses that suggested the worker was not eligible for the study (e.g., respondent indicated she is a "supervisor," "0" for caseload size). I also excluded surveys with ten percent or more of missing data on the variables necessary for the measurement and structural model (i.e., all scale and TTF questions). Second, variables were screened for univariate and multivariate outliers. A univariate outlier was defined as having a z-score greater than |3.29| (Tabachnick & Fidell, 2012). Multivariate outliers were identified by calculating a Mahalanobis distance score for each case, and then screening these scores in the same manner that the univariate outliers were screened (Kline, 2004). Mahalanobis values with an alpha < .001 suggest a high probability of an unusual observation (i.e., outlier). Depending on the findings, outliers were deleted, fixed (if an error), or retained due to being plausible. Third, variables were screened for normality and evidence of highly skewed distributions, which can contribute to multivariate non-normality. Variables with univariate skewness > |3.00| and kurtosis >

|8.00| were considered highly skewed (Kline, 2004) but none were found. Fourth, multivariate normality was assessed with Mardia's coefficient of multivariate kurtosis, with values > 5.00 suggesting non-normality (Bentler, 2005). Fifth, variables were screened for multicollinearity by inspecting a correlation matrix and examining tolerance (TOC) and variance inflation factors (VIF). Correlations ≥ .90, TOC < .10, and/or VIF > 10 suggested the presence of multicollinearity (Kline, 2004).

General Factor Analysis Considerations. Confirmatory factor analysis with maximum likelihood estimation (MLE) was used to test the fit of all hypothesized models to the data. All models were first tested for identification problems. A model was considered overidentified and testable if the number of data points exceeded the number of estimable parameters (Kline, 2004).[45] Each factor had one item fixed at 1 with the remaining items freely estimated. Decisions regarding changes to factorial structure, scale composition (e.g., item retention), and model re-estimation were based on fit statistics, factor loadings, parameter estimates, and modification indices, using the guidelines discussed in the literature review section. Model fit was assessed with χ^2, CFI (≥ 0.95 = good), SRMR (< .05 = good), and RMSEA (< .05 = good; .05 - .08 = reasonable, .08 - .10 = mediocre) with 90% confidence intervals. Changes to model fit for nested models was assessed with the χ^2 difference test. Factor loadings that were statistically significant and ≥ .40 (Hinkin, 1995) were considered acceptable. Crossloadings or correlated errors suggested by modification indices were estimated only if it made

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[45] Number of data points = v (v + 1) / 2, where v is the number of observed variables. Number of estimable parameters = number of factor loadings + error variances + factor variance + factor covariances.

substantive sense. Scale reliability was assessed by calculating Cronbach's alphas. Lastly, basic descriptive statistics (e.g., means and standard deviations) were calculated for each item and scale.

Aim 4. Establish the instrument's nomological validity by testing the hypotheses suggested by the TTF framework (i.e., that individual, task, and technology characteristics impact user evaluations of TTF, and that TTF impacts individual performance).

Hypotheses. The hypotheses for this aim are listed in Table 19. These hypotheses represent the key propositions of the TTF framework that were described in Chapter 2.

Measurement Model. Prior to testing these hypothesis in a structural model, CFA was used to establish the measurement validity for the individual, task, technology, and individual performance constructs. These scales were presented at the beginning of Aim 3 under Questionnaire Assembly and Scales. This involved using CFA to test and establish a separate measurement model for the exogenous constructs in the model (Individual, Task, and Technology) and the endogenous construct, Individual Performance, as specified in Figure 7. Estimation and analytic guidelines were described in the Analysis section of Aim 3. For the TTF construct the researcher used the final TTF measurement model that emerged from the factor analyses conducted in Aim 3.

Structural Model. Figure 8 shows the structural equation model (SEM) which was used to test the hypotheses of the TTF framework. The fit of the SEM model was tested using the same guidelines used to test the measurement model and described earlier in the Analysis section of Aim 3. Support for each hypotheses was based on adequate goodness of fit and statistically significant parameters among the factors. If the modification indices suggested new paths between factors, they were estimated assuming there was theoretical justification to do so.

Table 19

Hypotheses for Aim 4

#	Hypothesis Text
Individual characteristics (i.e. CWIS experience and Work Compatibility) will affect user evaluations of TTF.	
Workers with more experience on the CWIS will give higher evaluations of each TTF dimension.	
4.1.1	*TTF Dimension 1*
4.1.2	*TTF Dimension 2*
4.1 ...	*TTF Dimension ... N*
Workers who view CWIS as more compatible with their work style will give higher evaluations of each TTF dimension	
4.2.1	*TTF Dimension 1*
4.2.2	*TTF Dimension 2*
4.2 ...	*TTF Dimension ... N*
Task characteristics (i.e., Task Difficulty, Task Interdependence, and Worker Type) will affect user evaluations of TTF.	
Workers who report more difficult tasks will give lower evaluations of TTF.	
4.3.1	*TTF Dimension 1*
4.3.2	*TTF Dimension 2*
4.3 ...	*TTF Dimension ... N*
CPS workers, whose tasks involve more front-loading of data into OASIS, will give lower evaluations of TTF than other workers because their demands on the system are greater.	
4.4.1	*TTF Dimension 1*
4.4.2	*TTF Dimension 2*
4.4. ...	*TTF Dimension ... N*
Technology characteristics (i.e., urban/rural setting as a proxy for OASIS support) will affect user evaluations of TTF.	
4.5.1	*Workers from small towns and rural areas will give lower evaluations of TTF.*
User evaluations of TTF will be positively associated with Individual Performance.	
4.6.1	*TTF Dimension 1*
4.6.2	*TTF Dimension 2*
4.6 ...	*TTF Dimension ... N*

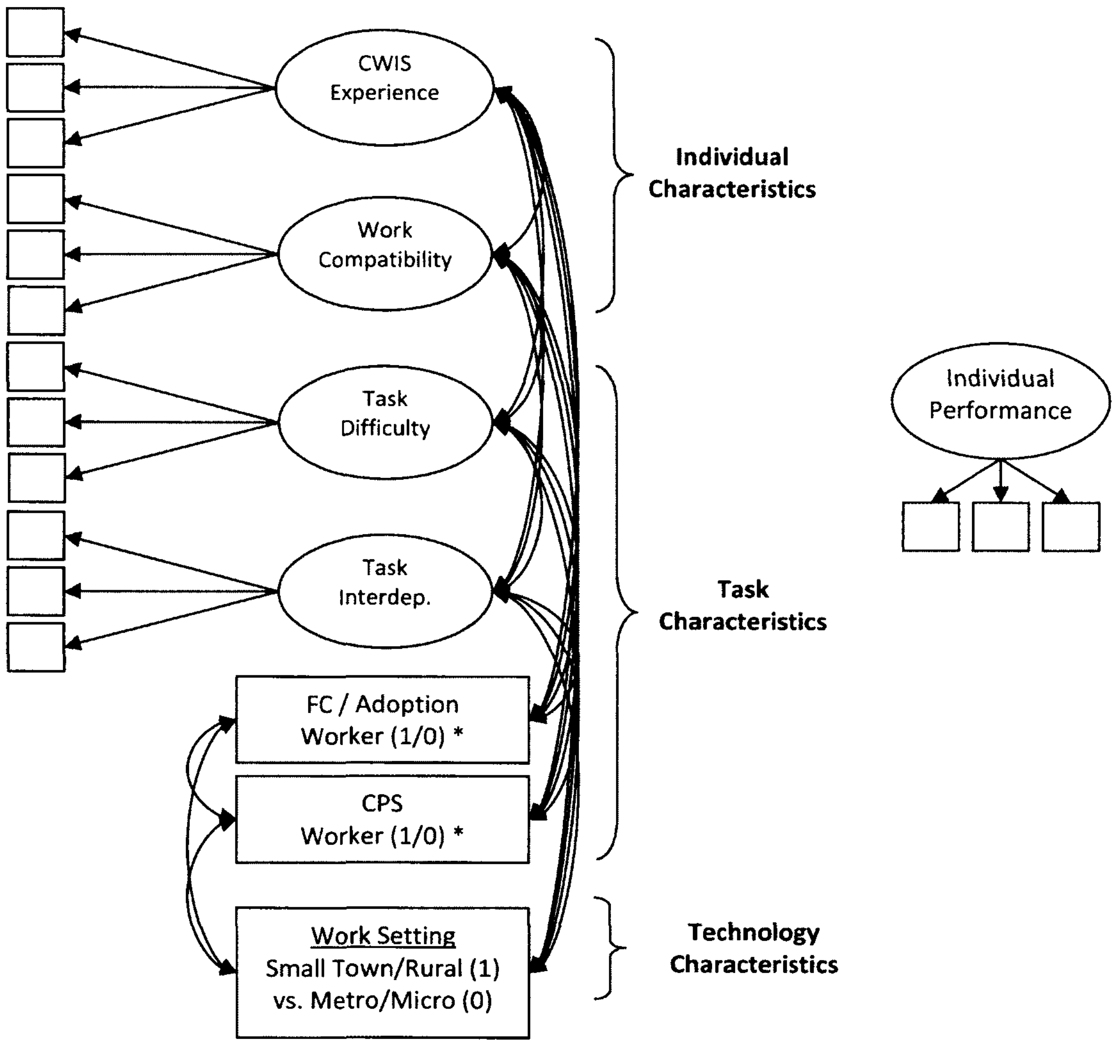

Figure 7. CFA Measurement Models for Exogenous Predictors of TTF (on left) and for Individual Performance (on right).

* These are dummy variables. Generic worker is the omitted, reference group.

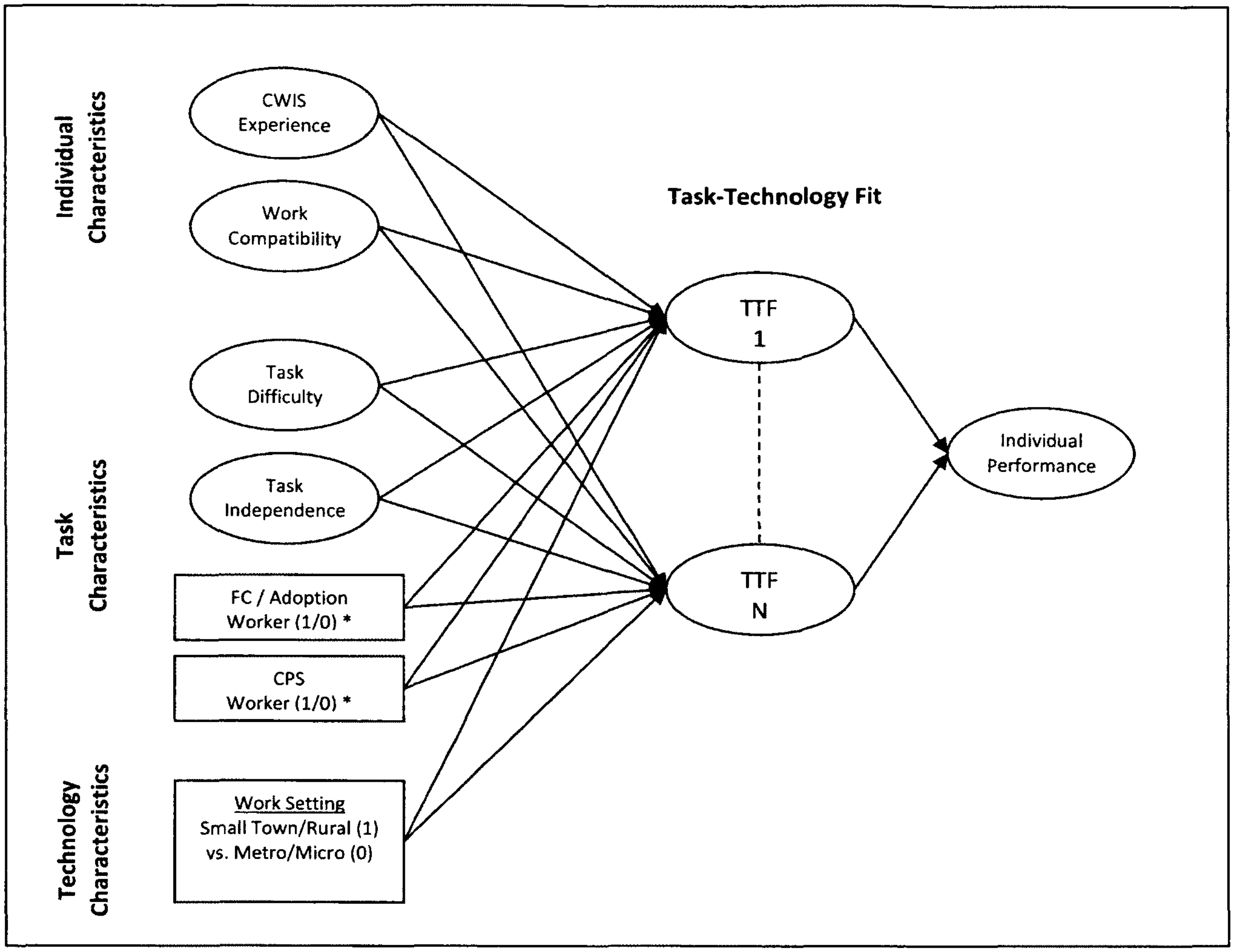

Figure 8. Structural Model of the TTF Framework.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter reviews the results of each aim, including the characteristics of each sample, participation rates, and results for each research question and hypothesis.

Aim 1. Develop a pool of items to measure TTF, or the degree to which CWIS meets the needs of frontline caseworkers performing case management.

Three 60-minute, in-person focus groups with a total of 18 workers (6 per group) were conducted. The groups represented workers from an urban, suburban, and two rural areas of Virginia (workers from two adjacent rural counties were combined into one group). Surveys were completed by 17 of the 18 workers and the survey results are summarized in Table 20.

Sample. Sixteen participants reported working primarily in CPS (n = 8) and Foster Care/Adoption (n = 8).[46] One worker reported primary responsibilities in CPS, Foster Care, and Adoption and was classified as a "Generic" worker. To protect confidentiality, responses from the Generic worker are not reported and were included only in the calculation of means and medians for the total sample. The majority of participants were female (87.5%), white (53.3%), non-Hispanic (100%)[47], and bachelor's level graduates (75%). The median age was 33 years (range: 25 to 56). Participants had been at their current agency for a median of 2.5 years (range: 3 months – 13 years, 1 month),

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[46] To facilitate analysis by worker type, this Foster Care/Adoption category was created by combining together workers who reported working primarily in Foster Care only (n = 3), Adoption only (n = 1), or both Foster Care and Adoption (n = 4).

[47] Race and ethnicity (i.e., Hispanic or not-Hispanic) were treated as separate constructs.

Table 20

Aim 1 – Characteristics of Focus Group Participants

Worker Characteristic	All Types (N = 16/17)[a]		CPS (n = 8)		FC / Adoption (n = 8)	
	N	%	n	%	n	%
Background						
Sex						
Female	14	87.5	7	87.5	7	87.5
Male	2	12.5	1	12.5	1	12.5
Age, Median	33		31.5		32.5	
(Range)	(25 – 56)		(25 – 56)		(25 - 46)	
Race						
Black or African American	7	46.7	2	28.6	5	62.5
White	8	53.3	5	71.4	3	37.5
Highest Education Completed						
Bachelor's in social work (BSW)	4	25.0	1	12.5	3	37.5
Other bachelor's degree	8	50.0	5	62.5	3	37.5
Master's in social work (MSW)	2	12.5	1	12.5	1	12.5
Other master's degree	2	12.5	1	12.5	1	12.5
Social Work Practice and Casework						
Work Setting						
Suburban	6	37.5	3	37.5	3	37.5
Urban	6	37.5	3	37.5	3	27.5
Rural	4	25.0	2	25.0	2	25.0
Years in current agency, Median	2.5		1.5		2.5	
(Range)[b]	(0.3 – 13.1)		(0.7 – 13.1)		(0.3 – 4.7)	
Years in role (in career), Median	3.6		4.8		2.5	
(Range)[b]	(0.7 – 20)		(2.6 – 20)		(0.7 – 8)	
Monthly caseload size, Median	15		15		15	
(Range)	(9 – 40)		(9 – 40)		(12 – 35)	

Note. FC = Foster Care. For complete wording of each question see the demographic questionnaire (Appendix A).
[a] Responses from one generic worker are not shown to protect confidentiality, but for the Overall sample they were included in the calculation of means and medians where appropriate. Therefore, counts may not add up to 17 due to missing responses or excluding the generic worker.
[b] Decimals represent number of months (e.g., 13.1 = 13 years and 1 month).

and in the child welfare field for a median of 3.6 years (range: 7 months – 20 years). Monthly caseload sizes ranged from nine to 40 cases (median: 15), but write-in comments suggested workers had varying interpretations of what constitutes a "case."

The survey also asked participants to report their experience with OASIS (two questions and a 4-item scale) and their mobility (a 3-item scale), or the extent to which they work away from the office (Table 21).[48] Means for both scales are interpreted on a 7-point scale where the higher number indicates more experience / mobility. Participants reported spending about 40% of their time on OASIS (range: 10% – 80%) and a mean of 3.8 (SD = 2.98) years using the system. According to the 7-point OASIS Experience and Mobility scales, workers reported high levels of experience with OASIS (Mean = 4.6, SD = 1.76) and high levels of mobility (Mean = 5.4, SD = .99). Both scales demonstrated good reliability (α = .723 for OASIS Experience; α = .683 for Mobility).

Results. None of the participants recommended changes to the definition of casework presented to them (see Chapter 3, Table 13) nor changes to the focus statement: "Generate short statements which describe the needs you have regarding OASIS and OASIS services when performing casework." Participants generated approximately 100 statements (after eliminating exact duplicates), and the number of statements generated were distributed similarly across all three groups (36, 33, and 31 statements). The 100 statements were reworded to take the form of a declarative statement and are listed in Appendix D. These statements were then presented to new

[48] Information about workers' mobility was collected for a different objective. Although the scale is not used in subsequent analyses, it is reported here in case it is of interest to the reader.

Table 21

Aim 1 – OASIS Experience and Mobility of Focus Group Participants

Worker Characteristic	Total (N = 17)	CPS (n = 8)	FC / Adoption (n = 8)
OASIS Experience			
Years using OASIS, Mean [a]	3.8	4.5	2.4
(SD)	(2.98)	(3.2)	(1.21)
% of time spent on OASIS, Median	40	42.5	45
(Range)	(10 – 80)	(10 – 70)	(25 – 80)
OASIS Experience (4-item scale) [b]			
Overall Scale, Mean	4.6	4.8	4.2
(SD)	(1.27)	(1.26)	(1.10)
Years using OASIS (Converted to 7-point scale), Mean (SD)	2.9 (1.76)	3.3 (2.05)	2.1 (.84)
Frequency of use, Mean	5.7	5.8	5.4
(SD)	(1.32)	(1.49)	(1.19)
Experience with OASIS, Mean	5.4	5.5	5.0
(SD)	(1.50)	(1.20)	(1.77)
Percent of time spent on OASIS (Converted to 7-point scale), Mean (SD)	3.4 (1.97)	3.2 (1.98)	3.8 (2.1)
Mobility (3-item scale) [c]			
Overall Scale, Mean	5.4	5.1	5.6
(SD)	(0.99)	(1.15)	(0.84)
Frequently perform outside of office, Mean	5.9	6.0	5.8
(SD)	(0.93)	(1.07)	(0.89)
Frequently work away from office, Mean	5.4	5.3	5.5
(SD)	(1.23)	(1.58)	(0.93)
Frequently in places that are far away, Mean	4.9	4.1	5.6
(SD)	(1.56)	(1.73)	(1.06)

Note. FC = Foster Care. Responses from one generic worker are not shown to protect confidentiality, but they were included in the calculation of means and medians for the Total sample. For complete wording of each question see the questionnaire (Appendix A).
[a] Decimals represent number of months (e.g., 1.8 = 1 year and 8 months).
[b] Items 1 - 3 adapted from Dishaw and Strong's (2003) 3-item Tool Experience Scale; item 4 adapted from Seddon and Kiew's (1996) use question. Because two of the items use different response scales, they were normalized to a 7-point scale before calculating a mean and alpha.
[c] Scale is based on Gebauer and Tang's (2008) 3-Item Mobility Scale.

sample of workers for the concept mapping study (i.e., rating and sorting), described next in Aim 2.

Aim 2. Identify from the item pool preliminary dimensions of TTF and the subscales to measure each dimension.

Sampling Frame. For this Aim, a new sample of workers was selected from a file that included the population of all potentially eligible workers in Virginia (1,499) spanning 118 counties and cities. Table 22 shows the number of eligible workers by worker type provided by DSS and urban/rural setting derived using Rural Urban Commuting Area Codes. Generic workers were those who DSS classified as "Family Services Programs" which means their primary work responsibilities involve two or more areas. The majority of eligible workers were Generic (55.7%), followed by those in CPS (21.7%), Foster Care (20.6%), and Adoption (1.9%). Metropolitan workers comprised 76.5% of the eligible sample, followed by workers in Small Towns (10%), Rural Areas (9.5%), and Micropolitan areas (4%).

Table 22

Aim 2 – Number of Eligible Workers by Worker Type and Urban/Rural Setting (N = 1,499)

Urban/Rural Setting	CPS	Foster Care	Adoption	Generic	Total
Metropolitan	218	227	25	677	1,147
Micropolitan	21	26	0	13	60
Small Town	43	29	3	75	150
Rural Area	44	27	1	70	142
Total	326	309	29	835	1,499

The initial plan was to randomly sample 48 workers stratified by worker type and urban/rural setting, with equal numbers from each strata-pair. This would create a non-proportionate sample with three workers from each strata-pair. However, various circumstances rendered this sampling goal impossible. First, as Table 22 shows there were no adoption workers in Micropolitan areas and only one in a Rural Area. To prevent under sampling the adoption workers, we sampled five additional adoption workers from the Metropolitan area, resulting in the sampling frame shown in Table 23.

Table 23

Aim 2 – Sampling Frame (Revision 1) by Urban/Rural Setting and Worker Type (N = 48)

Urban/Rural Setting	CPS	Foster Care	Adoption	Generic	Total
Metropolitan	3	3	8	3	17
Micropolitan	3	3	0	3	9
Small Town	3	3	3	3	12
Rural Area	3	3	1	3	10
Total	12	12	12	12	48

However, phone calls to the agencies to confirm the employment status of these 48 workers found that seven had left the agency or changed positions. Alternates from the same strata were identified for six of these seven workers (a CPS worker from a rural agency was not replaced), resulting in a revised sample of 47. Then, over the course of mailing study invitations and survey materials, seven additional workers were found to be ineligible for the study due to having left, changed positions, or indicating on their survey a job function that rendered them ineligible (e.g., "supervisor"). This left a total of 40 workers eligible for participation and the final sampling frame shown in Table 24.[49]

Table 24

Aim 2 – Sampling Frame (Revision 2) by Urban/Rural Setting and Worker Type (N =40)

Urban/Rural Setting	CPS	Foster Care	Adoption	Generic	Total
Metropolitan	3	3	7	2	15
Micropolitan	2	2	0	2	6
Small Town	3	3	1	2	9
Rural Area	3	3	1	3	10
Total	11	11	9	9	40

Participation Rates. Approximately 63% completed all three tasks (survey, sorting, and rating). Table 25 and Table 26 show participation rates by worker type and Urban/Rural setting, respectively. Participation rates for all three activities were highest among CPS (90.9%) and lowest among Generic (33.3%) and Rural (50%) workers.

Sample. The primary goal for this aim was to produce a concept map that suggests preliminary dimensions of TTF. Although 27 workers completed the sorting task, data from only 18 of these workers was used in the concept mapping analysis.

[49] Four of these workers never responded to any aspect of the project, so their eligibility cannot be confirmed. However, they were assumed to be part of eligible sample and are included in the return rate calculations.

Table 25

Aim 2 – Participation Rates by Worker Type and Study Activity

Worker Type	Eligible	All Activities		Survey		Sorting		Rating	
	N	N	%	N	%	N	%	N	%
CPS	11	10	90.9	11	100	10	90.9	10	90.9
Foster Care	11	5	45.5	8	72.7	7	63.6	5	45.5
Adoption	9	7	77.8	8	88.9	7	77.8	7	77.8
Generic	9	3	33.3	8	88.9	3	33.3	4	44.4
All Workers	40	25	62.5	35	87.5	27	67.5	26	65.0

Table 26

Aim 2 – Participation Rates by Urban/Rural Setting and Study Activity

Worker Type	Eligible	All Activities		Survey		Sorting		Rating	
	N	N	%	N	%	N	%	N	%
Metropolitan	15	10	66.7	13	86.7	10	66.7	10	66.7
Micropolitan	6	4	66.7	6	100	4	66.7	5	83.3
Small Town	9	6	66.7	8	88.9	7	77.8	6	66.7
Rural	10	5	50.0	8	80.0	6	60.0	5	50.0
All Workers	40	25	62.5	35	87.5	27	67.5	26	65.0

The nine participants whose sorting data were excluded had sorted either all (n = 6) or approximately half (n = 3) of their statements into groups *un*related to a need-based construct, such as frequency ("This happens sometimes"), value ("Agree", "Positive", "Negative", "Points of frustration", "Things that could be improved"), and experience

("Things I don't do", "Problems I have never had").[50] Seventeen of these workers also completed a demographic survey; the description of the sample is limited to these 17 workers.

As surveys were processed, it became clear that some workers reported a job function[51] that differed from what DSS provided and on which the sampling was based. The highlighted cells in Table 27 show the number of workers whose self-reported job function differed from that provided by DSS. For example, DSS classified four workers as Foster Care, but moving across the row shows that, of these four, only one classified herself as Foster Care. The remaining workers reported they have primary responsibilities in Adoption only (1) or two more areas, i.e., Generic (2).[52]

Table 27

Aim 2 – Comparison of Worker Types According to DSS vs. Reported by Worker (N = 17)

Worker Type According to DSS	Worker Type as Reported by Worker			
	CPS (5)	Foster Care (1)	Adoption (3)	Generic (8)
CPS (5)	4	0	0	**1**
Foster Care (4)	0	1	**1**	**2**
Adoption (6)	**1**	0	2	**3**
Generic (2)	0	0	0	2

[50] These nine participants included three small town foster workers, two rural CPS workers, one metro Adoption worker, and three CPS workers (each from a metro, micro, and small town area).
[51] Based on worker's response to the survey question, "In what area(s) of child welfare do you primarily work? (Check all that apply.)" Response options: CPS, Foster Care, Adoption, Other: __________
[52] These two generic workers included one worker who reported primary responsibilities in both Foster Care and Adoption, and one worker who reported CPS and Foster Care.

It was decided that, with the exception of calculating participation rates, all analyses involving worker type would use the job function the worker provided on her[53] survey, on the assumption that it is a more accurate reflection of her primary responsibilities. It is likely that the job functions provided and maintained by DSS reflect initial administrative assignments, which may not always correspond to workers' current responsibilities. Lastly, the small number of workers reporting only Foster Care or only Adoption (both in Aim 2 and in Aim 3) precluded meaningful analysis by worker type. Therefore, workers who reported primary responsibilities in Foster Care, Adoption, or both were classified as "Foster Care/ Adoption" workers. Workers who reported primary responsibilities in two or more *distinct* practice areas (e.g., CPS and Foster Care, CPS and Adult Protective Services, Adoption and Adult Protective Services) were classified as "Generic."

Table 28 describes characteristics of the sample. The sample included five CPS workers, nine Foster Care/Adoption workers,[54] and three Generic workers. The majority of participants were female (88.2%), white (76.5%), non-Hispanic (100%), and bachelor's level graduates (81.2%). The median age was 35 years (range: 25 to 58). Participants had been at their current agency for a median of 5.6 years (range: 1 year, 9 months – 20 years, 7 months), and in the child welfare field for a median of 8.4 years (range: 1 year, 3 months – 23 years). Monthly caseload sizes ranged from six to 40 cases (median: 12),

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[53] Although the sample included some men, "her" is used throughout the dissertation to ease readability.
[54] This sum reflects workers who reported working primarily in Foster Care only (n = 1), Adoption only (n = 3), or both Foster Care and Adoption (n = 5).

but write-in comments suggested workers had varying interpretations of what constitutes a "case."

Participants also reported their experience with OASIS (one question and a 4-item scale) and their mobility (a 3-item scale), or the extent to which they work away from the office (Table 29). Means for both scales are interpreted on a 7-point scale where the higher number indicates more experience/mobility. Participants reported spending about 40% of their time on OASIS (range: 10% – 80%) and a mean of 7.3 (SD = 3.87) years using the system. According to the 7-point OASIS Experience and Mobility scales, workers reported high levels of experience with OASIS (Mean = 5.4, SD = 1.34) and high levels of mobility (Mean = 5.0, SD = 1.50). Both scales demonstrated good reliability (α = .658 for OASIS Experience; α = .869 for Mobility).

Results.

Research Question 2.1. To what extent does the item pool represent the TTF construct (i.e., content validity)? The degree to which workers rated the importance of each item in measuring TTF and the overall item pool was used as indicator of content validity. Recall from the methods that workers were asked to rate the importance of each item on a scale from 1 (relatively unimportant) to 5 (extremely important). Ratings were in response to the question, "In your opinion, how important or unimportant is each statement when it comes to measuring how well OASIS and related services (e.g., training, tech support) meet caseworkers' needs?"

Table 28

Aim 2 – Characteristics of Participants whose Sorting Data was used in the CM Analysis

Worker Characteristic	Total (N = 17)		CPS (n = 5)		FC/Adoption (n = 9)		Generic (n = 3)	
Background								
Sex, n (%)								
Female	15	88.2	4	80.0	8	88.9	3	100.0
Male	2	11.8	1	20.0	1	11.1	0	
Age, Median	35		35		35		40	
(Range)	(25 – 58)		(25 – 37)		(28 – 58)		(29 – 47)	
Race, n (%)								
Black or AA	3	17.6	0	0	2	22.2	1	33.3
White	13	76.5	5	100	7	77.8	1	33.3
Other	1	5.9	0	0	0	0	1	33.3
Highest Education Completed, n (%)								
BSW	4	25.0	0	0	2	22.2	2	100
Other bachelor's	9	56.2	5	100	4	44.4	0	0
MSW	2	12.5	0	0	2	22.2	0	0
Other master's	1	6.2	0	0	1	11.1	0	0
Social Work Practice & Casework								
Work Setting, n (%)								
Metropolitan	8	47.1	1	20.0	7	77.8	0	0
Micropolitan	3	17.6	1	20.0	1	11.1	1	33.3
Small Town	3	17.6	1	20.0	1	11.1	1	33.3
Rural Area	3	17.6	2	40.0	0	0	1	33.3
Year in agency,	5.6		6.9		5.3		10.6	
Median (Range) [a]	(1.9 – 20.7)		(2.1 – 14.1)		(1.9 – 14.9)		(4.1 – 20.7)	
Years in career	8.4		6.9		8.7		5.0	
Median (Range) [a]	(1.3 – 23.0)		(1.3 – 14.1)		(3.9 – 23.0)		(4.1 – 20.7)	
Monthly caseload	12		15		8		10	
Median (Range)	(6 – 40)		(12 – 28)		(6 – 15)		(9 – 40)	

Note. FC = Foster Care, BSW = Bachelor's in social work, MSW = Masters in social work. "Generic" refers to workers who indicated that their primary work involves two or more distinct practice areas (e.g., CPS and Foster Care, CPS and Adult Protective Services). For complete question wording see the questionnaire (Appendix A). Counts may not add up to 17 due to missing responses. One worker whose sorting data was used in the concept mapping analysis did not complete a survey.

[a] Decimals represent number of months (e.g., 1.9 = 1 year and 9 months).

Table 29

Aim 2 – OASIS Experience and Mobility of Workers whose Sorting Data was used in the CM Analysis

Worker Characteristic	Total (N = 17)	CPS (n = 5)	FC/Adoption (n = 9)	Generic (n = 3)
OASIS Experience				
Years using OASIS, Mean [a]	7.3	5.9	7.4	9.2
(SD)	(3.87)	(4.17)	(3.7)	(4.61)
% of time spent on OASIS, Median	40	35	40	40
(Range)	(10 – 80)	(10 – 70)	(10 – 80)	(20 – 75)
OASIS Experience (4-item scale) [b]				
Overall Scale, Mean	5.4	4.7	5.6	6.3
(SD)	(1.34)	(1.84)	(1.01)	(.88)
Years using OASIS (Converted to 7-point scale), Mean (SD)	4.9 (2.00)	3.8 (2.68)	5.1 (1.54)	6.0 (1.73)
Frequency of use, Mean	5.4	4.8	5.3	6.3
(SD)	(1.46)	(1.6)	(1.5)	(.58)
Experience with OASIS, Mean	6.1	5.4	6.2	6.7
(SD)	(1.25)	(1.82)	(.97)	(.58)
% of time spent on OASIS (Converted to 7-point scale), Mean (SD)	3.2 (2.02)	2.8 (2.17)	3.4 (2.01)	3.3 (2.52)
Mobility (3-item scale) [c]				
Overall Scale, Mean	5.0	6.0	4.7	4.1
(SD)	(1.50)	(1.25)	(.88)	(2.78)
Frequently perform outside of office, Mean (SD)	5.5 (1.42)	6.4 (.89)	5.3 (.50)	4.7 (3.22)
Frequently work away from office, Mean (SD)	4.5 (1.91)	5.8 (1.79)	4.0 (1.58)	4.0 (2.65)
Frequently in places that are far away, Mean (SD)	4.9 (1.70)	5.8 (1.30)	4.9 (1.45)	3.7 (2.5)

Note. FC = Foster Care. "Generic" refers to workers who indicated that their primary work involves two or more distinct practice areas (e.g., CPS and Foster Care, CPS and Adult Protective Services). For complete question wording see the questionnaire (Appendix A). One worker whose sorting data was used in the concept mapping analysis did not complete a survey.

[a] Decimals represent number of months (e.g., 1.8 = 1 year and 8 months).

[b] Items 1 - 3 adapted from Dishaw and Strong's (2003) 3-item Tool Experience Scale; item 4 adapted from Seddon and Kiew's (1996) use question. Because two of the items use different response scales, they were normalized to a 7-point scale before calculating a mean and alpha.

[c] Scale is based on Gebauer and Tang's (2008) 3-Item Mobility Scale.

The mean rating for the entire item pool was 4.16 (SD = 0.30), suggesting a high level of content validity. The mean rating for any given item ranged from a low of 3.35 to a high of 4.71. Table 30 lists all 100 statements sorted by their average rating values, from highest to lowest.

Table 30

Aim 2 – Statements Sorted by Average Importance Rating

ID#	Statement	Average Rating
24	Information that is essential to my work can be entered in OASIS.	4.71
32	If OASIS crashes while I'm working on it, I can count on not losing too much data.	4.71
72	I can edit / update data when I need to.	4.71
2	OASIS is compatible with other software programs (e.g., Word) that I need to use in my work.	4.65
45	I can count on OASIS to be "up" and available when I need it.	4.59
61	It is easy to get access to the information I need.	4.59
94	When OASIS logs me out I can count on the work I was doing to be saved.	4.59
95	Terms and definitions in OASIS are consistent with terms and definitions used in policy.	4.59
9	Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.	4.53
29	It is easy to save data that I enter in OASIS so I can use it later.	4.53
31	When OASIS gives me a list of choices, like in a drop down list or check boxes, the choices(s) I need to select are usually available.	4.53
39	I can enter information only once and count on OASIS to "populate it" as needed into other forms that ask for the same information.	4.53
51	OASIS is compatible with other software programs I need to use in connection with OASIS (e.g. Word).	4.53
68	OASIS is easy to use.	4.53
78	Forms and reports that I start are easy to save for later.	4.53
83	Entering data is straightforward and efficient for my purposes.	4.53
69	The fields for which I need to provide information are available in OASIS.	4.47
80	Data that needs to be repeated elsewhere in the system is automatically populated.	4.47
97	It is easy to change a case from one track or category to another without having to retype everything.	4.47
12	I can easily get information from other documents (e.g., external reports) into OASIS when I need them to be part of the record.	4.41
52	It is easy to view information connected to many records without having to "drill down" into each one.	4.41
55	When I need to get information from written reports into OASIS, it is easy to upload or scan them in.	4.41

Table 30 Continued

ID#	Statement	Average Rating
58	OASIS allows me to document enough information to track the progress of a case.	4.41
3	Information needed for similar purposes is consolidated on one or a few screens.	4.35
44	It is easy to get access to case information that I need.	4.35
62	It is easy to access my case information in OASIS from any computer.	4.35
74	I often have to enter the same information multiple times because several fields often ask for the same kind of information.	4.35
77	It is easy to find the screen or screens I need to use for most tasks.	4.35
25	Accomplishing tasks in OASIS is straightforward.	4.29
35	In OASIS it is easy to see how a person is connected to other people and other cases.	4.29
85	It is easy to get access to the data that I need.	4.29
89	The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.	4.29
90	It is easy to print information in OASIS that I need to have on paper.	4.29
92	There is almost always a field or screen that corresponds to the information I need to enter.	4.29
5	Sometimes I have to enter the same information multiple times in different screens and reports.	4.24
16	When I need to change information in OASIS I can do so without too much of a problem.	4.24
18	OASIS allows me to enter data to the level of detail that I think is important.	4.24
19	The screens and options in OASIS are for the most part relevant to my tasks.	4.24
20	I can get tech support quickly when I need it.	4.24
21	The data in OASIS is up-to-date enough for my purposes.	4.24
36	It is clear to me what fields/data are required and what fields/data are not.	4.24
40	The fields I see on OASIS screens are relevant to me and the data I need to enter.	4.24
60	OASIS helps me check that the data I enter are free of spelling and grammatical errors.	4.24
65	When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.	4.24
66	I can easily upload and store pictures and images related to the case in OASIS.	4.24
70	OASIS automatically pre-fills letters and forms with known information.	4.24
75	I can access OASIS whenever I need to.	4.24
93	It is easy to understand how to use a new screen or form that has been added to OASIS.	4.24
41	When I need something printed out OASIS can automatically prefill a lot of the details using information that's already entered.	4.18
43	OASIS helps me structure and organize the information I enter.	4.18
54	OASIS keeps me informed of new information and assignments that I need to be aware of.	4.18
64	The definition and meaning of OASIS data fields related to my tasks are clear.	4.18
79	I can enter information in OASIS at the level of detail that I think is needed.	4.18
84	I can count on tech support having the knowledge to fix the issue I'm having.	4.18
98	The kinds of reports and materials I need to prepare can be produced / printed from OASIS.	4.18
14	OASIS makes tracking deadlines easy by automatically calculating events like end dates and deadlines.	4.12
15	It is easy to reference or link non-OASIS documents and materials with the corresponding case in OASIS.	4.12

Table 30 Continued

ID#	Statement	Average Rating
22	The information in OASIS is up-to-date enough for my purposes.	4.12
23	It is easy to get direct access to IT support.	4.12
26	It is easy to see what I need to do before closing a case or moving it to the next level.	4.12
30	OASIS streamlines the kind of documentation I need streamlined.	4.12
38	OASIS's search feature(s) is easy to use.	4.12
53	Sometimes is it difficult or impossible to exchange data between OASIS and another program due to compatibility issues.	4.12
56	Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field.	4.12
73	It is easy to correct information in OASIS that needs to be corrected.	4.12
10	My deadlines and due dates are easy to track in OASIS.	4.06
33	I often have to enter the same exact information in multiple places.	4.06
34	It is easy to see in OASIS what tasks have higher priorities.	4.06
48	It is easy to get IT support in a timely way.	4.06
49	When I need to, I can access OASIS no matter where I am (e.g., out in the field, on a laptop while traveling, etc.)	4.06
57	I can easily upload and store important external documents in OASIS.	4.06
71	It is easy to see what has and still needs to be done for a particular case.	4.06
37	It is easy to access information from other documents through OASIS.	4
7	The ways to enter data in OASIS are sufficient for my needs.	3.94
8	My tasks are presented in a way that makes it easy to prioritize them.	3.94
42	Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.	3.94
87	Tracking the status of cases is easy in OASIS.	3.94
88	OASIS is too slow for my pace.	3.94
6	The size of text fields and text boxes correspond well to the amount of information I need to enter.	3.88
47	New information that I need to know about is clearly presented to me in OASIS.	3.88
50	The role of supervisor approval in closing or editing a case is appropriate enough for my needs.	3.88
96	OASIS makes it easy to prioritize the work I need to do.	3.88
100	I can delete data when I need to.	3.88
11	Sometimes it is difficult to access case details that I need because I don't have permission to view the case.	3.82
13	The search options in OASIS are sufficient for my needs.	3.82
91	The OASIS training I receive is sufficient for my needs.	3.82
99	OASIS provides an effective way to remind me about things I need to track, like upcoming events or deadlines.	3.82
4	It is easy to see when a case is waiting for someone's input or action (like a supervisor review, a request to another agency or person, etc.)	3.76
59	It is easy to delete information that I know no longer needs to be in OASIS.	3.76
67	When I need to delete information in OASIS, I can do so without any problem.	3.76
82	Notifications about system updates and changes are presented to me in a concise way.	3.76
86	Sometimes it is difficult to "marry" paper files with OASIS.	3.76

Table 30 Continued

ID#	Statement	Average Rating
27	Sometimes it is difficult to view information on cases I need to read because the case is locked for one reason or another.	3.71
76	It is easy to delete data that is no longer relevant to my needs.	3.71
46	The OASIS training I receive is adequate for my needs.	3.65
81	OASIS is "temperamental."	3.65
17	The OASIS training is specific enough for my purposes.	3.59
63	OASIS's search function is intuitive enough for my needs.	3.53
28	I like the data entry forms in OASIS.	3.47
1	The way OASIS training is provided is adequate enough for my needs.	3.35

Note. Ratings are based on a 5-point scale, where 1 = Relative unimportant and 5 = Extremely important. Scores reflect the mean rating among all workers who rated the importance of each statement "when it comes to measuring how well OASIS and related services (e.g., training, tech support) meets caseworkers' needs."

Research Question 2.2. What dimensions of TTF are represented in the item pool?

All reliability indices of the sorting data suggested adequate to strong reliability. The similarity matrix had a final stress value of .285, which suggests a strong fit between the actual sorting data and the point map which conveys how often statements were sorted together (See Appendix Q for the point map of statements.). The stress value of .285 is identical to the average stress value Trochim (1993) observed in his study of 33 concept mapping projects. The split-half total matrix reliability, which measures the consistency with which sorters sorted statements, was adequate (Spearman-Brown coefficient = .734). The individual-to-total reliability coefficient (the average correlation from correlating each sorter's similarity matrix with the total similarity matrix) was .916, which is over the 'very good reliability' benchmark of ≥. 40 suggested by Nunnally and

Bernstein (1994) and close to the average individual-to-total reliability value (.929) in Trochim's (1993) review of 33 concept mapping studies.

To determine the TTF dimensions suggested by the sorting data and hierarchical cluster analysis, several cluster solutions were examined, starting with a 20-cluster map and progressively moving down to an 8-cluster map. This range was judged to be optimal based on the range of TTF dimensions typically seen in existing TTF instruments. Judgments about the optimal map were based on conceptual decisions guided by statement bridging values (see Appendix R for bridging values), cluster bridging values (the average values of all statements in the cluster), and the new clusters formed at each map iteration.

After reviewing various cluster solutions, a map with 11 clusters was determined to preserve the most detail while maintaining with some exceptions reasonably distinct clusters. Generally, maps with 12 or more clusters contained clusters that were too narrow in scope, sometimes containing two few items such that a common meaning could not be discerned. On the other hand, maps with 10 or fewer clusters contained clusters that were too broad and nonspecific to be of practical use in an instrument designed to assess specific attributes of a CWIS. Figure 9 shows the 11-cluster map that was selected. Cluster labels were based on the label suggested by the software, or edited to better reflect the core theme.

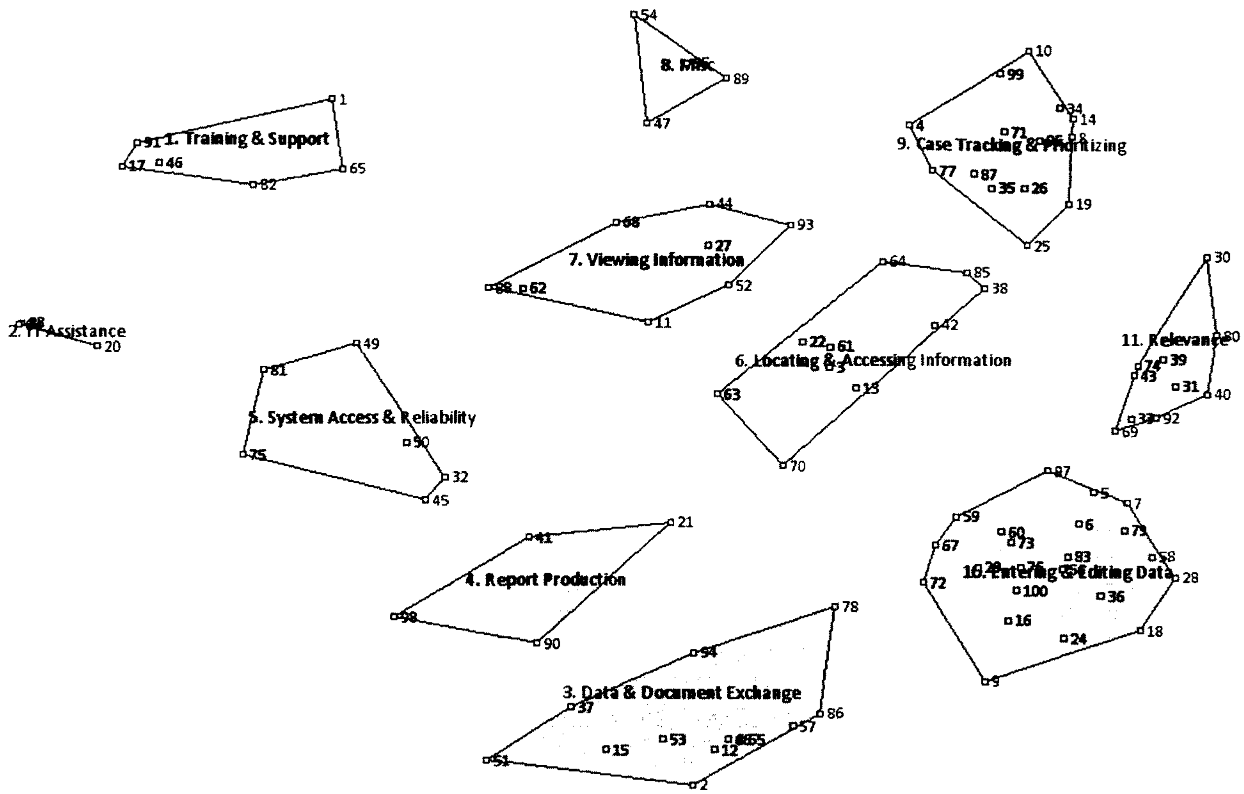

Figure 9. Aim 2 – 11-Cluster Map of Statements (Chosen Solution), with Cluster Labels.

Table 31 lists the 11 clusters and their characteristics. See Appendix S for items within each cluster.

<u>Modifications to the 11-Cluster Solution</u>. Although reliability indices were positive, many clusters lacked face validity, or included items that failed to cluster or only partially clustered. For example, items #21 ("The data in OASIS is up-to-date enough for my purposes"; Cluster 4) and #22 (The information in OASIS is up-to-date enough for my purposes"; Cluster 6) failed to cluster together, despite their obvious similarity. In other cases, some statements clustered together but reflected multiple themes. Cluster 8 ("Miscellaneous #1"), for example, includes four statements, two of

Table 31

Aim 2 – Initial Cluster Names and Features

#	Cluster	No. of Items	Description	Average Bridging Value [a]
1	Training and Support	6	Adequacy of CWIS training and support	.47
2	IT Assistance	4	Adequacy of IT support and assistance	.12
3	Data & Document Exchange	12	Ease with which information from other sources can be integrated or exchanged with the CWIS	.44
4	Report Production	4	Degree to which the CWIS supports report production	.72
5	System Access & Reliability	6	Reliability and accessibility of the CWIS	.71
6	Locating & Accessing Information	10	Ease of searching and locating needed information	.29
7	Viewing Information	8	Ease of viewing and accessing information	.45
8	Miscellaneous #1	4	[no clear theme]	.72
9	Case Tracking & Prioritizing	14	Degree to which the CWIS assists in prioritizing work and tracking case events	.35
10	Data Capture and Control	22	Degree to which the CWIS supports the level of data entry and editing necessary for the worker to accomplish tasks	.18
11	Miscellaneous #2	10	[Multiple themes related to data entry: 1) double entry, 2) relevance of fields and screens to what worker needs to enter, 3) structuring the data entry process] Extent to which CWIS fields and screens correspond to what the worker needs	.28

[a] Lower values are better: cluster bridging values < .24 suggest high internal consistency (i.e., items in the cluster were sorted together more frequently; values ≥ .54 suggest low internal consistency). Cutoffs based on Baldwin, Kroesen, Trochim, and Bell (2004).

which focus on "new information" (#47, #54), one which focuses on the meaning of buttons in OASIS (#89), and one which addresses the consistency of terms and definitions in OASIS versus those used in policy (See Appendix S for item wording).

Several issues may have led to the poor face validity in some clusters. First, the large number of items to sort (100), combined with an unfamiliar web-based interface, may have led to sorter fatigue and carelessness among some sorters. The number of items to sort could have been reduced by eliminating and combining not just items that were semantically redundant, but thematically redundant, as was done by Burke, et al. (2005).[55] Second, some of the items sorted, in retrospect, contained multiple themes or were multiply confounded. This may have made some items hard to interpret and therefore sort.[56]

Rather than include the identical, 100-item pool in the upcoming survey validation phase, a decision was made to revise the item pool according to the concerns just described. Table 32 lists the original 100 statements and revisions that were made. The revisions better emphasize the underlying need independent of task and technology, improve ambiguous statements, and reduce excessive redundancy in the item pool. To maintain context, the revisions are shown within the same Cluster 11

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[55] For example, statements 76 and 100 could have been combined, or one eliminated, without much loss of information: #76. "It is easy to delete data that is no longer relevant to my needs" and #100: "I can delete data when I need to."

[56] Recall from the literature review that fit should be operationalized in way that is as independent of the physical task and technology as possible. A TTF statement therefore should focus on the underlying need that gives rise to a task and which the technology should support. In retrospect, some statements did not meet this criterion. For example, consider the following statement, which had the highest (i.e., worst) bridging value (1.00) among all the items: "The kinds of report and materials I need to prepare can be produced/printed from OASIS." This statement confounds both the physical task (preparing reports) and a feature of the technology (report production/printing), neither of which should be explicit in a statement that is independent of task and technology. In addition to being more difficult to sort, the statement also lacks relevance to workers who need reports but do not need them printed, a limitation that can weaken the construct validity of the overall instrument (Bagozzi, 1979). Revising this statement requires emphasizing the underlying need, 'to have reports and materials,' and deemphasizing (or eliminating, if possible) any task or technology that could be associated with that need. A useful revision might be: "The kinds of report and materials I need are available to me in a useful format." This revision assumes that reports must be useful (an easier assumption) does but not assume they must be printed.

solution shown earlier, but it should not be assumed that the revised item pool (if re-sorted by the same workers) would produce the same clusters. The revised pool consists of 66 statements.

Table 32

Aim 2 – 11-Cluster Solution with Annotated Revisions

Clusters		Bridging Value	Rating Value	Reason for Revision
Cluster 1: Training and Support	*Average*	*.47*	*3.74*	
91	The OASIS training I receive is sufficient for my needs.	.20	3.82	
17	The OASIS training is specific enough for my purposes.	.22	3.59	
46	~~The OASIS training I receive is adequate for my needs.~~	.35	3.65	Redundant with #91, this cluster
1	~~The way OASIS training is provided is adequate enough for my needs.~~	.61	3.35	Redundant with #91, this cluster
65	When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.	.68	4.24	
82	Notifications about system updates and changes are presented to me in a concise way.	.76	3.76	
Cluster 2: IT Assistance	*Average*	*.12*	*4.15*	
84	I can count on tech support having the knowledge to fix the issue I'm having.	.00	4.18	
23	It is easy to get direct access to IT support.	.02	4.12	
48	It is easy to get IT support in a timely way.	.02	4.06	
20	~~I can get tech support quickly when I need it.~~	.45	4.24	Redundant with #48
Cluster 3: Data & Document Exchange	*Average*	*.44*	*4.29*	
78	~~Forms and reports that I start are easy to save for later.~~ *Tasks that I start but don't finish in OASIS are easy to save and resume later.*	.30	4.53	Too task-specific (starting "forms and reports")
57	~~I can easily upload and store important external documents in OASIS.~~	.34	4.06	Redundant with #86, this cluster
12	~~I can easily get information from other documents (e.g., external reports) into OASIS when I need them to be part of the record.~~	.35	4.41	Redundant with #86, this cluster

Table 32 Continued

Clusters		Bridging Value	Rating Value	Reason for Revision
55	~~When I need to get information from written reports into OASIS, it is easy to upload or scan them in.~~	.36	4.41	Redundant with #86, this cluster
66	~~I can easily upload and store pictures and images related to the case in OASIS.~~	.36	4.24	Redundant with #86, this cluster
2	~~OASIS is compatible with other software programs (e.g., Word) that I need to use in my work.~~ *OASIS is compatible with other software programs that I need to use in my work.*	.43	4.65	Too task-specific (e.g., "Word")
86	~~Sometimes it is difficult to "marry" paper files with OASIS.~~ *When I need to get information from other sources or documents into OASIS it is easy enough to do.*	.43	3.76	Too task-specific (e.g., "paper files")
53	~~Sometimes is it difficult or impossible to exchange data between OASIS and another program due to compatibility issues.~~ *When I need to exchange data between OASIS and another program, it is difficult or impossible.*	.46	4.12	Too limiting (e.g., "due to compatibility)
94	When OASIS logs me out I can count on the work I was doing to be saved.	.51	4.59	Saving Data
37	~~It is easy to access information from other documents through OASIS.~~	.53	4	Delete (too ambiguous)
15	~~It is easy to reference or link non-OASIS documents and materials with the corresponding case in OASIS.~~	.57	4.12	Redundant with # 12, this cluster
51	~~OASIS is compatible with other software programs I need to use in connection with OASIS (e.g. Word).~~	.66	4.53	Redundant with #2, this cluster
Cluster 4: Report Production	*Average*	*.72*	*4.22*	
21	The data in OASIS is up-to-date enough for my purposes.	.54	4.24	Redundant with #22, cluster 6
90	~~It is easy to print information in OASIS that I need to have on paper.~~	.64	4.29	Redundant with #98, this cluster
41	~~When I need something printed out OASIS can automatically prefill a lot of the details using information that's already entered.~~ *Reports and other information I need from OASIS are provided in an efficient way.*	.69	4.18	Too technology-specific (e.g., "automatically prefill")
98	~~The kinds of reports and materials I need to prepare can be produced / printed from OASIS.~~ *The kinds of reports and output I need from OASIS are available to me in a useful format.*	1.00	4.18	Too task-specific (e.g., 'printing')

Table 32 Continued

Clusters		Bridging Value	Rating Value	Reason for Revision
Cluster 5: System Access & Reliability	*Average*	*.71*	*4.19*	
49	~~When I need to, I can access OASIS no matter where I am (e.g., out in the field, on a laptop while traveling, etc.)~~ *When I need to, I can access OASIS no matter where I am (e.g., out in the field, at home, while traveling, etc.)*	.57	4.06	Examples not exhaustive and may bias response; added "at home"
45	I can count on OASIS to be "up" and available when I need it.	.68	4.59	
32	If OASIS crashes while I'm working on it, I can count on not losing too much data.	.68	4.71	
75	~~I can access OASIS whenever I need to.~~	.70	4.24	Redundant with #49, this cluster
81	OASIS is "temperamental."	.71	3.65	
50	~~The role of supervisor approval in closing or editing a case is appropriate enough for my needs.~~ *The ability to make changes to data in OASIS is adequate for my needs.*	.89	3.88	Too task- and technology-specific (e.g., "supervisor approval")
Cluster 6: Locating & Accessing Information	*Average*	*.29*	*4.12*	
13	~~The search options in OASIS are sufficient for my needs.~~ *The ways to search for or find data in OASIS are sufficient for my needs.*	.22	3.82	Too technology-specific (e.g., "search options")
42	Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.	.23	3.94	
61	It is easy to get access to the information I need.	.24	4.59	
38	~~OASIS's search feature(s) is easy to use.~~ *It is easy to find data that I need to locate.*	.25	4.12	Too technology-specific (e.g., "search feature(s)")
3	Information needed for similar purposes is consolidated on one or a few screens.	.25	4.35	
85	~~It is easy to get access to the data that I need.~~	.27	4.29	Redundant with #61, this cluster
70	~~OASIS automatically pre-fills letters and forms with known information.~~	.34	4.24	Redundant with #41, cluster 4
63	~~OASIS's search function is intuitive enough for my needs.~~ *The ways to find information in OASIS is intuitive enough for my needs.*	.34	3.53	Too technology-specific (e.g., "search function")

Table 32 Continued

Clusters		Bridging Value	Rating Value	Reason for Revision
22	The information in OASIS is up-to-date enough for my purposes.	.36	4.12	Data Currency
64	~~The definition and meaning of OASIS data fields related to my tasks are clear.~~ *The definition or meaning of data fields related to my tasks are clear.*	.39	4.18	
Cluster 7: Viewing Information	*Average*	*.45*	*4.17*	
52	It is easy to view information connected to many records without having to "drill down" into each one.	.35	4.41	May be too task-specific
27	~~Sometimes it is difficult to view information on cases I need to read because the case is locked for one reason or another.~~ Sometimes it is difficult to view or access information I need because it is inaccessible for one reason or another.	.36	3.71	Merged with #11, this cluster.
11	~~Sometimes it is difficult to access case details that I need because I don't have permission to view the case.~~	.39	3.82	Merged with #27, this cluster.
44	~~It is easy to get access to case information that I need.~~	.41	4.35	Redundant with #61, cluster 6
93	It is easy to understand how to use a new screen or form that has been added to OASIS.	.43	4.24	
62	It is easy to access my case information in OASIS from any computer.	.49	4.35	
88	OASIS is too slow for my pace.	.56	3.94	
68	OASIS is easy to use.	.58	4.53	
Cluster 8: Miscellaneous (Multiple themes)	*Average*	*.72*	*4.24*	
89	The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.	.61	4.29	
47	New information that I need to know about is clearly presented to me in OASIS.	.62	3.88	
95	Terms and definitions in OASIS are consistent with terms and definitions used in policy.	.81	4.59	
54	OASIS keeps me informed of new information and assignments that I need to be aware of.	.85	4.18	
Cluster 9: Case Tracking & Prioritizing	*Average*	*.35*	*4.07*	
26	~~It is easy to see what I need to do before closing a case or moving it to the next level.~~	.26	4.12	Delete (too task-specific [case closure, moving]
35	In OASIS it is easy to see how a person is connected to other people and other cases.	.27	4.29	
8	My tasks are presented in a way that makes it easy to prioritize them.	.29	3.94	
77	It is easy to find the screen or screens I need to use for most tasks.	.29	4.35	

Table 32 Continued

Clusters		Bridging Value	Rating Value	Reason for Revision
87	~~Tracking the status of cases is easy in OASIS.~~	.30	3.94	Redundant with #10, this cluster
96	OASIS makes it easy to prioritize the work I need to do.	.31	3.88	
25	Accomplishing tasks in OASIS is straightforward.	.31	4.29	
71	It is easy to see what has and still needs to be done for a particular case.	.33	4.06	
19	The screens and options in OASIS are for the most part relevant to my tasks.	.38	4.24	
14	~~OASIS makes tracking deadlines easy by automatically calculating events like end dates and deadlines.~~	.40	4.12	Too technology-specific (automatic calculations); redundant with #10, this cluster
34	~~It is easy to see in OASIS what tasks have higher priorities.~~	.40	4.06	Redundant with #8, this cluster
4	~~It is easy to see when a case is waiting for someone's input or action (like a supervisor review, a request to another agency or person, etc.)~~ *It is easy to see when a case I am involved in is waiting for or needs someone's input or action.*	.41	3.76	Examples may bias responses.
99	~~OASIS provides an effective way to remind me about things I need to track, like upcoming events or deadlines.~~	.45	3.82	Redundant with #10, this cluster
10	~~My deadlines and due dates are easy to track in OASIS.~~ *Tracking the status of deadlines, due dates, and other time sensitive items is easy in OASIS.*	.51	4.06	Examples not exhaustive and may bias response; added "and other time sensitive items"
Cluster 10: Data Capture & Control	*Average*	*.18*	*4.18*	
6	The size of text fields and text boxes correspond well to the amount of information I need to enter.	.10	3.88	
76	It is easy to delete data that is no longer relevant to my needs.	.10	3.71	
83	Entering data is straightforward and efficient for my purposes.	.11	4.53	
73	It is easy to correct information in OASIS that needs to be corrected.	.11	4.12	
79	I can enter information in OASIS at the level of detail that I think is needed.	.11	4.18	

Table 32 Continued

Clusters		Bridging Value	Rating Value	Reason for Revision
100	~~I can delete data when I need to.~~	.12	3.88	Redundant with #76, this cluster
7	~~The ways to enter data in OASIS are sufficient for my needs.~~	.12	3.94	Redundant with #83, this cluster
29	It is easy to save data that I enter in OASIS so I can use it later.	.13	4.53	
60	OASIS helps me check that the data I enter are free of spelling and grammatical errors.	.13	4.24	
56	Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field.	.15	4.12	
59	~~It is easy to delete information that I know no longer needs to be in OASIS.~~	.15	3.76	Redundant with #76, this cluster
97	~~It is easy to change a case from one track or category to another without having to retype everything.~~	.16	4.47	Too task-specific (reassigning case track)
5	~~Sometimes I have to enter the same information multiple times in different screens and reports.~~ Sometimes I have to enter the same information multiple times in different places.	.16	4.24	Too specific ("screens and reports")
16	When I need to change information in OASIS I can do so without too much of a problem.	.17	4.24	
67	~~When I need to delete information in OASIS, I can do so without any problem.~~	.17	3.76	Redundant with #76, this cluster
18	~~OASIS allows me to enter data to the level of detail that I think is important.~~	.19	4.24	Redundant with #79, this cluster
72	I can edit / update data when I need to.	.23	4.71	
36	It is clear to me what fields/data are required and what fields/data are not.	.24	4.24	
58	OASIS allows me to document enough information to track the progress of a case.	.26	4.41	
24	Information that is essential to my work can be entered in OASIS.	.28	4.71	
28	I like the data entry forms in OASIS.	.32	3.47	
9	Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.	.39	4.53	
Cluster 11: Structuring of Information	*Average*	*.28*	*4.32*	
33	~~I often have to enter the same exact information in multiple places.~~	.21	4.06	Redundant with #5, cluster10
69	~~The fields for which I need to provide information are available in OASIS.~~ *The fields and items for which I need to provide information are available in OASIS.*	.21	4.47	Added "and items" to expand applicability

Table 32 Continued

Clusters		Bridging Value	Rating Value	Reason for Revision
74	~~I often have to enter the same information multiple times because several fields often ask for the same kind of information.~~	.23	4.35	Redundant with #33, this cluster
92	~~There is almost always a field or screen that corresponds to the information I need to enter.~~	.23	4.29	Redundant with #69, this cluster
39	~~I can enter information only once and count on OASIS to "populate it" as needed into other forms that ask for the same information.~~	.26	4.53	Redundant with #33, this cluster
31	~~When OASIS gives me a list of choices, like in a drop down list or check boxes, the choices(s) I need to select are usually available.~~	.27	4.53	Redundant with #69, this cluster
43	OASIS helps me structure and organize the information I enter.	.27	4.18	
40	~~The fields I see on OASIS screens are relevant to me and the data I need to enter.~~	.31	4.24	Redundant with #19, cluster 9
80	~~Data that needs to be repeated elsewhere in the system is automatically populated.~~	.37	4.47	Redundant with #33, this cluster
30	OASIS streamlines the kind of documentation I need streamlined.	.46	4.12	

For clarity, Table 33 shows the revised list of clusters with their descriptions and Table 34 shows the clusters with their items.

Research Question 2.3. To what extent do the sorting and rating results (i.e., perceived TTF dimensions and perceived importance) vary by worker type? To determine if perceived dimensionality varies by worker type (CPS, Foster Care / Adoption, and Generic), the plan was to create separate maps for each category of worker. Significant differences by worker type in perceived dimensionality may suggest that each group defines the fit construct differently. This would manifest as

Table 33

TTF Dimensions Suggested by the Concept Mapping Study

TTF Dimension	Description
Training & Support	Adequacy of CWIS training and support
IT Assistance	Adequacy of IT support and assistance
Data & Document Exchange	Ease with which information from other sources can be integrated or exchanged with the CWIS
Report Production	Degree to which the CWIS supports report production
System Reliability & Data Recovery	System instability, speed and performance
Locating & Accessing Information	Ease of searching, locating, and accessing needed information
Viewing Information	Ease of viewing and consolidating information (e.g., information consolidated in effective views, connecting cases)
Miscellaneous	[no clear theme]
Case Tracking & Prioritizing	Degree to which the CWIS assists in prioritizing work and tracking case events
Data Capture & Control	Degree to which the CWIS supports the level of data entry and editing necessary for the worker to accomplish tasks
Structuring of Data	Degree to which the CWIS supports the streamlining and structuring of documentation.

Table 34

Aim 2 – 11-Cluster Solution with Statements (Final)

Clusters (# of items)
Cluster 1: Training and Support (4)
The OASIS training I receive is sufficient for my needs.
The OASIS training is specific enough for my purposes.
When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.
Notifications about system updates and changes are presented to me in a concise way.
Cluster 2: IT Assistance (3)
I can count on tech support having the knowledge to fix the issue I'm having.
It is easy to get direct access to IT support.
It is easy to get IT support in a timely way.
Cluster 3: Data & Document Exchange (5)
Tasks that I start but don't finish in OASIS are easy to save and resume later.
OASIS is compatible with other software programs that I need to use in my work.
When I need to get information from other sources or documents into OASIS it is easy enough to do.

Table 34 Continued

Clusters (# of items)
When I need to exchange data between OASIS and another program, it is difficult or impossible.
When OASIS logs me out I can count on the work I was doing to be saved.
Cluster 4: Report Production (3)
The data in OASIS is up-to-date enough for my purposes.
Reports and other information I need from OASIS are provided in an efficient way.
The kinds of reports and output I need from OASIS are available to me in a useful format.
Cluster 5: System Reliability & Data Recovery (5)
When I need to, I can access OASIS no matter where I am (e.g., out in the field, at home, while traveling, etc.)
I can count on OASIS to be "up" and available when I need it.
If OASIS crashes while I'm working on it, I can count on not losing too much data.
OASIS is "temperamental."
The ability to make changes to data in OASIS is adequate for my needs.
Cluster 6: Locating & Accessing Information (8)
The ways to search for or find data in OASIS are sufficient for my needs.
Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.
It is easy to get access to the information I need.
It is easy to find data that I need to locate.
Information needed for similar purposes is consolidated on one or a few screens.
The ways to find information in OASIS is intuitive enough for my needs.
The information in OASIS is up-to-date enough for my purposes.
The definition or meaning of data fields related to my tasks are clear.
Cluster 7: Viewing Information (6)
It is easy to view information connected to many records without having to "drill down" into each one.
Sometimes it is difficult to view or access information I need because it is inaccessible for one reason or another.
It is easy to understand how to use a new screen or form that has been added to OASIS.
It is easy to access my case information in OASIS from any computer.
OASIS is too slow for my pace.
OASIS is easy to use.
Cluster 8: Miscellaneous (4)
The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.
New information that I need to know about is clearly presented to me in OASIS.
Terms and definitions in OASIS are consistent with terms and definitions used in policy.
OASIS keeps me informed of new information and assignments that I need to be aware of.
Cluster 9: Case Tracking & Prioritizing (9)
In OASIS it is easy to see how a person is connected to other people and other cases.
My tasks are presented in a way that makes it easy to prioritize them.
It is easy to find the screen or screens I need to use for most tasks.
OASIS makes it easy to prioritize the work I need to do.
Accomplishing tasks in OASIS is straightforward.
It is easy to see what has and still needs to be done for a particular case.

Table 34 Continued

Clusters (# of items)
The screens and options in OASIS are for the most part relevant to my tasks.
It is easy to see when a case I am involved in is waiting for or needs someone's input or action.
Tracking the status of deadlines, due dates, and other time sensitive items is easy in OASIS.
Cluster 10: Data Capture & Control (16)
The size of text fields and text boxes correspond well to the amount of information I need to enter.
It is easy to delete data that is no longer relevant to my needs.
Entering data is straightforward and efficient for my purposes.
It is easy to correct information in OASIS that needs to be corrected.
I can enter information in OASIS at the level of detail that I think is needed.
It is easy to save data that I enter in OASIS so I can use it later.
OASIS helps me check that the data I enter are free of spelling and grammatical errors.
Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field.
Sometimes I have to enter the same information multiple times in different places.
When I need to change information in OASIS I can do so without too much of a problem.
I can edit / update data when I need to.
It is clear to me what fields/data are required and what fields/data are not.
OASIS allows me to document enough information to track the progress of a case.
Information that is essential to my work can be entered in OASIS.
I like the data entry forms in OASIS.
Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.
Cluster 11: Structuring of Data (3)
The fields and items for which I need to provide information are available in OASIS.
OASIS helps me structure and organize the information I enter.
OASIS streamlines the kind of documentation I need streamlined.

multigroup invariance in the subsequent (CFA) measurement models and suggest the need for separate measurement models (one for each worker type). However, this analysis could not be accomplished due to the small samples sizes for each worker group. For maps to be reliable at least 10-12 sorters are needed, but sample sizes for the CPS, foster care, adoption, and generic groups were 6, 2, 3, and 7 respectively. The small subgroup sizes also precluded a test for significant differences in mean item importance scores by worker type.

Aim 3. Establish the structural validity of the TTF measure by confirming or refining the preliminary TTF dimensions and subscales to achieve adequate levels of reliability and fit.

Sampling Frame. Sampling for this aim was done with a file containing the population of all potentially eligible workers in Virginia (1,400) spanning 118 counties and cities.[57] Workers who participated in prior phases of the project were not eligible. Table 35 shows the number of eligible workers by worker type provided by DSS and urban/rural setting derived using Rural Urban Commuting Area Codes. Generic workers were those whom DSS classified as "Family Services Programs," which means their primary work responsibilities involve two or more areas. The majority of eligible workers were CPS (43.8%), followed by Generic (30.5%), Foster Care (23.1%), and Adoption (2.6%). Metropolitan workers comprised 68.6% of the eligible sample, followed by workers in Rural Areas (14.4%), Small Towns (11.8%), and Micropolitan areas (5.1%). The initial plan was to randomly sample approximately 500 workers stratified by worker type and urban/rural setting, with equal numbers from each strata-pair. This would create a non-proportionate sample with approximately 31 workers from each strata-pair. However, various circumstances preventing this from occurring. First, as Table 35 shows there were too few adoption workers in any urban/rural group, only 17 Micropolitan Foster Care workers, and only 22 Micropolitan Generic workers. To prevent under-sampling, we chose to include in the sample all Adoption workers and additional workers from every strata pair (sampled equally) until a sample size near 500

[57] This population file was an updated version of the file used in Aim 2.

Table 35

Aim 3 – Number of Eligible Workers by Worker Type and Urban/Rural Setting (N = 1,400)

Urban/Rural Setting	CPS	Foster Care	Adoption	Generic	Total
Metropolitan	416	247	21	278	961
Micropolitan	31	17	2	22	72
Small Town	73	31	4	56	165
Rural Area	93	29	9	71	202
Total	613	324	36	427	1,400

was achieved. Table 36 shows the resulting sampling frame.

Table 36

Aim 3 – Sampling Frame (Revision 1) by Urban/Rural Setting and Worker Type

Urban/Rural Setting	CPS	Foster Care	Adoption	Generic	Total
Metropolitan	47	48	21	47	163
Micropolitan	31	17	2	22	72
Small Town	47	31	4	47	129
Rural Area	47	29	9	47	132
Total	172	125	36	163	496

Over the course of mailing study invitations and survey materials, 75 additional workers were found to be ineligible for the study due to having left the agency (n = 30) or indicating that they have no caseload or are in a supervisory, program management, or other position which rendered them ineligible to participate (n = 45). This left a total of 421 workers presumably eligible for participation and the final sampling frame shown in Table 37.

Table 37

Aim 3 – Sampling Frame (Revision 2) by Urban/Rural Setting and Worker Type

Urban/Rural Setting	CPS	Foster Care	Adoption	Generic	Total
Metropolitan	35	43	16	41	135
Micropolitan	22	16	2	21	61
Small Town	37	29	4	42	112
Rural Area	36	27	7	43	113
Total	130	115	29	147	421

Participation Rates. 250 out of the 421 eligible workers (59.4%) completed a survey. Table 38 and Table 39 show survey completion rates by worker type and urban/rural setting, respectively. Response rates were highest among Generic (72.8%) and Rural (67.3%) workers and lowest among Foster Care (42.6%) and Small Town (50%) workers.

Sample. Ten workers did not answer at least 10% of the 66 TTF items and were excluded from the dataset, resulting in a final N of 240. The sample characteristics and all subsequent analyses are based on these 240 workers.

As occurred in Aim 2, as surveys were processed it became clear that some workers reported a job function that differed from what DSS provided and on which the

Table 38

Aim 3 – Participation Rates by Worker Type

Worker Type	Eligible	Returned	
	N	N	%
CPS	130	77	59.2
Foster Care	115	49	42.6
Adoption	29	17	58.6
Generic	147	107	72.8
All Workers	421	250	59.4

Table 39

Aim 3 – Participation Rates by Urban/Rural Setting

Urban/Rural Setting	Eligible	Returned	
	N	N	%
Metropolitan	135	78	57.8
Micropolitan	61	39	63.9
Small Town	112	56	50.0
Rural	113	76	67.3
All Workers	421	249	59.1

Note. One worker entered an incorrect identifier in the survey, so her case could not be linked to the original file from DSS that provided her county and Urban/Rural setting.

sampling was based. The highlighted cells in Table 40 show the number of workers whose self-reported job function differed from that provided by DSS. For example, DSS classified 73 workers as CPS but 14 of these workers reported a different role (Foster

Care = 1, and Generic = 13). The largest discrepancy occurred with the Generic classification. Forty five workers whom DSS classified as working *exclusively* in either CPS, Foster Care, or Adoption reported working in two or more of these areas (i.e., Generic).

Table 40

Aim 3 – Comparison of Worker Types According to DSS vs. Reported by Worker (N = 240)

Worker Type According to DSS	Worker Type as Reported by Worker			
	CPS (74)	Foster Care (47)	Adoption (2)	Generic (117)
CPS (73)	59	**1**	0	**13**
Foster Care (48)	**3**	27	0	**18**
Adoption (16)	0	**1**	1	**14**
Generic (103)	**12**	**18**	**1**	72

As was done in Aim 2, with the exception of calculating participation rates, all analyses involving worker type used the job function the worker provided on her survey, on the assumption that it is a more accurate reflection of her primary responsibilities. In addition, the small number of workers reporting only Adoption (n = 2) precluded meaningful analysis for this group. Therefore, workers who reported primary responsibilities in Foster Care, Adoption, or both were classified as "Foster Care/ Adoption" workers. Workers who reported primary responsibilities in two or more *distinct* practice areas (e.g., CPS and Foster Care, CPS and Adult Protective Services, Adoption and Adult Protective Services) were classified as "Generic."

Table 41 describes characteristics of the sample. The sample included 101 Foster Care / Adoption workers (42.1%), 74 CPS workers (30.8%), and 65 (27.1%) Generic workers. The majority of participants were female (90.8%), white (71.7%), non-Hispanic (96.2%), and bachelor's level graduates (73.8%). The median age was 36.5 years (range: 3 months – 37 years, 9 months.). Participants had been at their current agency for a median of 5.3 years (range: 3 months – 37 years, 9 months), and in the child welfare field for a median of 7 years (range: 3 months – 40 years). Monthly caseload sizes ranged from 1.5 to 250 cases (median: 14), but write-in comments suggested workers had varying interpretations of what constitutes a "case."

Participants also reported their experience with OASIS (one question and a 4-item scale) and their mobility (a 3-item scale), or the extent to which they work away from the office (Table 42). Means for both scales are interpreted on a 7-point scale where the higher number indicates more experience / mobility. Participants reported spending about 50% of their time on OASIS (range: 4% – 97%) with a mean of 6.5 (SD = 4.43) years using the system. According to the 7-point OASIS Experience and Mobility scales, workers reported high levels of experience with OASIS (Mean = 5.0, SD = 1.08) and high levels of mobility (Mean = 5.0, SD = 1.36). Reliability was moderate for the OASIS experience scale ($\alpha = .503$) and good for Mobility ($\alpha = .761$).

Table 41

Aim 3 – Characteristics of Participants

Worker Characteristic	Total (N = 240)		CPS (n = 74)		FC / Adoption (n = 101)		Generic (n = 65)	
Background								
Sex, n (%)								
Female	218	(90.8)	64	(86.5)	91	(90.1)	63	(96.9)
Male	22	(9.2)	10	(13.5)	10	(9.9)	2	(3.1)
Age, median (Range)	36.5	(20 – 66)	36.5	(23 – 66)	35.0	(20 – 65)	38.0	(23 – 66)
Race, n (%)								
Black or AA	61	(25.4)	18	(24.3)	23	(22.8)	20	(30.8)
White	172	(71.7)	53	(71.6)	75	(74.3)	44	(67.7)
Other [a]	7	(2.9)	3	(4.1)	3	(3.0)	1	(1.5)
Highest Education Completed, n (%)								
BSW	47	(19.6)	20	(27.0)	17	(16.8)	10	(15.4)
Other bachelor's	130	(54.2)	36	(48.6)	54	(53.5)	40	(61.5)
MSW	35	(14.6)	7	(9.5)	21	(20.8)	7	(10.8)
Other master's	27	(11.2)	10	(13.5)	9	(8.9)	8	(12.3)
Other doctoral	1	(0.4)	1	(1.4)	0	(0.0)	0	(0.0)
Social Work Practice & Casework								
Work Setting, n (%)								
Metropolitan	74	(31.0)	18	(24.3)	38	(38.0)	18	(27.7)
Micropolitan	38	(15.9)	16	(21.6)	13	(13.0)	9	(13.8)
Small Town	55	(23.0)	13	(17.6)	27	(27.0)	15	(23.1)
Rural	72	(30.1)	27	(36.5)	22	(22.0)	23	(35.4)
Yrs in agency, Median (Range) [b]	5.3	(0.25 – 37.8)	5.3	(0.33 – 34)	5.0	(0.25 – 37.8)	6.2	(0.75 – 37.1)
Yrs in role (career), Median (Range) [b]	7	(0.33 – 40)	7	(0.33 – 34)	6.7	(0.33 – 38.8)	8	(0.75 – 40)
Monthly caseload, Median (Range)	14	(1.5 – 250)	15	(5 – 120)	13	(1.5 – 250)	15	(3.5 – 97)

Note. FC = Fost er Care, BSW = Bachelor's in social work, MSW = Master's in social work. "Generic" refers to workers who indicated that their primary work involves two or more distinct practice areas (e.g., CPS and Foster Care, CPS and Adult Protective Services). For complete question wording see the demographic questionnaire (Appendix X). Counts may not add up to 17 due to missing responses.

[b] "Other" can include workers who specified two or more races.

[c] Decimals represent number of months (e.g., 1.9 = 1 year and 9 months).

Table 42

Aim 3 – OASIS Experience and Mobility of Participants

Worker Characteristic	Total (N = 240)	CPS (n = 74)	FC / Adoption (n = 101)	Generic (n = 65)
OASIS Experience				
Years using OASIS, Mean [a]	6.5	5.8	6.1	7.9
(SD)	(4.43)	(3.67)	(4.54)	(4.78)
% of time spent on OASIS, Median	50	50	50	50
(Range)	(4 – 97)	(4 - 97)	(10 – 95)	(5 – 95)
OASIS Experience (4-item scale) [b]				
Overall Scale, Mean	5.0	5.0	4.9	5.2
(SD)	(1.08)	(1.14)	(1.07)	(0.99)
Years using OASIS (Converted to 7-point scale), Mean (SD)	4.2 (2.12)	4.1 (1.92)	4.0 (2.19)	4.8 (2.17)
Frequency of use, Mean	5.9	5.9	5.9	5.8
(SD)	(1.31)	(1.28)	(1.32)	(1.32)
Experience with OASIS, Mean	5.9	5.9	5.7	6.1
(SD)	(1.21)	(1.24)	(1.28)	(1.04)
% of time spent on OASIS (Converted to 7-point scale), Mean (SD)	3.9 (1.98)	3.9 (1.82)	3.9 (2.07)	4.1 (2.05)
Mobility (3-item scale) [c]				
Overall Scale, Mean	5.0	4.9	5.2	4.7
(SD)	(1.36)	(1.36)	(1.21)	(1.52)
Frequently perform outside of office, Mean (SD)	5.4 (1.50)	5.6 (1.53)	5.4 (1.26)	5.0 (1.75)
Frequently work away from office, Mean (SD)	4.6 (1.72)	4.6 (1.73)	4.7 (1.57)	4.3 (1.91)
Frequently in places that are far away, Mean (SD)	5.0 (1.74)	4.6 (1.80)	5.5 (1.53)	4.7 (1.81)

Note. FC = Foster Care. "Generic" refers to workers who indicated that their primary work involves two or more distinct practice areas (e.g., CPS and Foster Care, CPS and Adult Protective Services). For complete question wording see the demographic questionnaire (Appendix A). One worker whose sorting data was used in the concept mapping analysis did not complete a survey.

[a] Decimals represent number of months (e.g., 1.8 = 1 year and 8 months).

[b] Items 1 - 3 adapted from Dishaw and Strong's (2003) 3-item Tool Experience Scale; item 4 adapted from Seddon and Kiew's (1996) use question. Because two of the items use different response scales, they were normalized to a 7-point scale before calculating a mean and alpha.

[c] Scale is based on Gebauer and Tang's (2008) 3-Item Mobility Scale.

Summary of Samples across all three Aims. Table 43 and Table 44 compare workers' responses across all the three samples / aims. Significance tests were not conducted due to small cell sizes across some categories. All three samples were similar in terms of sex, age, education, and monthly caseload size. Workers from Aim 1 differed from those in Aim 2 and 3 in terms of race, years in current agency, and years in career. Workers in Aim 2 and Aim 3 were predominantly white (76.5% and 71.7%, respectively), whereas workers in Aim 1 (focus groups) were more balanced with respect to race. Workers in Aim 1 had spent fewer years at their agency (median = 2.5) and in their career (median = 3.6) compared to workers in Aim 2 (agency = 5.6; career = 8.4) and Aim 3 (agency = 5.3; career = 7.0) (Table 43).

Workers from all three samples were similar in terms of the percent of time they spend on OASIS, but workers from Aim 1 had been using it for fewer years (Mean = 3.8) than workers in Aim 2 (Mean = 7.3) and Aim 3 (Mean = 6.5). Similarly, workers from Aim 1 had a lower mean score on the 4-item OASIS Experience Scale (4.6) compared to workers in Aim 2 (5.4) and Aim 3 (5.0). Workers from all three samples reported similar levels of mobility, as measured by the 3-item Mobility scale.

Table 43

Characteristics of Participants across all three Aims

Worker Characteristic	Aim 1 Item Generation (N = 17)		Aim 2 Sorting & Rating (N = 17)		Aim 3 Survey Validation (N = 240)	
Background						
Sex, n (%)						
Female	14	(87.5)	15	(88.2)	218	(90.8)
Male	2	(12.5)	2	(11.8)	22	(9.2)
Age, Median (Range)	33	(25 – 56)	35	(25 – 58)	36.5	(20 – 66)
Race, n (%)						
Black or African American	7	(46.7)	3	(17.6)	61	(25.4)
White	8	(53.3)	13	(76.5)	172	(71.7)
Other [a]	0		1	(5.9)	7	(2.9)
Highest Education Completed, n (%)						
Bachelor's in social work (BSW)	4	(25.0)	4	(25.0)	47	(19.6)
Other bachelor's degree	8	(50.0)	9	(56.2)	130	(54.2)
Master's in social work (MSW)	2	(12.5)	2	(12.5)	35	(14.6)
Other master's degree	2	(12.5)	1	(6.2)	27	(11.2)
Other doctoral degree	0		0		1	(0.4)
Social Work Practice and Casework						
Work Setting, n (%) [b]						
Suburban (Metropolitan)	6	(37.5)	8	(47.1)	74	(31.0)
Urban (Micropolitan)	6	(37.5)	3	(17.6)	38	(15.9)
Small Town	NA		3	(17.6)	55	(23.0)
Rural Area	4	(25.0)	3	(17.6)	72	(30.1)
Years in agency, Median (Range) [c]	2.5	(0.3 – 13.1)	5.6	(1.9 – 20.7)	5.3	(0.25 – 37.8)
Years in career), Median (Range) [c]	3.6	(0.7 – 20)	8.4	(1.3 – 23.0)	7.0	(0.33 – 40)
Monthly caseload, Median (Range)	15	(9 – 40)	12	(6 – 40)	14	(1.5 – 250)

Note. Aim 1 frequencies and percentages are based on 16 of the 17 workers who completed the survey. The one generic worker is excluded to protect confidentiality. However, medians and means are based on all 17 workers. For complete wording of each question see questionnaire (Appendix A).

[a] "Other" can include workers who specified two or more races.

[b] Aim 1 involved a convenience sample of workers selected from four counties that represented suburban, urban, and rural areas (workers from two rural areas were combined into one group). Aim 2 and 3 involved a random sample of workers, stratified by four levels of urban/rural setting based on Rural Urban Commuting Area Codes: Metropolitan, Micropolitan, Small Town, and Rural Area.

[c] Decimals represent number of months (e.g., 1.8 = 1 year and 8 months).

Table 44

OASIS Experience and Mobility of Participants across all three Aims

Worker Characteristic	Aim 1 Focus Group (N = 17)	Aim 2 Sorting (N = 17)	Aim 3 Survey Validation (N = 240)
OASIS Experience			
Years using OASIS, Mean [a] (SD)	3.8 (2.98)	7.3 (3.87)	6.5 (4.43)
% of time spent on OASIS, Median (Range)	40 (10 – 80)	40 (10 – 80)	50 (4 – 97)
OASIS Experience (3-item scale) [b]			
Overall Scale, Mean (SD)	4.6 (1.27)	5.4 (1.34)	5.3 (1.13)
Years using OASIS (Converted to 7-point scale), Mean (SD)	2.9 (1.76)	4.9 (2.00)	4.3 (2.11)
Frequency of use, Mean (SD)	5.7 (1.32)	5.4 (1.46)	5.9 (1.29)
Experience with OASIS, Mean (SD)	5.4 (1.50)	6.1 (1.25)	5.9 (1.21)
% of time spent on OASIS (Converted to 7-point scale), Mean (SD)	3.4 (1.97)	3.2 (2.02)	3.9 (1.98)
Mobility (3-item scale) [c]			
Overall Scale, Mean (SD)	5.4 (.99)	5.0 (1.50)	5.0 (1.36)
Frequently perform outside of office, Mean (SD)	5.9 (.93)	5.5 (1.42)	5.4 (1.50)
Frequently work away from office, Mean (SD)	5.4 (1.23)	4.5 (1.91)	4.6 (1.72)
Frequently in places that are far away, Mean (SD)	4.9 (1.56)	4.9 (1.70)	5.0 (1.74)

Notes. For complete question wording see the demographic questionnaire (Appendix A).
[a] Decimals represent number of months (e.g., 1.8 = 1 year and 8 months).
[b] Items 1 - 3 adapted from Dishaw and Strong's (2003) 3-item Tool Experience Scale; item 4 adapted from Seddon and Kiew's (1996) use question. Because two of the items use different response scales, they were normalized to a 7-point scale before calculating a mean and alpha.
[c] Scale is based on Gebauer and Tang's (2008) 3-Item Mobility Scale.

Results.

Data Screening. All 86 potential scale items (20 non-TTF items and 66 TTF items) were screened for missing values, outliers, evidence of floor or ceiling effects, and multicollinearity. Forty-four workers (18.3%) had at least one missing value on a potential scale item: 14 workers were missing one ($n = 11$) or two ($n = 3$) answers to the non-TTF items, and 35 workers were missing one ($n = 29$), two ($n = 5$), or three ($n = 1$) answers to the TTF items. The highest percentage of missing data for any given variable was 1.3%. Given the limited amount of missing item data, listwise deletion would lose too much usable information. Consequently, missing values were replaced by the worker's median response for variables from the same scale (i.e., same-person median response substitution). Lastly, the urban/setting value could not be determined for one worker who entered an incorrect access code during the survey. This worker was deleted leaving an $N = 239$. All subsequent analyses are based on the imputed dataset.

Five responses with z-scores greater than $|3.29|$ were flagged as univariate outliers. All of these outliers reflected answers on the extreme ends of the 7-point Likert scales (i.e., either a 1 or 7), but were nonetheless plausible and therefore unchanged. Eleven cases with Mahalanobis distance scores > 132.28 ($p < .001$, $\chi^2(86)$) were flagged as multivariate outliers and were deleted. Evidence of case-wise floor and ceiling effects in which a worker tended to answer identically across all items were examined by studying cases with low standard deviations (SD) among the 20 non-TTF items and the 66 TTF items. Three cases were deleted due to limited variability in responses, as evidenced by an $SD < .50$. The final dataset included 225 cases.

Multicollinearity, as evidence by a tolerance (TOL) < .10 and/or variance inflation factor (VIF) > 10, was a concern for two items on the 6-item Individual Performance scale.[58] These two items had a correlation of .904. Each item's mean, standard deviation (SD), skewness, and kurtosis are shown in Table 45 (non-TTF items) and Table 46 (TTF items). SDs ranged from 1.21 to 2.12 for the non-TTF items and 1.18 to 1.90 for the TTF items. There was no univariate non-normality as all skewness and kurtsosis indices were well within the recommended cut-off points of |3.00| and |10.00|, respectively.

Multivariate normality was assessed with Mardia's kurtosis value. The 86 items had a Mardia's kurtosis value of 25.8, a sign of multivariate kurtosis based on Bentler's (2005) suggested cut-off of > 5.0. Given the low item-specific kurtosis and skewness values and the elimination of multivariate outliers, the remaining multivariate normality is likely due to the kurtotic nature of the Likert responses. In large samples (> 100), maximum likelihood estimation (MLE) is fairly robust to kurtotic violations of multivariate normality, and in such conditions parameter estimates are still fairly accurate (Brown, 2006; Diamantopoulos et al., 2000; Kline, 2011).

Hypothesis 3.1. TTF is an N-dimensional construct as suggested by the point-cluster map produced from the concept mapping study. This CFA tested the hypothesis that TTF is a 11-factor structure comprising the 11 clusters and 66 respective items from the concept map (CM) generated in Aim 2. Consistent with the TTF theory the 11 factors were permitted to correlate, errors were uncorrelated, and each observed variable

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[58] Using OASIS makes it easier to do my job (TOL = .08, VIF = 12.6),
Using OASIS improves my job performance (TOL = .09, VIF = 11.7).

Table 45

Aim 3 – Descriptive Statistics for non-TTF Items

Scale Items	Mean	SD	Skewness	Kurtosis
OASIS Experience				
How many years have you used OASIS? (7 equal bins)	4.24	2.12	-0.27	-1.15
How frequently do you use OASIS for casework-related tasks?	5.87	1.30	-0.87	-0.47
How much experience do you have with OASIS?	5.87	1.21	-1.17	1.29
What percent of your time do you spend on OASIS? (7 equal bins)	3.92	1.98	-.035	-1.08
Work Compatibility				
I think that using OASIS fits well with the way I like to work.	4.44	1.57	-0.57	-0.47
Using OASIS is compatible with all aspects of my work.	4.27	1.57	-0.27	-1.11
Using OASIS fits into my work style.	4.52	1.45	-0.68	-0.15
Task Difficulty				
Frequently the case management problems I work on involve answering questions that have never been asked in quite that form before.	4.10	1.37	-0.20	-0.21
I frequently deal with ad-hoc, non-routine case management problems.	4.98	1.38	-0.59	0.14
I frequently deal with ill-defined case management problems.	4.61	1.39	-0.35	-0.32
Task Interdependence				
The problems I deal with frequently involve more than one case management function.	5.61	1.24	-1.24	1.57
The problems I deal with frequently involve more than one office, group of people, agency, organization, etc.	5.38	1.54	-1.13	0.62
Mobility				
I am frequently in places that are far away from my office due to work-related travel.	4.97	1.73	-0.75	-0.47
I frequently perform my job outside of a standard office environment.	5.33	1.49	-1.16	0.79
I frequently work away from an office environment for long periods of time.	4.57	1.69	-0.46	-0.84
Individual Performance				
Overall, I find OASIS useful to my job.	5.44	1.36	-1.53	2.16
Using OASIS enhances my effectiveness in the job.	4.62	1.50	-0.62	-0.46
Using OASIS increases my productivity.	4.27	1.54	-0.31	-0.73
Using OASIS makes it easier to do my job.	4.31	1.52	-0.41	-0.60
Using OASIS improves my job performance.	4.31	1.48	-0.31	-0.58
Using OASIS enables me to accomplish my tasks more quickly.	3.84	1.58	0.03	-0.79

Table 46

Aim 3 – Descriptive Statistics for TTF Items

#	Items	Mean	SD	Skewness	Kurtosis
1	Certain kinds of information that I need to access are not available to me in OASIS for one reason or another. (REVERSED)	3.39	1.49	0.41	-0.56
2	Tracking the status of deadlines, due dates, and other time sensitive items is easy in OASIS.	3.72	1.75	0.00	-1.16
3	When I need to exchange data between OASIS and another program, it is difficult or impossible. (REVERSED)	2.99	1.50	0.51	-0.35
4	OASIS is "temperamental." (REVERSED)	2.75	1.51	0.76	-0.05
5	OASIS allows me to document enough information to track the progress of a case.	5.34	1.26	-1.52	2.14
6	When I need to change information in OASIS I can do so without too much of a problem.	4.75	1.59	-0.81	-0.32
7	OASIS keeps me informed of new information and assignments that I need to be aware of.	3.86	1.62	-0.08	-1.00
8	I can count on OASIS to be "up" and available when I need it.	4.43	1.50	-0.57	-0.60
9	The screens and options in OASIS are for the most part relevant to my tasks.	4.76	1.35	-0.84	-0.01
10	OASIS is easy to use.	4.64	1.55	-0.71	-0.48
11	I like the data entry forms in OASIS.	4.22	1.43	-0.29	-0.65
12	Accomplishing tasks in OASIS is straightforward.	4.37	1.45	-0.44	-0.64
13	Sometimes it is difficult to view or access information I need because it is inaccessible for one reason or another. (REVERSED)	3.65	1.36	0.11	-0.73
14	In OASIS it is easy to see how a person is connected to other people and other cases.	3.84	1.55	-0.03	-1.04
15	The definition or meaning of data fields related to my tasks are clear.	4.33	1.33	-0.42	-0.46
16	Sometimes I have to enter the same information multiple times in different places. (REVERSED)	2.55	1.28	1.15	1.67
17	I can enter information in OASIS at the level of detail that I think is needed.	5.00	1.45	-1.09	0.46
18	Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field. (REVERSED)	3.27	1.62	0.67	-0.31
19	It is easy to get access to the information I need.	4.45	1.40	-0.62	-0.25
20	If OASIS crashes while I'm working on it, I can count on not losing too much data.	2.94	1.51	0.41	-0.74
21	The information in OASIS is up-to-date enough for my purposes.	4.80	1.32	-0.82	0.26
22	Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved. (REVERSED)	3.49	1.50	0.45	-0.52
23	The OASIS training is specific enough for my purposes.	4.53	1.60	-0.80	-0.19
24	It is easy to find data that I need to locate.	4.47	1.45	-0.56	-0.38

Table 46 Continued

#	Items	Mean	SD	Skewness	Kurtosis
25	OASIS streamlines the kind of documentation I need streamlined.	4.14	1.41	-0.30	-0.38
26	I can count on tech support having the knowledge to fix the issue I'm having.	5.40	1.35	-0.73	0.05
27	OASIS helps me check that the data I enter are free of spelling and grammatical errors.	4.17	1.80	-0.28	-1.23
28	The ability to make changes to data in OASIS is adequate for my needs.	4.67	1.46	-0.83	-0.02
29	The fields and items for which I need to provide information are available in OASIS.	4.81	1.36	-0.98	0.28
30	It is easy to understand how to use a new screen or form that has been added to OASIS.	4.55	1.39	-0.62	-0.20
31	It is easy to find the screen or screens I need to use for most tasks.	4.92	1.36	-1.05	0.45
32	It is clear to me what fields/data are required and what fields/data are not.	5.05	1.42	-1.04	0.29
33	It is easy to access my case information in OASIS from any computer.	4.28	1.90	-0.51	-1.14
34	When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.	3.91	1.64	-0.06	-1.06
35	It is easy to delete data that is no longer relevant to my needs.	3.55	1.58	0.17	-0.82
36	The size of text fields and text boxes correspond well to the amount of information I need to enter.	4.74	1.55	-0.88	-0.13
37	The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.	4.43	1.49	-0.47	-0.88
38	The ways to find information in OASIS is intuitive enough for my needs.	4.59	1.39	-0.82	-0.01
39	It is easy to get IT support in a timely way.	5.12	1.44	-0.66	-0.03
40	The OASIS training I receive is sufficient for my needs.	4.67	1.59	-0.81	-0.37
41	Reports and other information I need from OASIS are provided in an efficient way.	4.60	1.44	-0.75	-0.28
42	It is easy to see when a case I am involved in is waiting for or needs someone's input or action.	4.06	1.57	-0.23	-1.11
43	When I need to get information from other sources or documents into OASIS it is easy enough to do.	3.83	1.64	-0.08	-1.16
44	It is easy to get direct access to IT support.	4.80	1.62	-0.60	-0.37
45	It is easy to correct information in OASIS that needs to be corrected.	4.32	1.59	-0.48	-0.85
46	It is easy to save data that I enter in OASIS so I can use it later.	4.99	1.30	-1.18	1.13
47	OASIS is too slow for my pace. (REVERSED)	3.43	1.66	0.25	-0.78
48	It is easy to see what has and still needs to be done for a particular case.	3.73	1.58	0.00	-1.07
49	The ways to search for or find data in OASIS are sufficient for my needs.	4.24	1.52	-0.40	-0.86

Table 46 Continued

#	Items	Mean	SD	Skewness	Kurtosis
50	It is easy to view information connected to many records without having to "drill down" into each one.	3.34	1.60	0.29	-0.86
51	The kinds of reports and output I need from OASIS are available to me in a useful format.	4.46	1.48	-0.74	-0.40
52	My tasks are presented in a way that makes it easy to prioritize them.	3.92	1.54	-0.12	-0.87
53	OASIS helps me structure and organize the information I enter.	4.24	1.45	-0.36	-0.63
54	The data in OASIS is up-to-date enough for my purposes.	4.63	1.39	-0.69	-0.08
55	Entering data is straightforward and efficient for my purposes.	4.70	1.37	-0.74	-0.28
56	Information needed for similar purposes is consolidated on one or a few screens.	4.01	1.53	-0.21	-0.88
57	New information that I need to know about is clearly presented to me in OASIS.	3.99	1.45	-0.19	-0.78
58	OASIS is compatible with other software programs that I need to use in my work.	3.40	1.59	0.07	-0.88
59	When I need to, I can access OASIS no matter where I am (e.g., out in the field, at home, while traveling, etc.)	2.12	1.68	1.38	0.67
60	Tasks that I start but don't finish in OASIS are easy to save and resume later.	4.52	1.54	-0.69	-0.52
61	Terms and definitions in OASIS are consistent with terms and definitions used in policy.	4.72	1.35	-0.81	0.18
62	Information that is essential to my work can be entered in OASIS.	5.18	1.18	-1.32	1.68
63	OASIS makes it easy to prioritize the work I need to do.	3.83	1.56	-0.05	-0.93
64	I can edit / update data when I need to.	4.91	1.37	-1.08	0.67
65	Notifications about system updates and changes are presented to me in a concise way.	4.86	1.39	-0.83	0.30
66	When OASIS logs me out I can count on the work I was doing to be saved.	3.96	1.80	-0.20	-1.17

loaded on only one factor. The model was overidentified with 1960 *df*. The model showed poor fit, $X^2 = 4116.40$, $p < .001$, CFI = .783, SRMR = .072, RMSEA = .070 (90% CI = .067 - .073).[59] Most importantly, however, the covariance matrix was not positive definite and AMOS declared the solution inadmissible. Given the mixed face validity in

[59] Per the literature review and methods, model fit was assessed with X2, CFI (close to > 0.95 = good), SRMR (< .05 = good), and RMSEA (< .05 = good; .05 - .08 = reasonable, .08 - .10 = mediocre) with 90% confidence intervals.

several of the clusters from the CM where some items either failed to cluster or clustered in ways that made little substantive sense, it is of little surprise that this 11-factor model showed poor fit.

Hypothesis 3.2. TTF is an N-dimensional construct as suggested by Factor Analysis.

Exploratory Factor Analysis. Because the CM structure was not supported by the initial CFA, an exploratory factor analysis (EFA) using parallel analysis was used to explore the factorial structure of the 66 TTF items for 225 cases. In a parallel analysis, factors are retained if their real-data eigenvalue exceeds the 95th percentile of the simulated (i.e., random) eigenvalues. An initial analysis suggested six factors; however, a 6-factor EFA produced a factor comprised of all but one of the seven reverse coded items. The grouping of these items did not make substantive sense; the negativistic language in these items may have introduced a method effect, or may have tapped workers' general affect toward OASIS rather than their reaction to the underlying need the item represented. Because the reverse coded items lacked any discernable needs-based theme, they were removed and the parallel analysis was rerun with the remaining 58 items. The results suggested retaining five factors (Table 47; shaded cells).

An EFA with five factors was run on the 58 TTF items. Because the TTF factors are expected to correlate, a nonorthogonal, oblique rotation was selected (for direct oblimin). Bartlett's Test of Sphericity was significant at $p < .001$ ($\chi^2 = 10075.35$, df = 1653) which suggests that the correlations between variables were (overall) significantly different than zero and that factor analysis is appropriate. Twelve items had low factor

Table 47

Aim 3 –EFA Parallel Analysis for TTF Items

Real-Data Eigenvalues		Random Data Eigenvalues	
Root	Eigenvalue	Means	95th Percentiles
1	**25.73497**	1.44225	**1.55253**
2	**2.13747**	1.31699	**1.41681**
3	**1.85777**	1.23298	**1.29988**
4	**1.31471**	1.16223	**1.23003**
5	**1.20631**	1.09728	**1.15266**
6	.99368	1.03631	1.08473
...	...	...	...
58	-.22450	-.46239	-.44767

loadings (< .40) and 17 had communalities < .50, indicating at least 50% of their variance was not explained by the factor. In addition, two items[60] crossloaded on two factors and several items lacked face validity with their purported factor. Multiple EFAs were rerun, each time eliminating one variable based on the size of the communality, factor loading, its contribution to face validity, and the number of items remaining in the factor. Two items that loaded onto a single factor were retained despite their low communalities (< .50).[61] Dropping these items, which had high loadings (.532 and .719) would have eliminated an entire factor that made a substantive contribution to the TTF construct.

The final EFA (18 items) explained 64.3% of the variance. Bartlett's Test of Sphericity was significant at $p < .001$ ($\chi 2$= 2379.99, df = 153). Model fit was assessed by

[60] q53 – OASIS helps me structure and organize the information I enter.
q10 – OASIS is easy to use.
[61] q66 – When OASIS logs me out I can count on the work I was doing to be saved (Communality = .389).
q20 – If OASIS crashes while I'm working on it, I can count on not losing too much data (Communality = .499).

examining the residuals between the observed correlation coefficients and the ones predicted from the model. The results suggested the 5-factor model fit the data well: most of the residuals were small; only 2 (1%) had an absolute value greater than 0.05. Multicollinearity was not a concern as only two variables[62] had a correlation > .80 and both loaded onto the same factor. Communalities ranged from .389 to .934 and factor loadings ranged from .532 to .987.

Table 48 shows the pattern matrix for the 5-factor EFA.[63] Factor 1 (6 items) reflects the extent to which OASIS supports workers in prioritizing and managing their tasks (Case Tracking and Prioritizing); Factor 2 (3 items) represents the adequacy of IT Support; Factor 3 (2 items) represents the adequacy of CWIS Training; Factor 4 (5 items) the extent to which OASIS supports workers in their ability to enter, edit, and save essential data (Data Capture and Control); and Factor 5 (2 items) reflects the CWIS' ability to recover data during a system interruption (Data Recovery). Both items in Factor 3 had a negative loading which suggests workers tended to disagree with these statements.

The factor correlation matrix (Table 49) shows that several factors are indeed interrelated and that non-orthogonal rotation was appropriate. Positive correlations (> .30) existed between Factor 1 and 4 (.62), 1 and 5 (.41), and 4 and 5 (.39). Factor 3 was negatively correlated (< -.30) with every other factor, which suggests that more

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[62] q40 – The OASIS training I receive is sufficient for my needs.
q23 – The OASIS training is specific enough for my purposes.

[63] In an oblique rotation, the pattern matrix ignores shared variance (i.e., the relationship between the factors) and shows only the unique contribution of a variable to a factor.

positive assessments of training correspond to more negative assessments of everything else.

Table 48

Aim 3 – EFA Pattern Matrix for TTF Items

#	Items	Factor: Case Tracking & Prioritizing	IT Support	CWIS Training	Data Capture & Control	Data Recovery
48	It is easy to see what has and still needs to be done for a particular case.	.830				
2	Tracking the status of deadlines, due dates, and other time sensitive items is easy in OASIS.	.791				
63	OASIS makes it easy to prioritize the work I need to do.	.720				
42	It is easy to see when a case I am involved in is waiting for or needs someone's input or action.	.677				
7	OASIS keeps me informed of new information and assignments that I need to be aware of.	.663				
52	My tasks are presented in a way that makes it easy to prioritize them.	.662				
39	It is easy to get IT support in a timely way.		.987			
44	It is easy to get direct access to IT support.		.770			
26	I can count on tech support having the knowledge to fix the issue I'm having.		.740			
40	The OASIS training I receive is sufficient for my needs.			-.906		
23	The OASIS training is specific enough for my purposes.			-.846		
62	Information that is essential to my work can be entered in OASIS.				.902	
64	I can edit / update data when I need to.				.711	
28	The ability to make changes to data in OASIS is adequate for my needs.				.681	
29	The fields and items for which I need to provide information are available in OASIS.				.616	
46	It is easy to save data that I enter in OASIS so I can use it later.				.597	
20	If OASIS crashes while I'm working on it, I can count on not losing too much data.					.719
66	When OASIS logs me out I can count on the work I was doing to be saved.					.532

Table 49

Aim 3 – EFA Factor Correlation Matrix for TTF Items

Factor	Case Tracking & Prioritizing	IT Support	CWIS Training	Data Capture & Control	Data Recovery
Case Tracking & Prioritizing	1.000	.279	-.493	.622	.411
IT Support	.279	1.000	-.247	.232	.245
CWIS Training	-.493	-.247	1.000	-.448	-.175
Data Capture & Control	.622	.232	-.448	1.000	.387
Data Recovery	.411	.245	-.175	.387	1.000

Exploratory Factor Analysis vs. the Concept Map. The EFA and concept mapping study produced some similar factors, but the Concept Map went farther by suggesting some additional dimensions, mostly related to data management (see Table 50). That the Concept Map is more expansive is due in part to it using all of the items in the pool, whereas the EFA provides a clear way of eliminating items that fail to load on a factor.

An item-level analysis was conducted to explore precisely where the EFA and CM converged and diverged with respect to grouping items. Table 51 lists the 66 items used in the factor analysis according to their CM cluster, along with a column showing the factor the item was assigned to in the EFA which reduced the list from 66 to 16 items. The table shows there was perfect convergence for IT Support (i.e., the same three items workers sorted into that cluster were grouped together in the EFA), moderate agreement for Training and Support (CM and EFA grouped together 2 of the 4 items), and strong agreement for Case Tracking and Prioritizing (agreement on 5 out of 6 items). There was less agreement on items to measure Data Capture and Control. The

Table 50

Comparison of TTF dimensions as suggested by EFA vs. Concept Mapping Study

TTF Dimension	EFA	Concept Mapping
Case Tracking & Prioritizing	Factor 1	Cluster 9
IT Support	Factor 2	Cluster 2
CWIS Training & Support	Factor 3	Cluster 1
Data Entry & Control	Factor 4	Cluster 10
Data Recovery	Factor 5	Cluster 5
Exchanging Data	---	Cluster 3
Locating & Accessing Data	---	Cluster 6
Viewing Data	---	Cluster 7
Structuring of Data	---	Cluster 11
Report Production	---	Cluster 4
System Access & Reliability	---	Cluster 5

five items the EFA assigned to Data Capture and Control were spread across three clusters in the CM (5, 10, and 11). The CM results for these items all make substantive sense except for, *The ability to make changes to data in OASIS is adequate for my needs,* which was grouped with items that focus on the accessibility and reliability of the CWIS (Cluster 5); there is little face validity for this assignment, and the EFA's assignment makes more substantive sense.

The 50 CM items that the EFA did not retain tap needs related to data and document exchange (Cluster 3), report production (Cluster 4), system access and reliability (Cluster 5), locating and accessing information (Cluster 6), viewing information (Cluster 7), and structuring information (Cluster 10). It is difficult to determine why these 50 items did not load highly on any factor in an EFA, but there are several

Table 51

Item-Level Analysis of TTF Dimensions Suggested by Concept Map vs. EFA

Concept Map Clusters	EFA-Assigned Factor
Cluster 1: Training & Support	
The OASIS training I receive is sufficient for my needs.	Training
The OASIS training is specific enough for my purposes.	Training
When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.	
Notifications about system updates and changes are presented to me in a concise way.	
Cluster 2: IT Support	
I can count on tech support having the knowledge to fix the issue I'm having.	IT Support
It is easy to get direct access to IT support.	IT Support
It is easy to get IT support in a timely way.	IT Support
Cluster 3: Data & Document Exchange	
Tasks that I start but don't finish in OASIS are easy to save and resume later.	
OASIS is compatible with other software programs that I need to use in my work.	
When I need to get information from other sources or documents into OASIS it is easy enough to do.	
When I need to exchange data between OASIS and another program, it is difficult or impossible.	
When OASIS logs me out I can count on the work I was doing to be saved.	
Cluster 4: Report Production	
The data in OASIS is up-to-date enough for my purposes.	
Reports and other information I need from OASIS are provided in an efficient way.	
The kinds of reports and output I need from OASIS are available to me in a useful format.	
Cluster 5: System Access & Reliability	
When I need to, I can access OASIS no matter where I am (e.g., out in the field, at home, while traveling, etc.)	
I can count on OASIS to be "up" and available when I need it.	
If OASIS crashes while I'm working on it, I can count on not losing too much data.	
OASIS is "temperamental."	
The ability to make changes to data in OASIS is adequate for my needs.	Data Capture & Control
Cluster 6: Locating & Accessing Information	
The ways to search for or find data in OASIS are sufficient for my needs.	
Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.	
It is easy to get access to the information I need.	
It is easy to find data that I need to locate.	

Table 51 Continued

Concept Map Clusters	EFA-Assigned Factor
Information needed for similar purposes is consolidated on one or a few screens.	
The ways to find information in OASIS is intuitive enough for my needs.	
The information in OASIS is up-to-date enough for my purposes.	
The definition or meaning of data fields related to my tasks are clear.	
Cluster 7: Viewing Information	
It is easy to view information connected to many records without having to "drill down" into each one.	
Sometimes it is difficult to view or access information I need because it is inaccessible for one reason or another.	
It is easy to understand how to use a new screen or form that has been added to OASIS.	
It is easy to access my case information in OASIS from any computer.	
OASIS is too slow for my pace.	
OASIS is easy to use.	
Cluster 8: Miscellaneous	
The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.	
New information that I need to know about is clearly presented to me in OASIS.	
Terms and definitions in OASIS are consistent with terms and definitions used in policy.	
OASIS keeps me informed of new information and assignments that I need to be aware of.	Case Tracking & Prioritizing
Cluster 9: Case Tracking & Prioritizing	
In OASIS it is easy to see how a person is connected to other people and other cases.	
My tasks are presented in a way that makes it easy to prioritize them.	Case Tracking & Prioritizing
It is easy to find the screen or screens I need to use for most tasks.	
OASIS makes it easy to prioritize the work I need to do.	Case Tracking & Prioritizing
Accomplishing tasks in OASIS is straightforward.	
It is easy to see what has and still needs to be done for a particular case.	Case Tracking & Prioritizing
The screens and options in OASIS are for the most part relevant to my tasks.	
It is easy to see when a case I am involved in is waiting for or needs someone's input or action.	Case Tracking & Prioritizing
Tracking the status of deadlines, due dates, and other time sensitive items is easy in OASIS.	Case Tracking & Prioritizing
Cluster 10: Data Capture & Control	
The size of text fields and text boxes correspond well to the amount of information I need to enter.	
It is easy to delete data that is no longer relevant to my needs.	

Table 51 Continued

Concept Map Clusters	EFA-Assigned Factor
Entering data is straightforward and efficient for my purposes. It is easy to correct information in OASIS that needs to be corrected. I can enter information in OASIS at the level of detail that I think is needed.	
It is easy to save data that I enter in OASIS so I can use it later.	Data Capture and Control
OASIS helps me check that the data I enter are free of spelling and grammatical errors. Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field. Sometimes I have to enter the same information multiple times in different places. When I need to change information in OASIS I can do so without too much of a problem.	
I can edit / update data when I need to.	Data Capture and Control
It is clear to me what fields/data are required and what fields/data are not. OASIS allows me to document enough information to track the progress of a case.	
Information that is essential to my work can be entered in OASIS.	Data Capture and Control
I like the data entry forms in OASIS. Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.	
Cluster 11: Structuring of Information	
The fields and items for which I need to provide information are available in OASIS.	Data Capture and Control
OASIS helps me structure and organize the information I enter. OASIS streamlines the kind of documentation I need streamlined.	

possibilities. Workers who completed the survey may have focused on the semantic similarities between statements, rather than on the underlying needs they tap. For example, many items refer to the "ease" at which the CWIS supports a particular task need, such as *"It is easy to find data that I need to locate"* and *"It is easy to delete data that is no longer relevant to my needs."* If some workers focused on the "ease" of use and others focused on the underlying task need i.e., ability to locate or delete data, the response patterns would be disrupted due to the statements being interpreted differently. Respondent fatigue could also have contributed to many items not loading onto a factor. The survey included these 66 items, but also many more that assessed workers' demographics and other constructs in the TTF framework (individual, task, and technology characteristics; individual performance).

Ultimately, however, the CM suggests dimensions that have good face validity, and may still be candidate dimensions for TTF. Table 52 lists the dimensions suggested by both the CM and EFA studies. A future study could develop items for the six dimensions that failed to load in the EFA and verify their contribution to measuring TTF with another scale development study. The items and scales could be supplemented with those suggested by the literature, feedback from experts, or brainstorming sessions with caseworkers from other states.

Confirmatory Factor Analysis. A CFA (Model 1) was run to test the hypothesis that TTF is a 5-factor structure with 18 items as suggested by the EFA (Figure 10). Multivariate kurtosis critical ratio was 17.21, suggesting non-normality. Removing the top three outliers based on Mahalanobis d-squared values did not substantially improve kurtosis or model fit. However, this degree of multivariate non-normality was not a significant concern for reasons cited earlier. Model 1 was overidentified with 125 *df* with a $\chi^2 = 204.40$ ($p < .001$). All indices showed good fit: SRMR = .043, CFI = .966,

Table 52

TTF dimensions and scales for future research, as suggested by the Concept Mapping study and EFA

TTF Dimension	Description	Suggested by CM	Suggested by EFA
CWIS Training and Support	Adequacy of CWIS training and support	✓	✓
IT Assistance	Adequacy of IT support and assistance	✓	✓
System Reliability & Data Recovery	System instability, speed and performance	✓	
Report Production	Degree to which the CWIS supports report production	✓	
Case Tracking & Prioritizing	Degree to which the CWIS assists in prioritizing work and tracking case events	✓	✓
Locating and Accessing Information	Ease of searching, locating, and accessing needed information	✓	
Viewing Information	Ease of viewing and consolidating information (e.g., information consolidated in effective views, connecting cases)	✓	
Entering & Editing Data (Data Capture and Control)	Degree to which the CWIS supports the level of data entry and editing necessary for the worker to accomplish tasks	✓	✓
Data & Document Exchange	Ease with which information from other sources can be integrated or exchanged with the CWIS	✓	
Structuring of Data	Degree to which the CWIS supports the streamlining and structuring of documentation.	✓	

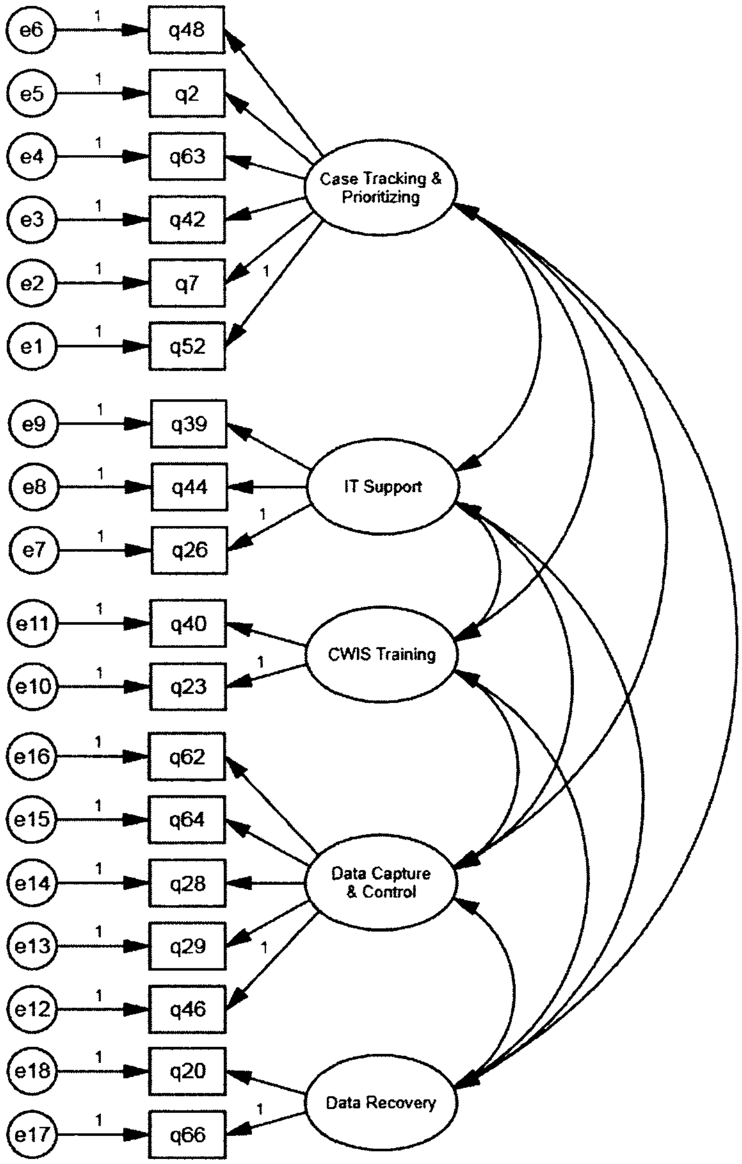

Figure 10. Aim 3 – Hypothesized 5-factor CFA Model of TTF (Model 1).

RMSEA = .053 (90% CI = .040 - .066). However, the 2-item factor, Data Recovery, showed both poor convergent validity (one item with a R2 = .33 [64]) and poor scale reliability (Composite Reliability = .598 and Cronbach's alpha = .584). In addition, including this

[64] q20 = If OASIS crashes while I'm working on it, I can count on not losing too much data.

factor in subsequent SEMs created fit problems, such as negative error variances for Data Recovery and Individual Performance and a model that would not converge. Given these findings, along with the low communality encountered in the EFA for one of its indicators, Data Recovery was dropped and the model rerun.

Model 2 without Data Recovery (χ^2 = 164.87, df = 98, $p < .001$) showed good fit with .SRMR = .043, CFI = .970, and RMSEA = .055 (90% CI = .040 - .070). Inspection of modification indices and standardized residuals revealed no localized points of ill fit. No cross-loadings were indicated and all standardized residuals were below the recommended cutoff of 2.58 (Jöreskog & Sörbom, 1993). Table 53 shows key statistics for each parameter and indicator in the model. All freely estimated unstandardized parameters were significant at $p < .001$ and standardized factor loadings ranged from .70 to .96. All four factors showed good convergent validity as evidenced by large R^2 values on every indicator (range = .49 - .91).

Consistent with the theory that TTF dimensions are interrelated, all factor covariances were significant at $p < .05$. All factor correlations were below .80 (range: .219 – .731) which suggested good discriminant validity among the factors (Table 54). All scales showed strong reliability with Cronbach's alphas above .70 (Table 55). Model 2 (4 factors, 16 items) was considered the best-fitting and most parsimonious model for the TTF construct.

Table 53

Aim 3 – Parameter Estimates and R^2s for 5-factor CFA Model of TTF (Model 2)

			Unstandardized			Standardized	
			Estimate	S.E.	C.R.	Estimate	R^2s
q52	←	Case Tracking & Prioritizing	1.000			.814	.663
q7	←	Case Tracking & Prioritizing	.915	.079	11.545	.709	.502
q42	←	Case Tracking & Prioritizing	.894	.076	11.726	.717	.515
q63	←	Case Tracking & Prioritizing	1.050	.071	14.685	.847	.718
q2	←	Case Tracking & Prioritizing	.980	.086	11.400	.702	.493
q48	←	Case Tracking & Prioritizing	1.054	.073	14.452	.838	.702
q26	←	IT Support	1.000			.756	.572
q44	←	IT Support	1.264	.102	12.364	.793	.629
q39	←	IT Support	1.351	.103	13.135	.955	.912
q23	←	CWIS Training	1.000			.940	.884
q40	←	CWIS Training	.915	.070	13.093	.870	.757
q46	←	Data Capture & Control	1.000			.759	.577
q29	←	Data Capture & Control	1.095	.090	12.130	.795	.632
q28	←	Data Capture & Control	1.229	.096	12.778	.833	.694
q64	←	Data Capture & Control	1.051	.091	11.518	.759	.576
q62	←	Data Capture & Control	.938	.079	11.930	.783	.613

Table 54

Aim 3 – Factor Covariances and Correlations for 5-factor CFA Model of TTF (Model 2)

			Covariances				Correlations
			Estimate	S.E.	C.R.	p	
Case Tracking & Prioritizing	↔	IT Support	.352	.100	3.538	***	.277
Case Tracking & Prioritizing	↔	CWIS Training	1.048	.164	6.399	***	.556
Case Tracking & Prioritizing	↔	Data C & C	.903	.128	7.071	***	.731
IT Support	↔	CWIS Training	.334	.115	2.901	.004	.219
IT Support	↔	Data C & C	.278	.079	3.505	***	.278
CWIS Training	↔	Data C & C	.844	.133	6.327	***	.569

Data C & C = Data Capture and Control

Table 55

Aim 3 – Scale Reliability for 5-factor CFA Model of TTF (Model 2)

	No. of items	Cronbach's alpha
Case Tracking & Task Prioritizing	6	.897
IT Support	3	.866
CWIS Training	2	.900
Data Capture & Control	5	.889

The four scales suggested by the EFA have established reliability and validity, and could thus be used to reliably measure TTF for child welfare workers using a CWIS. Table 56 lists each of the EFA scales and items. In a survey, respondents would be asked to indicate the extent to which they agree or disagree with each statement, using the same 7-point scale (Strongly Disagree to Strongly Agree) used in this study.

Hypothesis 3.3. TTF is an one-dimensional construct. This hypotheses examined if a one-factor solution (Model 3) provides a better fit to the data than a model that assumes multiple dimensions. This is a routine test of a one-factor competing model recommended by Kline (2004). All 16 items from Model 2 were specified to load onto a single TTF dimension (Figure 11). Model 3 was overidentified with 104 df. The χ^2 value of 716.85 ($p < .001$) represented an extremely poor fit to the data, and a significant decrement from the overall fit of the 4-factor model ($\chi^2_{diff}(6) = 551.98$, $p < .001$). The other indices of fit (SRMR = .096, CFI = .705, RMSEA = .162) confirm the poor fit between a one-factor model and the data.

Table 56

Final TTF Scales with Established Reliability and Validity

TTF Scales and Items	No. of items	Cronbach's alpha
Case Tracking & Prioritizing	6	.897
Degree to which the CWIS assists in prioritizing work and tracking case events		
It is easy to see what has and still needs to be done for a particular case.		
Tracking the status of deadlines, due dates, and other time sensitive items is easy in OASIS.		
OASIS makes it easy to prioritize the work I need to do.		
It is easy to see when a case I am involved in is waiting for or needs someone's input or action.		
OASIS keeps me informed of new information and assignments that I need to be aware of.		
My tasks are presented in a way that makes it easy to prioritize them.		
IT Support	3	.866
Adequacy of IT support and assistance		
It is easy to get IT support in a timely way.		
It is easy to get direct access to IT support.		
I can count on tech support having the knowledge to fix the issue I'm having.		
CWIS Training	2	.900
Adequacy of CWIS training and support		
The OASIS training I receive is sufficient for my needs.		
The OASIS training is specific enough for my purposes.		
Data Capture & Control	5	.889
Degree to which the CWIS supports the level of data entry and editing necessary for the worker to accomplish tasks		
Information that is essential to my work can be entered in OASIS.		
I can edit / update data when I need to.		
The ability to make changes to data in OASIS is adequate for my needs.		
The fields and items for which I need to provide information are available in OASIS.		
It is easy to save data that I enter in OASIS so I can use it later.		

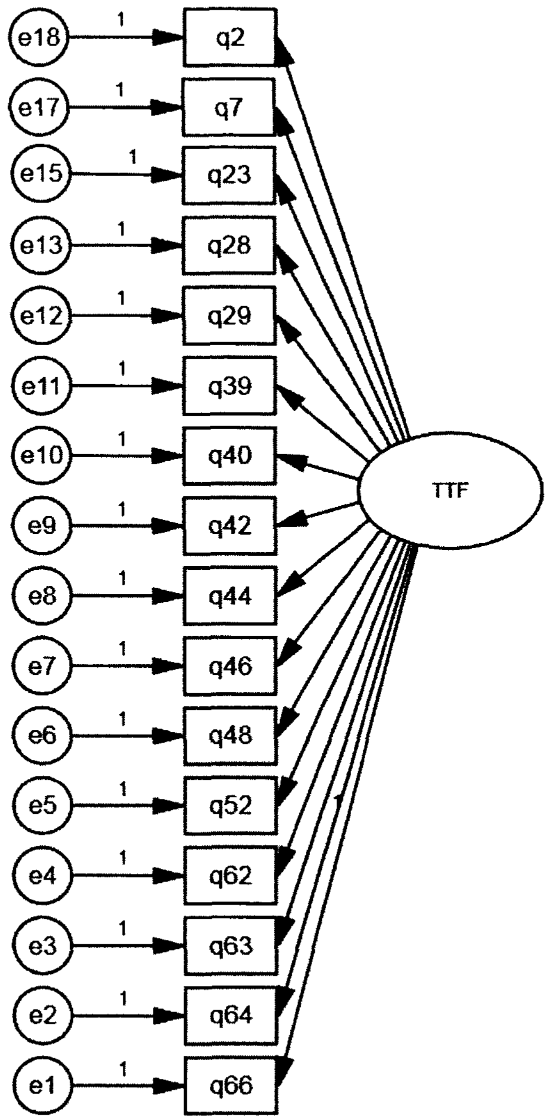

Figure 11. Aim 3 – Hypothesized One-Factor CFA Model of TTF (Model 3).

Hypothesis 3.4. TTF is an N-dimensional construct with one or more higher-order factors. This hypothesiss examined if a single higher-order TTF factor explains the four lower-order factors from Model 2, and provides equal or better fit to the data than a model with multiple first-order factors. The model with a higher-order factor may provide a more parsimonious account for the correlations among the lower order factors, all of which were significant in Model 2. Figure 12 shows the higher-order model (Model 4) tested for this hypothesis.

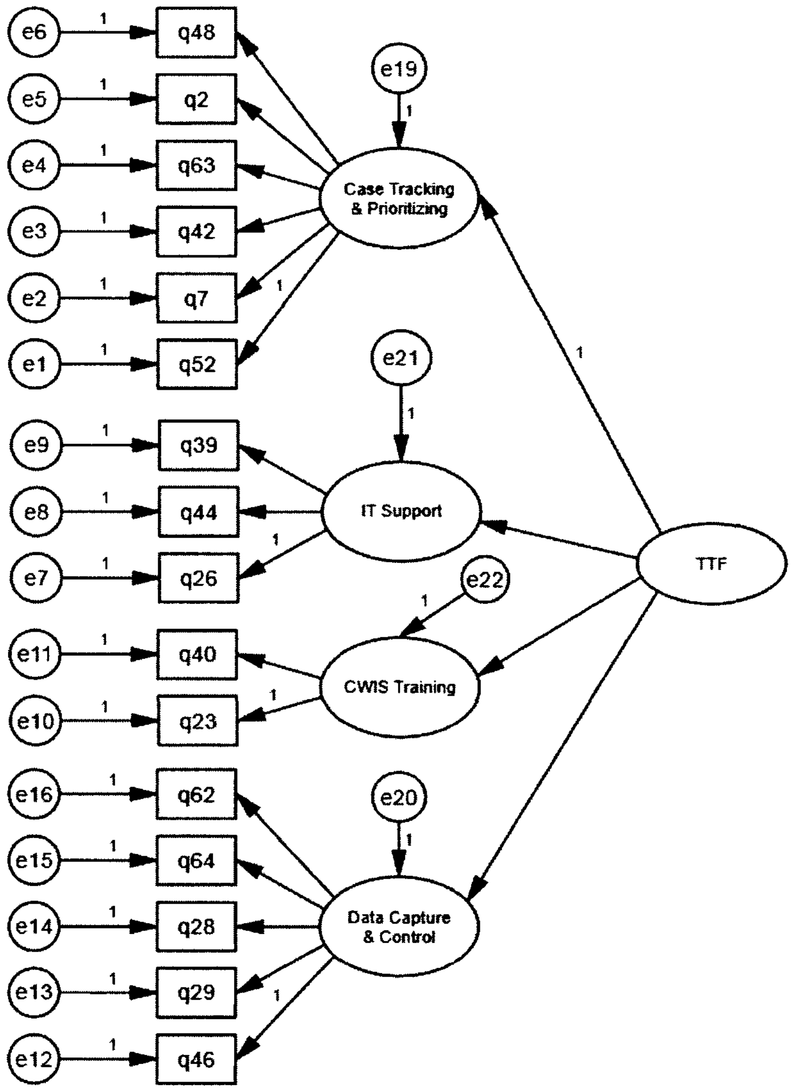

Figure 12. Aim 3 – Hypothesized Higher-Order CFA Model of TTF (Model 4).

The model was overidentified with 100 df. Because the higher-order model is a special case of the first-order model, the fit statistics between the two should be similar, and the results confirm this. The χ^2 value of 164.88 ($p < .001$) is similar to that of the first-order solution from Model 2 (χ^2 = 164.87). The higher-order model also shows similarly good levels of fit with CFI = .971, SRMR = .043, and RSMEA = .054 (90% CI = .039 - .068). All other results (e.g., magnitude and significance of parameters, etc.) were similar so results focus only on the new parameters introduced due to the second-order factor.

Table 57 shows key statistics for the new parameters and indicators introduced with the higher-order model. The freely estimated second-order factor loadings were all significant at $p < .001$ and the standardized factor loadings ranged from .325 to .864. R^2 values (i.e., percent of variance explained) were high for Data Capture & Control (.75) and Case Tracking & Prioritizing (.72) but low for CWIS Training (.433) and IT Support (.106).

Table 57

Aim 3 – Parameter Estimates and R^2s for Higher-Order CFA Model of TTF (Model 4)

			Unstandardized			Standardized	R^2s
			Estimate	S.E.	C.R.	Estimate	
Case Tracking & Prioritizing	←	TTF	1.000			.846	.715
Data Capture & Control	←	TTF	.803	.102	7.914	.864	.747
IT Support	←	TTF	.312	.077	4.046	.325	.106
CWIS Training	←	TTF	.935	.118	7.900	.658	.433

Because the first- and second-order models demonstrate equally good levels of fit, judgment as to whether the TTF construct should be modeled as a first- or second-order structure rests on the substantive meaningfulness of the underlying theory

(Byrne, 2009). Also considered is how the TTF instrument and its results will be used in practice. Although a higher-order TTF factor makes theoretical sense, its inclusion may reduce the value of an instrument designed to measure discrete facets of the CWIS, by steering attention away from the more specific and therefore actionable first-order factors. Given the context of the instrument's use, the first-order CFA model (Model 2) was still considered the best approach to model the TTF construct.

Aim 4. Establish the instrument's nomological validity by testing the hypotheses suggested by the TTF framework (i.e., that individual, task, and technology characteristics impact user evaluations of TTF, and that TTF impacts individual performance).

Figure 13 (reproduced from Chapter 3) shows the hypothesized model of the causal structure of the TTF framework. The factors associated with individual, task, and technology characteristics are presumed to impact each dimension of TTF. In turn, each dimension of TTF is presumed to positively impact Individual Performance.

Before testing these causal pathways, a CFA was run to establish the underlying measurement model. This involved testing and validating three separate measurement models: The first model (reported earlier) included the 4-factor TTF construct (Model 2). The second model included the exogenous factors hypothesized to predict the TTF dimensions: OASIS Experience (4 items), Work Compatibility (3 items), Task Difficulty (3 items), Task Interdependence (2 items), worker type (dummy variables: CPS = 1/0, Foster Care/Adoption = 1/0, with Generic as the omitted reference group), and rural/urban practice setting (Rural/Small Town = 1, Metro/Micropolitan = 0). The third

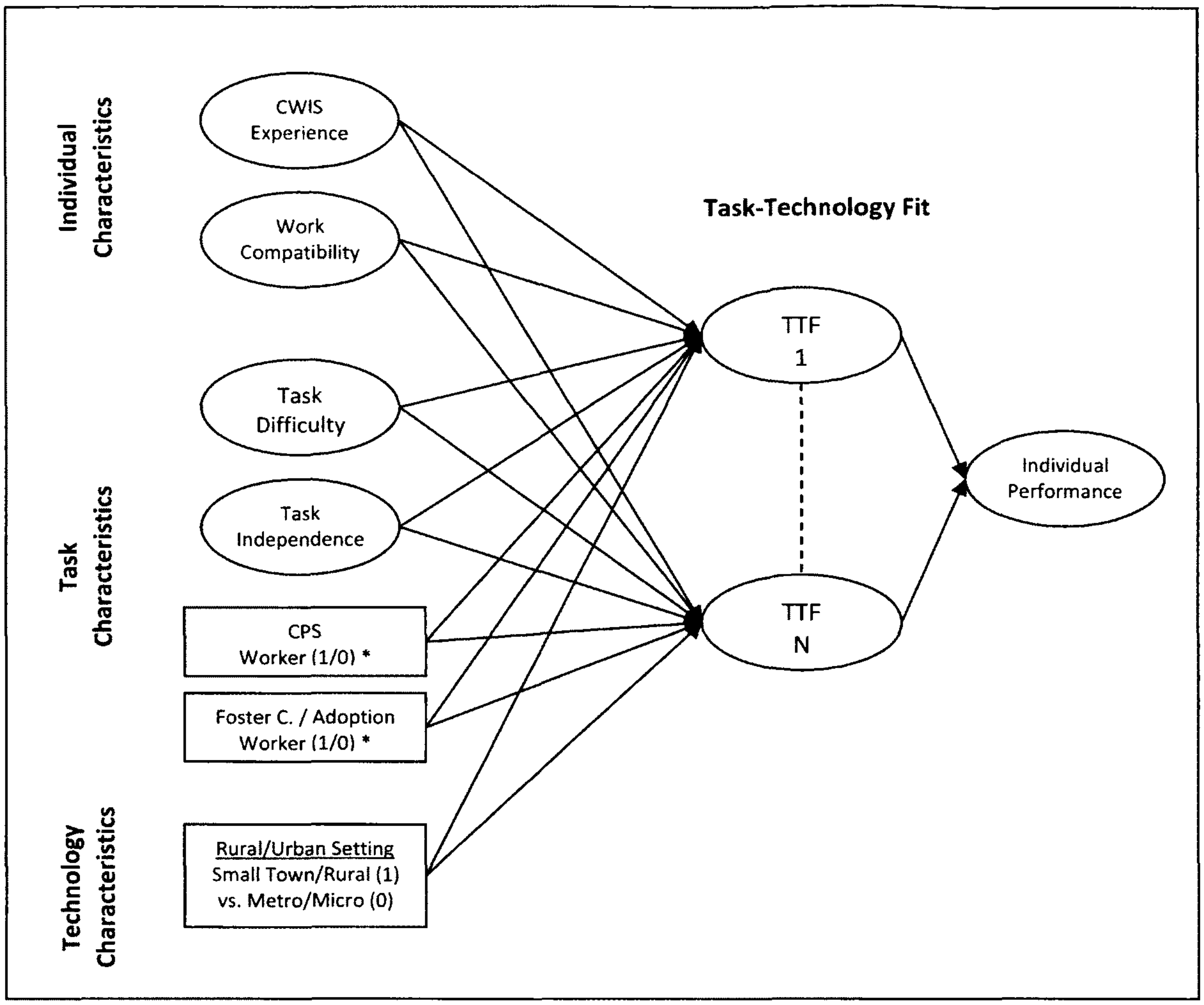

Figure 13. Aim 4 - Hypothesized Structural Model of the TTF Framework.

measurement model examined the main dependent variable, Individual Performance (6 items).

Measurement Model for TTF Predictors (exogenous factors). Figure 14 shows the initial hypothesized measurement model for the TTF predictors. The initial model (Model 1) returned a negative error variance for an indicator of CWIS Experience

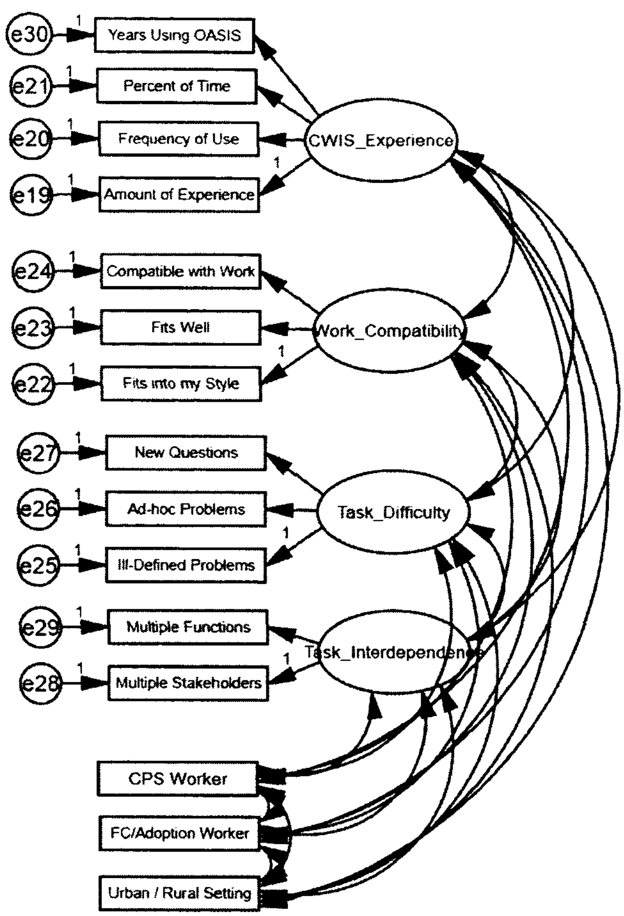

Figure 14. Aim 4 – Hypothesized Measurement Model for Endogenous TTF Predictors.

(Amount of Experience).[65] Item analysis revealed that another indicator of CWIS Experience, Years Using OASIS,[66] correlated negatively with two of the indicators for CWIS Experience and created a negative average covariance among the items. This finding makes sense given that the two indicators of CWIS Experience measure *frequency of use*[67] and the other two Amount of Experience and Years using OASIS

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[65] How much experience do you have with OASIS?

[66] Approximately how long (in years and months) have you been using OASIS? (recoded into seven bins with equal percentiles)

[67] How frequently do you use OASIS for casework-related tasks? (Frequency of Use),

measure perceived and actual *experience*. These differing metrics may not correlate, as might happen with a new worker (little experience) who is using OASIS 80% of the time (high frequency).

Years using OASIS was dropped and a re-estimated model (Model 2; $\chi^2 = 102.95$, df = 59, $p < .001$) showed good fit with SRMR (.054), CFI (.957), and RMSEA (.058, 90% CI: .039 - .076). Although modification indices and standardized residuals showed no areas of ill fit, the correlation between Task Difficulty and Task Interdependence was very high (.854; $p < .001$). In other words, these two factors showed poor discriminate validity and could be combined into one factor.[68]

A re-estimated model with Task Difficulty and Task Independence as one factor, called Task Difficulty (Model 3) showed some loss of fit but still reasonable: $\chi^2 = 129.75$ (df = 65, $p < .000$), SRMR = .061, CFI = .937, RMSEA = .067 (.050 - .083). This loss of fit is to be expected given that more complex models will almost always fit better. Although modification indices were within reasonable limits, R^2 values showed that one indicator of Task Difficulty (New Questions)[69] was not a reliable indicator ($R^2 = .249$). Eliminating this item would increase the reliability of the overall scale (Cronbach's alpha from .815 to .824) and increase parsimony.

Model 4 without New Questions showed improved fit for all indices: $\chi^2 = 101.81$ (df = 53, $p < .001$), SRMR = .058, CFI = .949, RMSEA = .064 (90% CI = .045 - .083).

Approximately what percent of your time do you spend on OASIS (Percent of Time).

[68] Further evidence for merging them together surfaced during the later SEMs. When included in the SEM as two factors, their standardized regression weights all exceeded 1. A common reason for Beta values > 1 is the presence of two more highly correlated factors (Jöreskog, 1999).

[69] Frequently the case management problems I work on involve answering questions that have never been asked in quite that form before.

However, convergent validity was a concern for CWIS Experience due to low R^2s for two of its three indicators, Percent Time on OASIS (R^2 = .317) and Amount of Experience (R^2 = .149). Despite the limitations with CWIS Experience, it was decided to retain this factor in the model given its theoretical significance, with the caveat that further work is needed to examine this construct.

Model 4 was selected as the best-fitting model to represent the exogenous factors in the TTF framework. All freely estimated unstandardized parameters were significant at $p < .001$ and all standardized factor loadings ranged from .56 to .97 except for Amount of Experience (.39). Work Compatibility and Task Difficulty showed adequate convergent validity as evidenced by moderate to large R^2 values on every indicator (range = .44 - .94) (See Table 58).

Model 4 also had three significant correlations: Work Compatibility and CWIS Experience (.342, p = .003), Work Compatibility and Task Difficulty (-.239, p. = .002), and CPS Workers and FC/Adoption Worker (-.571, p < .001). The worker type correlation makes sense as these are both correlated with the omitted reference group, Generic Worker (Table 59). All scales showed adequate to good reliability per Cronbach's alphas (Table 60).

Measurement Model for Individual Performance. Figure 15 shows the hypothesized measurement model for the dependent variable, Individual Performance. The model (Model 1; χ^2 = 42.03, df = 9, p < .001) showed good fit with SRMR (.028) and CFI (.975) but poor fit with RMSEA (.128, 90% CI: .091 - .168). Recall from the data screening that multicollinearity was a concern for two items on the Individual

Table 58

Aim 4 – Parameter Estimates and R^2s for Exogenous TTF predictors (Model 4)

			Unstandardized			Standardized	
			Estimate	S.E.	C.R.	Estimate	R^2s
Amount of Experience	←	CWIS Exp.	1.000			.386	.148
Frequency of Use	←	CWIS Exp.	2.171	.544	3.988	.776	.602
Percent of Time	←	CWIS Exp.	2.385	.561	4.251	.563	.317
Fits into my Style	←	Work Comp.	1.000			.879	.772
Fits Well	←	Work Comp.	1.193	.067	17.737	.972	.944
Compatible with Work	←	Work Comp.	.822	.070	11.692	.666	.444
Ad-hoc Problems	←	Task Difficulty	1.000			.835	.697
Ill-defined Problems	←	Task Difficulty	.910	.083	10.991	.752	.565
Multiple Functions	←	Task Difficulty	.716	.074	9.720	.664	.441
Multiple Stakeholders	←	Task Difficulty	.923	.091	10.123	.690	.477

Note. CWIS Exp. = CWIS Experience, Work Comp. = Work Compatibility. All parameters significant at $p < .001$.

Table 59

Aim 4 – Factor Covariances and Correlations for Exogenous TTF predictors (Model 4)

			Covariances				
			Estimate	S.E.	C.R.	p	Correlations
CWIS Experience	↔	Work Compatibility	.203	.067	3.021	.003	.342
CWIS Experience	↔	Task Difficulty	.058	.049	1.196	.232	.109
Work Compatibility	↔	Task Difficulty	-.349	.113	-3.078	.002	-.239
CWIS Experience	↔	Urban/Rural Setting	-.005	.019	-.261	.794	-.021
CWIS Experience	↔	CPS Worker	.007	.018	.389	.697	.032
CWIS Experience	↔	FC/Adoption Worker	-.009	.019	-.506	.613	-.041
Work Compatibility	↔	Urban/Rural Setting	.023	.043	.521	.602	.036
Work Compatibility	↔	CPS Worker	-.029	.041	-.708	.479	-.049
Work Compatibility	↔	FC/Adoption Worker	-.010	.043	-.223	.824	-.015
Task Difficulty	↔	Urban/Rural Setting	-.017	.042	-.408	.683	-.030
Task Difficulty	↔	CPS Worker	-.048	.039	-1.231	.218	-.090
Task Difficulty	↔	FC/Adoption Worker	.026	.041	.632	.528	.046
Urban/Rural Setting	↔	CPS Worker	.000	.016	-.023	.982	-.002

Table 59 Continued

			Covariances				Correlations
			Estimate	S.E.	C.R.	p	
Urban/Rural Setting	↔	FC/Adoption Worker	-.016	.016	-.989	.323	-.066
CPS Worker	↔	FC/Adoption Worker	-.131	.018	-7.417	***	-.571

*** p < .001

Table 60

Aim 4 – Scale Reliability for Exogenous TTF Predictors (Model 4)

	No. of items	Cronbach's alpha
CWIS Experience	3	.560
Work Compatibility	3	.868
Task Difficulty	4	.824

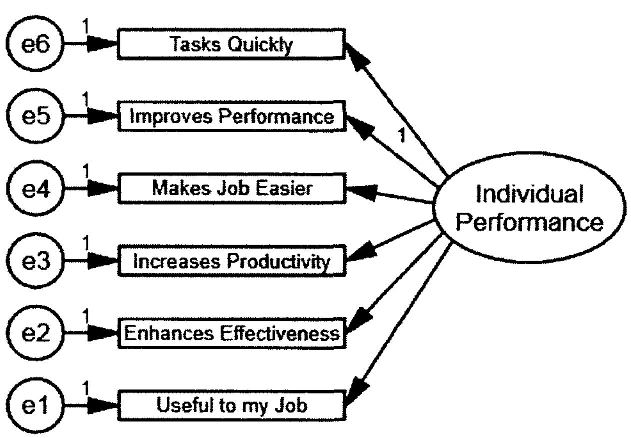

Figure 15. Aim 4 – Hypothesized Measurement Model for Individual Performance.

Performance scale: Makes Job Easier[70] and Improves Performance[71]. A correlation matrix shows these correlate at .904. A re-specified model (Model 2) without Makes Job Easier showed good fit with $\chi^2 = 22.23$, df = 5, $p < .001$, SRMR = .024, and CFI = .981. However, RMSEA remained poor at .124 (90% CI: .074 to .179). Modification indices suggested fit could be improved by specifying an error covariance between Useful to my Job[72] and Enhances Effectiveness[73]. The items are similar enough in wording that an error covariance is justified. Re-estimating the model to include the error covariance (Model 3) improved fit for every index: $\chi^2 = 9.27$, df = 1, $p = .055$ ($\chi^2_{diff} = 12.96$, $p < .001$), SRMR (.013), CFI (.994), and brought RMSEA within a reasonable range (.077), although its 90% CI remained wide (.000 to .143). The large RMSEA, however, may not be a concern given that models with small *df* can lead to artificially high RMSEA values (Herzog & Boomsma, 2009). In addition, the χ^2 is not significant which means the lack of fit in the model is not significant. All unstandardized estimates were significant at $p < .001$ and all factor loadings were ≥ .68 with most R^2s ranging from .68 - .86 (Useful to my Job had an $R^2 = .46$.). Reliability was excellent (Cronbach's alpha = .926).

Structural Equation and Measurement Model. Figure 16 shows the AMOS representation of the measurement and structural model that was tested. Model 1 was overidentified with 486 df ($\chi^2 = 976.17$, $p < .001$) and showed poor fit with SRMR (.075) and CFI (.895) but reasonable fit with RMSEA (.067, 90% CI: .061 - .073). Most of the

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[70] Using OASIS makes it easier to do my job.
[71] Using OASIS improves my job performance.
[72] Overall, I find OASIS useful to my job.
[73] Using OASIS enhances my effectiveness in the job.

Table 61

Aim 4 – Parameter Estimates and R^2s for Individual Performance (Model 3)

			Unstandardized			Standardized	
			Estimate	S.E.	C.R.	Estimate	R^2s
Improves Performance	←	Individual Perf.	1.000			.927	.859
Useful to my Job	←	Individual Perf.	.667	.055	12.218	.675	.455
Enhances Effectiveness	←	Individual Perf.	.949	.048	19.976	.868	.754
Increases Productivity	←	Individual Perf.	1.016	.046	22.154	.905	.819
Tasks Quickly	←	Individual Perf.	.948	.054	17.689	.823	.677

Note. Individual Perf. = Individual Performance. All parameters significant at $p < .001$.

large modification indices (including one as high as 113.25) suggested fit could be improved substantially by correlating various errors associated with Work Compatibility and those with Individual Performance. Further, all of the standardized residuals among the Work Compatibility and Individual Performance indicators exceeded 2.65 (range: 3.20 – 5.33), and were in fact the only standardized residuals that did so. However, correlating these errors did not make theoretical or substantive sense as there was little sign of item content overlap or a common method bias. Also indicated was a direct path from Work Compatibility to Individual Performance (M.I. = 55.18). Although this path was not theorized (Work Compatibility was instead predicted to influence TTF), it is plausible and would suggest a causal relationship between the two constructs, in which case TTF would partially – rather than fully – mediate the influence of the exogenous factors on Individual Performance.

To test the hypothesis that Work Compatibility directly predicts Individual

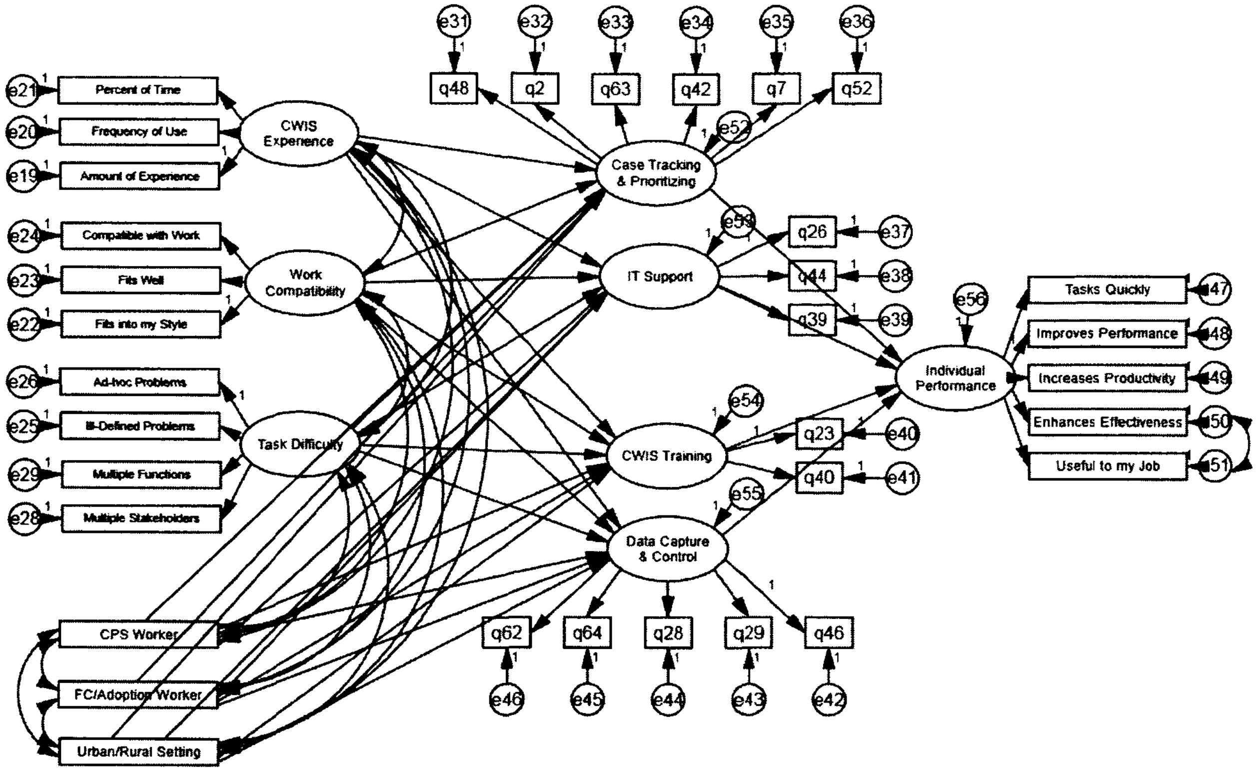

Figure 16. Aim 4 – Structural and Measurement Model of the TTF Framework.

Performance, a direct path between the two was drawn and the model re-estimated (Model 2). Fit improved in all indices: χ^2 = 782.35 (df = 485, p < .001), SRMR = .056, CFI = .936, and RMSEA (.052, 90% CI: .045 - .059). Although modification indices suggested some possible points of ill fit, none had strong theoretical justification. Among 29 causal paths estimated, 10 were significant at p = .05, only one of which reflected a path between a TTF dimension and Individual Performance (i.e., Case Tracking & Prioritizing, standardized B = .170, p = .004). In the interest of parsimony, a new model (Model 3) was estimated with the non-significant paths omitted. Also omitted were the dummy variables for CPS and FosterCare/Adoption worker and the variable indicating if the worker was in a rural or urban setting; none of these significantly predicted any of the dimensions of TTF. Deleting these non-significant paths improved fit slightly (Model 3): χ^2 = 694.78 (df = 420, p < .001), SRMR = .060, CFI = .939, and RMSEA (.054, 90% CI: .047 - .061). As shown in the top half of Table 62, seven of the 10 structural paths remained significant by at least p < .05: CWIS Experience significantly predicted all four TTF dimensions, Work Compatibility significantly predicted Data Capture and Control (p = .045) and Individual Performance (p < .001), and Case Tracking and Prioritizing significantly predicted Individual Performance (p = .007). The paths between Task Difficulty and three of the TTF dimensions became non-significant. Standardized loadings for the significant paths ranged from .13 to .85. In the measurement model, all freely estimated parameters were significant by at least p < .001 and standardized loadings for all but the CWIS Experience indicators ranged from .69 to .95.

Table 62

Aim 4 –Parameter Estimates for the SEM (Model 3)

			Unstandardized					Standardized
			Estimate	S.E.	C.R.	P		Estimate
Structural Model								
Case Tracking & Pr.	←	CWIS Experience	5.038	2.015	2.500	.012	*	.852
IT Support	←	CWIS Experience	1.405	.657	2.138	.033	*	.306
CWIS Training	←	CWIS Experience	4.293	1.742	2.464	.014	*	.634
Data C & C	←	CWIS Experience	2.987	1.263	2.366	.018	*	.671
Data C & C	←	Work Compatibility	.143	.071	2.007	.045	*	.192
Individual Perf.	←	Work Compatibility	.883	.057	15.545	***		.863
Case Tracking & Pr.	←	Task Difficulty	-.130	.082	-1.578	.114		-.114
IT Support	←	Task Difficulty	-.030	.068	-.446	.656		-.035
CWIS Training	←	Task Difficulty	-.105	.098	-1.076	.282		-.081
Individual Perf.	←	Case Track & Pr.	.130	.048	2.721	.007	*	.126

Table 62 Continued

			Unstandardized					Standardized
			Estimate	S.E.	C.R.	P		Estimate
Measurement Model								
Amt. of Experience	←	CWIS Experience	1.000					.183
Frequency of Use	←	CWIS Experience	1.826	.825	2.213	.027	*	.310
Percent of Time	←	CWIS Experience	2.982	1.322	2.256	.024	*	.335
Fits into my Style	←	Work Compatibility	1.000					.912
Fits Well	←	Work Compatibility	1.094	.048	22.802	***		.925
Compatible with Work	←	Work Compatibility	.826	.065	12.803	***		.695
Ill-Defined Problems	←	Task Difficulty	.912	.082	11.146	***		.758
Ad-hoc Problems	←	Task Difficulty	1.000					.841
q2	←	Case Tracking & Pr.	.938	.081	11.601	***		.701
q63	←	Case Tracking & Pr.	1.019	.066	15.473	***		.858
q42	←	Case Tracking & Pr.	.853	.072	11.904	***		.714
q7	←	Case Tracking & Pr.	.872	.075	11.709	***		.705
q26	←	IT Support	1.000					.757
q44	←	IT Support	1.264	.102	12.385	***		.794
q39	←	IT Support	1.347	.102	13.146	***		.953
q23	←	CWIS Training	1.000					.936
q40	←	CWIS Training	.924	.069	13.323	***		.874
q29	←	Data C & C	1.091	.090	12.085	***		.792
q28	←	Data C & C	1.221	.096	12.688	***		.827
q64	←	Data C & C	1.056	.091	11.583	***		.762
Tasks Quickly	←	Individual Perf.	.955	.055	17.490	***		.819
Improves Perform.	←	Individual Perf.	1.000					.915
Increases Productivity	←	Individual Perf.	1.028	.046	22.231	***		.905
Enhances Effective.	←	Individual Perf.	.978	.047	20.865	***		.884
Useful to my Job	←	Individual Perf.	.695	.054	12.851	***		.694
q62	←	Data C & C	.948	.078	12.081	***		.791
q46	←	Data C & C	1.000					.759
Multiple Functions	←	Task Difficulty	.700	.073	9.616	***		.654
Multiple Stakeholders	←	Task Difficulty	.906	.090	10.057	***		.682
q52	←	Case Tracking & Pr.	.960	.067	14.340	***		.815
q48	←	Case Tracking & Pr.	1.000					.829

Note. Case Tracking & Pr. = Case Tracking & Prioritizing, Individual Perf. = Individual Performance, Data C & C = Data Capture & Control.

* p-value < .05, *** p-value < .001

R^2s are shown in Table 63. Although 90% of the variance in Individual Performance was accounted for, most of this was explained by Work Compatibility rather than any TTF dimension as was originally hypothesized.

Table 63

Aim 4 – R^2s for the SEM (Model 3)

	Estimate
Dependent Variable	
Individual Performance	.895
TTF Dimensions	
Case Tracking & Prioritizing	.780
IT Support	.099
CWIS Training	.430
Data Capture & Control	.665
Measurement Model	
Useful to my Job	.482
Enhances Effectiveness	.781
Increases Productivity	.818
Improves Performance	.838
Tasks Quickly	.671
q62	.626
q64	.581
q28	.684
q29	.627
q46	.576
q40	.764
q23	.876
q39	.909
q44	.631
q26	.574
q52	.665
q7	.498
q42	.510
q63	.737
q2	.491
q48	.687
Multiple Functions	.428
Multiple Stakeholders	.465
Ad-hoc Problems	.708
Ill-Defined Problems	.575
Compatible with Work	.484
Fits Well	.855
Fits into my Style	.832
Percent of Time	.112
Frequency of Use	.096
Amount of Experience	.034

The final measurement and structural model is shown in Figure 17, and a simplified version of the model with only the structural paths for clarity is shown in Figure 18.

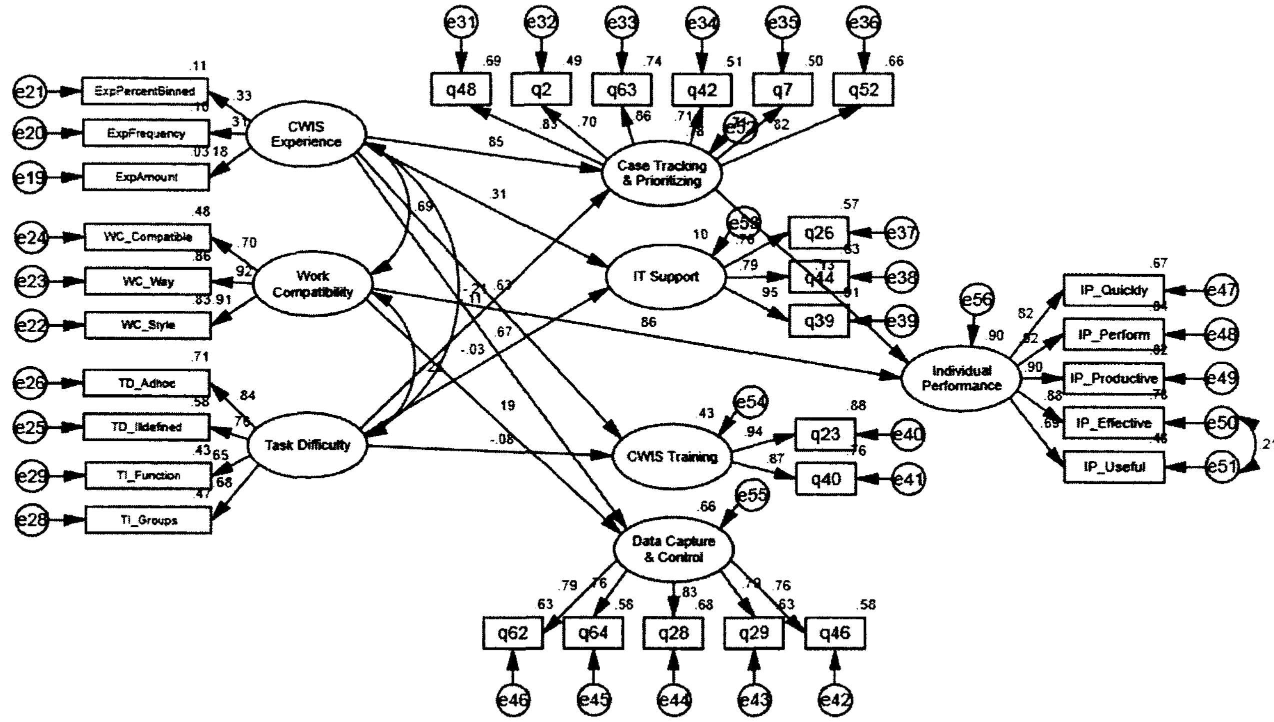

Figure 17. Aim 4 – Final Measurement and Structural Model for the TTF Framework (standardized solution shown with R^2s).

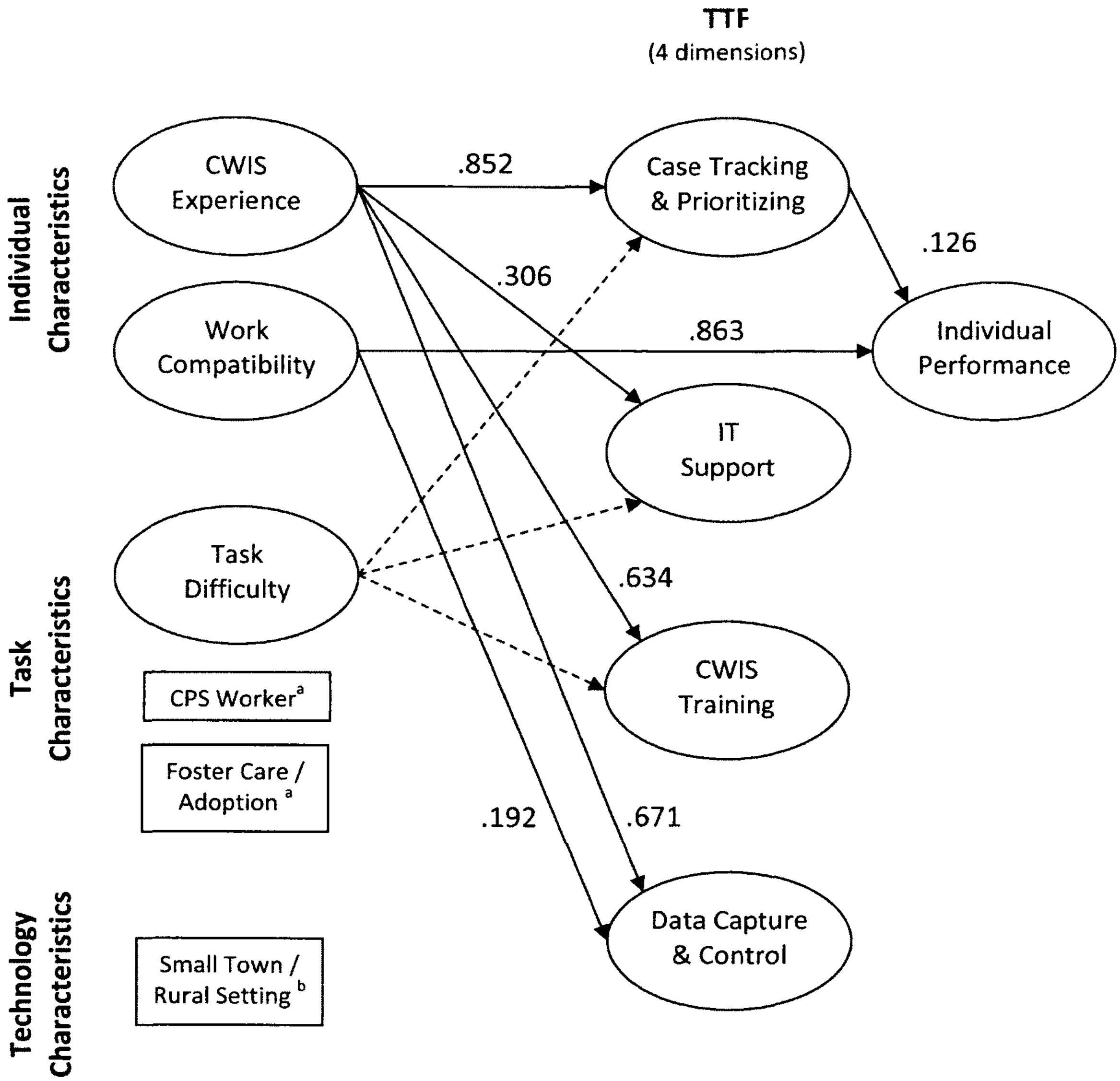

Figure 18. Aim 4 – Final Structural Model for TTF Framework (standardized solution shown).

Note. All paths with parameters were significant by at least $p < .05$. Dashed lines reflect non-significant paths. Missing paths were not significant in previous iterations of the model. Correlations omitted for clarity.
[a] Dummy variable (with Generic worker as reference group).
[b] Dichotomous variable (Small Town/Rural = 1, Metropolitan/Micropolitan = 0)

Validity of the Hypotheses in the TTF Framework. SEM showed mixed support for the hypotheses in the TTF framework. Support was found for six of the TTF hypotheses (Table 64).

Table 64

Aim 4 – Degree of Support for Structural Hypotheses and Nomological Validity of the TTF Framework

#	Hypothesis Text	Supported or Not Supported
Individual characteristics (i.e. CWIS experience and Work Compatibility) will affect user evaluations of TTF.		
Workers with more experience on CWIS will give higher evaluations of TTF		
4.1.1	*... Case Tracking & Support*	Supported
4.1.2	*... IT Support*	Supported
4.1.3	*... CWIS Training*	Supported
4.1.4	*... Data Capture & Control*	Supported
Workers who view CWIS as more compatible with their work style will give higher evaluations of TTF		
4.2.1	*... Case Tracking & Support*	Not Supported
4.2.2	*... IT Support*	Not Supported
4.2.3	*... CWIS Training*	Not Supported
4.2.4	*... Data Capture & Control*	Supported
Task characteristics (i.e., Task Difficulty, Task Interdependence, and Worker Type) will affect user evaluations of TTF.		
Workers who report more difficult tasks will give lower evaluations of TTF.		
4.3.1	*... Case Tracking & Support*	Not Supported
4.3.2	*... IT Support*	Not Supported
4.3.3	*... CWIS Training*	Not Supported
4.3.4	*... Data Capture & Control*	Not Supported
CPS workers, whose tasks involve more front-loading of the data into the CWIS, will give lower evaluations of TTF than other workers because their demands on the system are greater.		
4.4.1	*... Case Tracking & Support*	Not Supported
4.4.2	*... IT Support*	Not Supported

Table 64 Continued

#	Hypothesis Text	Supported or Not Supported
4.4.3	*... CWIS Training*	Not Supported
4.4.4	*... Data Capture & Control*	Not Supported
Technology characteristics (i.e., urban/rural setting as a proxy for OASIS support) will affect user evaluations of TTF.		
4.5.1	*Workers from small towns and rural areas will give lower evaluations of TTF.*	Not supported
User evaluations of TTF will be positively associated with Individual Performance.		
4.6.1	*... Case Tracking & Support*	Supported
4.6.2	*... IT Support*	Not Supported
4.6.3	*... CWIS Training*	Not Supported
4.6.4	*... Data Capture & Control*	Not Supported

As shown in Table 64, workers with more experience on the CWIS gave significantly higher evaluations (4.1.1 to 4.1.4) on all four TTF dimensions (Case Tracking and Prioritizing, IT Support, CWIS Training, and Data Capture and Control). Second, workers who viewed the CWIS as more compatible with their work style (Work Compatibility) gave significantly higher evaluations (4.2.4) on the TTF dimension, Data Capture and Control. Lastly, higher evaluations on Case Tracking and Support was positively and significantly related to Individual Performance (4.6.1).

No support was found for the relationship between Task Characteristics, worker type, and Urban/Rural setting on any TTF dimension. Lastly, the analysis found support for an unanticipated positive and direct relationship between Work Compatibility (i.e., degree to which the CWIS is compatible with the workers' work style) and Individual Performance, such that workers who viewed the CWIS as more compatible with their work style reported greater levels of Individual Performance. Work Compatibility explained most of the variance in Individual Performance.

Discussion

Direct Effect of Work Compatibility on Individual Performance. The most surprising finding was the unanticipated direct effect of Work Compatibility (WC) on Individual Performance. Specifying this direct path, which is not part of the TTF framework, allowed the model to fit and significantly changed the structural parameters and implications that would otherwise exist had WC been excluded from the model. Measurement challenges related to Work Compatibly and Individual Performance like this have been reported. For example, Moore and Benbasat (1991) had difficulty empirically distinguishing between WC and a version of Individual Performance which they called Relative Advantage which used many of the same scale items.[74] In Moore and Benbasat's study, WC and Relative Advantage did not emerge as separate factors in a factor analysis, despite sorters consistently separating them in previous sorting experiments. As the authors point out,

> "This may mean that, while conceptually different, they are being viewed identically by respondents, or that there is a causal relationship between the two. For example, it is unlikely that respondents would perceive the various advantages of using the [system], if its use were in fact not compatible with the respondents' experience or work style" (p. 208).

This study did not subject the WC items to a sorting process (only TTF items were sorted), so it is unclear if caseworkers in this study would make the same conceptual

[74] Moore and Benbasat's (1991) Relative Advantage scale, and the Individual Performance scale in this study, were both based on items from Davis' (1989) Perceived Usefulness scale.

distinction. A future study should explore this.

Overall Effect of Work Compatibility on the TTF Framework. Including WC in the model seemed to suppress the effect of other variables in the TTF framework. For instance, in the final SEM model, urban/rural setting and task difficulty were not significant predictors of any TTF dimension. Much of this could be due to the significant amount of variance explained by WC and how it interacts with other variables in the model. For example, in a model without WC (not reported)[75], workers in rural work settings were more likely to rate IT Support (a TTF dimension) higher ($\beta = .317$, $p = .043$) than workers in urban settings. This finding supports the hypothesis that users in different regions of a state may evaluate TTF differently because of their physical proximity to IT support or DSS headquarters or their perceived value in the broader DSS organization. The presence of WC also seemed to suppress the effect of task difficulty. In the same model without WC, task difficulty negatively predicted all four TTF dimensions (by at least $p < .03$), such that workers reporting greater task difficulty gave more negative evaluations on all four dimensions of TTF (consistent with TTF theory). The emergence of TD as a significant predictor of TTF when WC can be partially due to WC being significantly correlated with TD (-.239, $p = .002$). The negative correlation means that workers who reported less task difficulty tended to report greater compatibility with the CWIS, a finding that makes conceptual sense.

Task-Technology Fit Unaffected by Worker Type. It is noteworthy that worker type (a measure of task characteristics) did not predict TTF regardless of whether WC

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[75] $\chi^2 = 622.16$, $p < .001$, CFI = .943, SRMR = .055, RMSEA = .049 (90% CI = .042 - .057).

was included in the model. It may be that worker type is not an effective proxy of task characteristics when assessing a worker's task portfolio. Casework is a diffuse activity that includes case management, administrative, and clerical tasks shared by all workers regardless of their assigned role (e.g., CPS vs. Foster Care). The lines become even more blurred in the context of CWIS use, where all workers must to some extent engage in tasks related to searching, finding, entering, and editing data, all in the support of case management. In addition, the impact of worker type on TTF as originally hypothesized by Goodhue and Thompson (1995) assumed task characteristics vary as one moves vertically up the organizational hierarchy, from "clerical staff to low level managers to higher-level managers" (p. 222). This is not the case when distinguishing across different types of caseworker types, who all use the CWIS for a similar purpose – case management. If a future study sought to measure the extent to which a CWIS meets a much wider range of users who operate at different levels of the organization – like caseworkers, supervisors, and program managers – than a "worker type" variable (like job title) might emerge as an important predictor of TTF.

CHAPTER 5

CONCLUSIONS

The purpose of this study was to develop and validate an instrument that measures the degree to which a state's child welfare information system (CWIS) meets caseworkers' needs, a concept known as task-technology fit (TTF). Measures of TTF have been developed for other settings and technologies but never for caseworkers using a CWIS. The first objective was to define what caseworkers need from their CWIS – i.e., the TTF construct – and then develop an instrument to measure if those needs are being met. In addition, this study also tested whether TTF leads to improved performance, and if ratings of TTF are affected by characteristics of the users, their tasks, and the technology. These propositions all stem from the TTF framework, which posits that users will evaluate the usefulness of technology based on the extent to which it meets their tasks needs and individual abilities.

Empirical Findings

The main findings are described in the previous chapters, but are briefly synthesized here to frame the subsequent discussions about implications for theory, methodology, and policy. Chapter 2 made the case that many CWIS systems fail to meet the needs of workers, and that a better understanding of the fit between workers and CWIS can lead to better information systems. Better systems are those that meet the needs of workers in a way that makes them more effective in serving children and families in the child welfare system. Chapter 2 also demonstrated that the lack of methodologically rigorous evaluation tools available to CWIS evaluators has stymied progress in developing systems that meet workers' needs. A methodologically rigorous instrument is one that is based in theory, is developed with end users' input, and meets widely accepted thresholds of validity and reliability. Among the many theories in information systems research, the TTF framework was seen as particularly well-suited for understanding the fit between workers and CWIS. This study sought to develop a TTF instrument by asking workers to develop the items, and then using qualitative and quantitative techniques to organize those items into valid and reliable scales that can measure discrete aspects of what workers need from a CWIS. These discrete aspects represent the TTF dimensions that were of critical interest.

As described in Chapter 4, this study identified four key dimensions that reflect needs related to *case tracking and prioritizing*, *IT support*, *CWIS training and support*, and *data capture and control*. These four dimensions represent workers' principal needs when using a CWIS to perform case management, and are the basis upon which they will evaluate the system. The study also identified six additional dimensions that, while having face validity, did not emerge as discriminant factors in the rigorous context of factor analysis. These six dimensions reflected needs related to *report production*, *system access and reliability*, *exchanging data*, *locating and accessing data*, *viewing data*, and *structuring data*. The conclusions are that we have very strong support and valid scales for four TTF dimensions, and six other dimensions that warrant further study.

The last section of Chapter 4 tested the hypotheses that characteristics of the user, their tasks, and the technology influence how they rate their fit with the CWIS (i.e., TTF), which further influences how they evaluate their job performance in terms of effectiveness and productivity. Significant support was found for six of 21 hypotheses tested: Workers with more experience on CWIS gave higher evaluations on all four TTF dimensions (four hypotheses); workers who saw the CWIS as compatible with their work style (work compatibility) were more likely to report their data capture and control needs were being met; and positive evaluations of case tracking and support were associated with greater perceived individual performance.

Theoretical Implications

In interpreting the empirical findings, it is important to note that the inclusion of work compatibility (WC) as a predictor in the model affected, in unanticipated ways, the relationship among many of the other constructs. This finding has important implications for our understanding of TTF as a framework for evaluating information systems. That the presence or absence of WC affected other structural paths in the model suggests that WC may serve as a moderator of other parts of the TTF framework. This could be explored in future analyses. For example, a SEM could test for interactions between Work Compatibility and the other predictors of TTF, like task characteristics and whether the worker works in an urban or rural setting. Although WC was not directly correlated with urban/rural setting, as a moderator it may influence its effect. For example, workers in rural areas may evaluate TTF differently (e.g., perceived IT support) depending on their level of WC. It is also possible that WC does not even belong in the TTF framework because people with varying degrees of WC might experience relationships among TTF and performance variables differently. This notion could be examined with a multigroup analyses that compares how the paths in the TTF framework vary for workers with different levels of WC. If there is significant measurement invariance, it is possible that TTF needs to be operationalized differently for each group.

A major finding discussed in Chapter 4 is that WC significantly predicted individual performance, a finding that was not originally hypothesized. While other studies have shown a direct link between WC and individual performance (see e.g., Sun, Bhattacherjee, & Ma, 2009), none have done so in the context of the TTF framework. The closest example in the literature is a study by Staples and Seddon (2004), who treated WC (also using Moore and Benbasat's scale) as a *dimension of TTF* when examining TTF's impact on Individual Performance. However, the authors did not examine the unique impact of WC on Performance[76] so whether they would have encountered similar measurement challenges is unknown.

In this study, including WC in the model helped identify a measurement challenge that obviously still exists since 1991. Although WC may be conceptually distinct from individual performance, its correlation with individual performance is so high such that it attenuates the contribution of many other constructs in the TTF framework. Without additional research, it is unclear how the results of the many TTF studies published since 1995 would change had the researchers included a measure of WC; it is clearly an area requiring further research.

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[76] The authors modeled TTF as a second-order factor (comprised of WC and three other first-order factors), and therefore did not examine the unique relationships between each TTF factor and other variables in the model.

Methodological Implications – Developing Scales with Concept Mapping and Factor Analysis

The study undertook an extensive scale development process that demonstrated how both traditional and uncommon techniques of scale development can be used to develop, measure, and validate a new construct.

Contribution to Content Validity. An important contribution of this study was using CM techniques, particularly feedback from the target population, to develop the item pool and identify preliminary TTF dimensions. This technique yielded TTF items and dimensions that would probably not have surfaced if the item pool had been generated with more traditional instrument development techniques, like consulting the literature or a panel of experts in IT and child welfare. When evaluating information systems, experts in IT and child welfare tend to emphasize how well systems support decision-making, have business intelligence/dashboard features, and bring the data back to the worker in a meaningful way. Case workers, on the other hand, tend to emphasize as they did in this study needs related to data entry, documentation, and case management. It is likely that both sets of stakeholders are "correct" and combining insights from both would enhance the scope and content validity of the TTF construct. To assess content validity, a future study could compare the items, concept maps, and scales generated by caseworkers in this study with the same elements generated by experts in CWIS and child welfare. A high similarity between the caseworkers and experts would provide support for content validity (Albert & Steiner, 2005).

Contribution to Factorial Validity. While CM's contribution to content validity is more clear – namely by using the unique insights of the target population in defining the bounds of the construct – the degree to which CM can be used to inform scale development techniques like factor analysis is less straightforward. Given the differences in how CM and factor analyses work, there is no reason to expect constructs based on each of them to perfectly agree, but some alignment would provide validation for the construct and also support the compatibility of CM and factor analysis in developing scales. In this study, compatibility between the two methods did emerge: both techniques yielded four identical TTF dimensions related to case tracking and prioritizing, IT support, CWIS training, and data capture and control. However, the CM also produced several dimensions that, although face valid, did not survive the item pruning that factor analysis imposes via factor loadings and other metrics. For example, the CM suggested six additional TTF dimensions that tapped workers' needs related to system reliability and data recovery, report production, locating and accessing information, viewing information, data and document exchange, and structuring of data. That these CM dimensions were not reproduced in the EFA does not suggest they have no substantive value: their elimination could easily be due to measurement issues, such as sorting fatigue and problems with item wording. And, of course, CM is more expansive in part because it uses all of the items in the pool, whereas the EFA provides a clear a way of eliminating items via factor loadings, communalities, and other metrics.

Incorporating CM and Factor Analysis in Future Studies. To boost the construct validity of new instruments, scale develop studies can leverage techniques from both

CM and factor analyses. For example, item generation could involve feedback from members of the target population (CM) combined with the more traditional techniques of rational deduction, clinical experience, existing literature and instruments, and expert solicitation. The item pool would then be pruned of duplicates and refined according to best practices in item writing and formatting. The refined item pool could then be subjected to a sorting and rating process (CM) to identify preliminary dimensions, and those dimensions would be subjected to further scrutiny by another sample of experts or members of the target population (as a check on content validity). If additional dimensions are suggested, the researchers could generate items explicitly for those new dimensions, using any of the item generation methods. Finally, the items would be administered to a larger sample and subjected to factor analysis and other traditional psychometric testing. As before, there is no expectation the dimensions suggested by the CM will align perfectly with those of the factor analysis, but the convergence will likely increase with each successive study that provides iterative feedback to the target population and experts, and further refines the scales according to that feedback. Obviously, incorporating this kind of iterative feedback and testing is resource-intensive, but it would nonetheless allow one to leverage and test the advantages of both techniques in developing constructs and scales that meet all aspects of construct validity.

Policy Implication

State and federal policies related to evaluating CWIS continue to focus on highly subjective evaluations of systems using either focus groups, user interviews, instruments with unknown reliability and validity, or instruments that fail to provide specific feedback about exactly what must be improved, and for which workers it matters most. This study offers several contributions along this front, the most obvious being the development of a psychometrically valid yet preliminary instrument to evaluate the extent to which a CWIS meets caseworkers needs in four critical areas: case tracking and prioritizing, IT support, CWIS training, and data capture and control. Its use of task-technology fit theory corresponds well with the task-focused nature of case work, and aligns itself with the policies and practices that dictate and define case work practice, which remain highly task-specific. In addition, in this study workers' experience with the CWIS significantly influenced their evaluation of the system, specifically the extent to which the CWIS supported their needs in four TTF dimensions. CWIS evaluations, even those not based on TTF theory, may benefit by including a measure of CWIS experience. Without it, the evaluator has no way of knowing how much of the evaluation results are due to workers' experience versus something unique to the CWIS. However, this study is a preliminary investigation into the measurement of TTF for caseworkers using CWIS. As with any process of developing an instrument, replication studies are needed to further refine the scales and address the measurement issues and limitations unique to this one study.

Limitations

In recommending this instrument and its scales to researchers, a few points of caution are appropriate. First, the items were developed from workers using a specific CWIS (Virginia's), working in a particular organizational context (Virginia's Department of Social Services). Another group of caseworkers with different CWIS experiences may have generated different items and, consequently, different dimensions of TTF. Second, TTF items were generated from frontline workers who use the CWIS, instead of relying on subject-matter experts and the literature. Critics of concept mapping argue that items generated by non-experts reflect workers' *understanding* of the domain, but not necessarily their knowledge of it (Albert & Steiner, 2005). Consequently, the TTF instrument produced in this study may not represent all facets of TTF. Both of these limitations may affect the content and external validity of the TTF construct and scales developed in this study. Given the diversity of CWIS systems in existence and the diversity of users, developing a single TTF instrument that generalizes to any CWIS is a challenging task that will require additional scale development and several replication studies.

Conclusion

Despite the central role CWIS play in caseworkers' lives, there is a scarcity of reliable tools to measure the extent to which these systems do – and do not – meet workers' needs. This study was the first to apply principles from TTF to the evaluation of CWIS, and in doing so identified four critical needs that a CWIS must address and established reliable scales that can measure if those needs are being met. The study showed how qualitative feedback from workers can be supplemented with quantitative techniques to develop an instrument that is face valid and methodologically rigorous. An instrument with these qualities increases the odds that we accurately measure what we think we are measuring, and does so in a way that allows evaluators to understand more precisely where and for whom the CWIS is failing so they make targeted improvements. As computing continues to proliferate in child welfare and agencies experiment with new, more innovative technologies, rigorous evaluation tools will become even more critical. Without solid evaluations, we have little information to guide us in improving existing systems and developing new ones that truly support child welfare practice.

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APPENDICES

APPENDIX A

AIMS 1, 2, & 3 – DEMOGRAPHIC QUESTIONNAIRE

* Item taken or adapted from the 2004 National Study of Licensed Social Workers (Whitaker et al., 2006).
** Item taken or adapted from Seddon and Kiew's use question (1996).
*** Item taken or adapted from Dishaw and Strong's (2003) 3-item Tool Experience scale.
**** Item taken or adapted from Gebauer and Tang's 3-Item Mobility Scale (2008, p. 338).

BACKGROUND

1. What is your gender? * ☐ Female ☐ Male

2. What is your age (in years)? * Age in years: _____

3. What is your race? *

    ☐ Asian/Pacific Islander
    ☐ Black/African-American
    ☐ Native American/Alaskan Native
    ☐ White
    ☐ Other (please specify): ___________________

4. What formal education programs have you *completed*? (Check all that apply.) *

    ☐ Bachelor's degree in social work (i.e., BSW)
    ☐ Other bachelor's degree
    ☐ Master's degree in social work (i.e., MSW)
    ☐ Other master's degree
    ☐ Doctoral degree in social work (i.e., DSW)
    ☐ Other doctoral degree
    ☐ Other (please specify): __________________________

SOCIAL WORK PRACTICE

5. Do you hold a social work license in Virginia? ☐ Yes ☐ No

6. Approximately how many years have you worked for your current agency?

    Years ____ Months ____

7. In what area(s) of child welfare to you *primarily* work? (Check all that apply.)

    ☐ CPS ☐ Foster Care ☐ Adoption ☐ Other (please specify): ___________________

8. Approximately how many years have you worked in this area(s) of child welfare (not just in your current position, but in your entire career)?

    Years ____ Months ____

9. In a typical month, what is the approximate size of your caseload? * ___________________

OASIS

10. Approximately how long have you been using OASIS?

Years ____ Months ____

11. How frequently do you use OASIS for casework-related tasks? ***

None of the time	Hardly any of the time	A small part of time	About half of the time	A large part of the time	Most of the time	All of the time
☐	☐	☐	☐	☐	☐	☐

12. How much experience do you have with OASIS? ***

Very little experience	A little experience	Some experience	An average amount of experience	A fair bit of experience	A lot of experience	Very much experience
☐	☐	☐	☐	☐	☐	☐

13. Approximately what percent of your time do you spend on OASIS? **

Percent of your time ____

MOBILITY ****

To what extent do you agree or disagree with the following statements?:

14. I frequently perform my job outside of a standard office environment.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

15. I frequently work away from an office environment for long periods of time.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

16. I am frequently in places that are far away from my office due to work-related travel.

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

SERVICES TO CLIENTS

17. *In a typical month*, what percent of time do you spend on the following casework-related tasks?

Task	0%	1-20%	21-40%	41-60%	61-80%	81+%
Intake *(screening and accepting reports of child*	☐	☐	☐	☐	☐	☐

abuse and neglect)						
Investigations *(determining if child abuse and neglect occurred)*	☐	☐	☐	☐	☐	☐
Family Assessments *(assessing family strengths and needs)*	☐	☐	☐	☐	☐	☐
Risk and Safety Assessments *(evaluating a child's safety and risk)*	☐	☐	☐	☐	☐	☐
Case Planning *(developing case plans; identifying goals and outcomes)*	☐	☐	☐	☐	☐	☐
Service Provision *(arranging, providing, and coordinating delivery of services)*	☐	☐	☐	☐	☐	☐
Ongoing Case Monitoring, Evaluation, and Follow-Up	☐	☐	☐	☐	☐	☐
Case Closure	☐	☐	☐	☐	☐	☐
Administrative *(e.g., supervisory meetings, staff meetings)*	☐	☐	☐	☐	☐	☐
Court-Related Activities *(e.g., preparing reports, waiting in court, appearances)*	☐	☐	☐	☐	☐	☐
Training	☐	☐	☐	☐	☐	☐
Traveling *(time spent in vehicle carrying out tasks, such as going to and from visits, interviews, court, etc.)*	☐	☐	☐	☐	☐	☐
Other (please specify): ____________	☐	☐	☐	☐	☐	☐

APPENDIX B

AIM 1 – FOCUS GROUP TELEPHONE CONSENT SCRIPT

Hi, my name is Kurt Heisler and I am a faculty member at Eastern Virginia Medical School in Norfolk, Virginia. I'm working with Rita Katzman from the Department of Social Services on a research study involving OASIS.

Do you have a moment to talk?

[IF YES …]

The purpose of the study is to develop a survey tool that child welfare agencies can use to assess how well systems like OASIS meet caseworkers' needs. To start, I'm hoping to recruit 6 workers from [County #1] to participate in a 1 hour focus group. I will also be doing focus groups with 6 workers in [County #2] and 6 in [County #3]. Each worker who participates will get a $40 Amazon gift card.

The focus group is designed to generate ideas about what frontline workers need most from a system like OASIS, and then organize these ideas into a list. The plan is to later use this list to create questions for the survey tool we're developing.

Your participation is completely voluntary and you can leave the study at any time. Choosing to participate or not to participate will have no impact (positive or negative) on your relationship with supervisors. One risk of participating is someone in the group discussing what people said to others outside of the group, but I'm going to discuss with everyone the importance of confidentiality to discourage this from happening. You may not benefit directly from being in this study, but the results of the study may assist DSS in their efforts to improve OASIS. When I share the results with DSS, I won't use your name or any information that would make it possible for anyone to identify you. Although you will receive a $40 Amazon gift certificate for participating, you will not be compensated for time lost during work hours.

Do you think you would be interested in participating in this project?

[IF YES …]

Do you have any questions so far?

If you have any questions later on, you can call me or James Paulson, another researcher on this study, at 757-668-6436. All research with volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a participant in this study you may contact, anonymously if you wish, a member of the Institutional Review Board at Eastern Virginia Medical School at 757-

446-8423. Dr. Robert Williams, Associate Dean of the Office of Research Subjects' Protections for Eastern Virginia Medical School (EVMS), is available at that telephone number to answer any of your questions. In the event of injury resulting from this research study, EVMS provides no financial compensation plan or free medical care.

Do you agree to be in this study?

[IF YES ...]

I'm trying to schedule a time and place that is convenient for everyone. When would be convenient for you?

Month	Day	Time(s)
___________	_____	________
___________	_____	________
___________	_____	________
___________	_____	________

Once we settle on a time that is convenient for everyone, I will send out an email to confirm the place and time. Can I have your email? ________________________________.

Thank you. Again, my name is Kurt Heisler. If you have any questions in the meantime, feel free to give me a call. My number is 757-668-6499. Otherwise, you should expect an email from me soon with some suggested times and dates for the focus group.

Thank you.

CONSENT LOG				
Subject Name	**Date/Time of Phone Consent**	**Consenter Name**	**Consent Given? (Y) or (N)**	**Consent er Initials**

APPENDIX C

AIM 1 – FOCUS GROUP FACILITATOR SCRIPT

Introduction	**[HANDOUT GIFT CARDS and SURVEY]** Thank you for being here. My name is Kurt Heisler and I am a researcher at Eastern Virginia Medical School in Norfolk, Virginia. Assisting me today is Elise Wallace, also from EVMS. As I indicated on the phone, I'm working with Matt Wade and Rita Katzman from DSS on a research study involving OASIS. The purpose of the study is to develop a survey tool that child welfare agencies can use to assess how well systems like OASIS meet caseworkers' needs. To help develop this survey tool, I'm first doing focus groups with workers in different parts of Virginia, which is why I've invited you here today. I'd like to spend the next 50 minutes or so learning a little bit about what you do, how you use OASIS in your work, and about what you need from a system like OASIS. I'll be using the feedback you give me to help determine what to include in the survey tool we're developing. This is a research study so there are a few things I want to go over. First, I will treat all of your responses confidentially. Statements made by other group members should also be treated confidentially and should not be shared outside of this group. Also, your participation is completely voluntary. Although you have all shown interest in participating, you are free to leave the focus group at any time. As I said on the phone, I will share the results with DSS, but I won't use your name or any information that would make it possible for anyone to identify you. Does anyone have any questions before we get started? If you have any questions later on, you can call me or James Paulson, another researcher on this study, at 757-668-6436. All research with volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a participant in this study you may contact, anonymously if you wish, a member of the Institutional Review Board at Eastern Virginia Medical School at 757-446-8423. Dr. Robert Williams, Associate Dean of the Office of Research Subjects' Protections for Eastern Virginia Medical School (EVMS), is available at that telephone number to answer any of your questions. In the event of injury resulting from this research study, EVMS provides no financial compensation plan or free medical care. Okay. Let's get started.	**5 min.**	**1:00 – 1:05**
Survey	Now, I'd like you to take a few minutes to complete the survey in front of you. The surveys will help me learn how similar (or dissimilar) this group is to other groups who are participating, and to caseworkers in general.	**10 min.**	**1:05 – 1:15**

Review definition of casework	**[HANDOUT "CASEWORK TASKS"]** I'd like to first make sure we're on the same page when talking about "casework." This is a list of the major casework-related tasks that OASIS may or may not support. And some of these may be specific to certain areas of work, like CPS. Are there any major tasks or activities that you do that are not listed here? We're going to be referring back to this list later so I want to make sure it covers all the major aspects of casework.	**8 min.**	**1:15 – 1:23**
Discuss experience with OASIS in doing casework	Let's spend a few minutes talking about how you use OASIS in your day-to-day work. I'd also like to hear about how you use OASIS-related services. This might be things like IT support, OASIS training, user manuals, and so on. As you think about how you use OASIS, it may help to refer to the list of casework tasks. Who would like to start? PROMPTS: - What about training? - What about IT support, or the help desk? - What about reports? - What about the information *in* OASIS?	**8 min.**	**1:23 – 1:31**
Review Focus Statement	The survey tool we're developing will ask workers to indicate how well various aspects of their agency's information system and services meet their needs. But we need to know what those needs might be. This is the main goal of these focus groups: to identify the needs workers have when it comes to performing casework, needs which a system like OASIS should support. **[SHOW STATEMENT ON PROJECTOR]** To generate a list of needs, I've come up with this statement: *"Generate short statements that describe the kinds of things you need from OASIS and OASIS services when performing casework tasks."* Before we begin, does this statement make sense? Does anything need to be clarified? We can revise it if needed. PROMPT: *These are needs that, if OASIS supported, would help you do your job. Or needs that, if OASIS doesn't support, can inhibit how you can do your job.* *It may help to think about what works well with OASIS for your job. And what does not work well. The first represents needs that are being met, the second: needs that are not being met.*	**5 min.**	**1:31 – 1:36**

Respond to Focus Statement	Okay. I'd like everyone to brainstorm in response to this statement. Elise will be writing the statements on the screen so everyone can see the list of statements as they evolve. Here are a few things to keep in mind: Try to ensure that each statement addresses one idea or need at a time; Be as comprehensive as possible; try to think about what you need from OASIS for all different aspects of casework. The goal is to generate a set of statements that represents the entire range of workers' needs regarding OASIS and OASIS services in support of casework. [DISCOURAGE STATEMENTS THAT DESCRIBE DISCRETE FUNCTIONALITY AND TASKS, WHICH HAVE RELEVANCE TO ONLY ONE TYPE OF WORKER. INSTEAD, FOCUS ON THE UNDERLYING NEED FOR THESE TASKS.] [WITHHOLD CRITICSM OF OTHERS' STATEMENTS] PROMPT: - What about OASIS-related services? - The broader IT environment in which OASIS is used? - Other aspects of the IT and data environment which may inhibit or facilitate casework.	**20 min.**	**1:36 – 1:56**
Review items	Okay. Now that we have a long list. Let's review them once to see if any need to edited for clarity. Also, let's make sure we haven't overlook any key needs related to casework.	**4 min**	**1:56 – 2:00**
Close	Okay. Well that concludes the discussion for today. Thank you all for your help. Here is the contact information I mentioned at the beginning of the group. **[HAND OUT FOCUS GROUP INFORMATION SHEET]**		
Total			**60 min.**

APPENDIX D

AIM 1 – STATEMENTS GENERATED FROM FOCUS GROUPS

#	Statement
1	The way OASIS training is provided is adequate enough for my needs.
2	OASIS is compatible with other software programs (e.g., Word) that I need to use in my work.
3	Information needed for similar purposes is consolidated on one or a few screens.
4	It is easy to see when a case is waiting for someone's input or action (like a supervisor review, a request to another agency or person, etc.)
5	Sometimes I have to enter the same information multiple times in different screens and reports.
6	The size of text fields and text boxes correspond well to the amount of information I need to enter.
7	The ways to enter data in OASIS are sufficient for my needs.
8	My tasks are presented in a way that makes it easy to prioritize them.
9	Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.
10	My deadlines and due dates are easy to track in OASIS.
11	Sometimes it is difficult to access case details that I need because I don't have permission to view the case.
12	I can easily get information from other documents (e.g., external reports) into OASIS when I need them to be part of the record.
13	The search options in OASIS are sufficient for my needs.
14	OASIS makes tracking deadlines easy by automatically calculating events like end dates and deadlines.
15	It is easy to reference or link non-OASIS documents and materials with the corresponding case in OASIS.
16	When I need to change information in OASIS I can do so without too much of a problem.
17	The OASIS training is specific enough for my purposes.
18	OASIS allows me to enter data to the level of detail that I think is important.
19	The screens and options in OASIS are for the most part relevant to my tasks.
20	I can get tech support quickly when I need it.
21	The data in OASIS is up-to-date enough for my purposes.
22	The information in OASIS is up-to-date enough for my purposes.
23	It is easy to get direct access to IT support.
24	Information that is essential to my work can be entered in OASIS.
25	Accomplishing tasks in OASIS is straightforward.
26	It is easy to see what I need to do before closing a case or moving it to the next level.
27	Sometimes it is difficult to view information on cases I need to read because the case is locked for one reason or another.
28	I like the data entry forms in OASIS.
29	It is easy to save data that I enter in OASIS so I can use it later.
30	OASIS streamlines the kind of documentation I need streamlined.
31	When OASIS gives me a list of choices, like in a drop down list or check boxes, the choices(s) I need to select are usually available.
32	If OASIS crashes while I'm working on it, I can count on not losing too much data.
33	I often have to enter the same exact information in multiple places.
34	It is easy to see in OASIS what tasks have higher priorities.
35	In OASIS it is easy to see how a person is connected to other people and other cases.
36	It is clear to me what fields/data are required and what fields/data are not.
37	It is easy to access information from other documents through OASIS.

38 OASIS's search feature(s) is easy to use.
39 I can enter information only once and count on OASIS to "populate it" as needed into other forms that ask for the same information.
40 The fields I see on OASIS screens are relevant to me and the data I need to enter.
41 When I need something printed out OASIS can automatically prefill a lot of the details using information that's already entered.
42 Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.
43 OASIS helps me structure and organize the information I enter.
44 It is easy to get access to case information that I need.
45 I can count on OASIS to be "up" and available when I need it.
46 The OASIS training I receive is adequate for my needs.
47 New information that I need to know about is clearly presented to me in OASIS.
48 It is easy to get IT support in a timely way.
49 When I need to, I can access OASIS no matter where I am (e.g., out in the field, on a laptop while traveling, etc.)
50 The role of supervisor approval in closing or editing a case is appropriate enough for my needs.
51 OASIS is compatible with other software programs I need to use in connection with OASIS (e.g. Word).
52 It is easy to view information connected to many records without having to "drill down" into each one.
53 Sometimes is it difficult or impossible to exchange data between OASIS and another program due to compatibility issues.
54 OASIS keeps me informed of new information and assignments that I need to be aware of.
55 When I need to get information from written reports into OASIS, it is easy to upload or scan them in.
56 Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field.
57 I can easily upload and store important external documents in OASIS.
58 OASIS allows me to document enough information to track the progress of a case.
59 It is easy to delete information that I know no longer needs to be in OASIS.
60 OASIS helps me check that the data I enter are free of spelling and grammatical errors.
61 It is easy to get access to the information I need.
62 It is easy to access my case information in OASIS from any computer.
63 OASIS's search function is intuitive enough for my needs.
64 The definition and meaning of OASIS data fields related to my tasks are clear.
65 When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.
66 I can easily upload and store pictures and images related to the case in OASIS.
67 When I need to delete information in OASIS, I can do so without any problem.
68 OASIS is easy to use.
69 The fields for which I need to provide information are available in OASIS.
70 OASIS automatically pre-fills letters and forms with known information.
71 It is easy to see what has and still needs to be done for a particular case.
72 I can edit / update data when I need to.
73 It is easy to correct information in OASIS that needs to be corrected.
74 I often have to enter the same information multiple times because several fields often ask for the same kind of information.
75 I can access OASIS whenever I need to.
76 It is easy to delete data that is no longer relevant to my needs.
77 It is easy to find the screen or screens I need to use for most tasks.
78 Forms and reports that I start are easy to save for later.

79 I can enter information in OASIS at the level of detail that I think is needed.
80 Data that needs to be repeated elsewhere in the system is automatically populated.
81 OASIS is "temperamental."
82 Notifications about system updates and changes are presented to me in a concise way.
83 Entering data is straightforward and efficient for my purposes.
84 I can count on tech support having the knowledge to fix the issue I'm having.
85 It is easy to get access to the data that I need.
86 Sometimes it is difficult to "marry" paper files with OASIS.
87 Tracking the status of cases is easy in OASIS.
88 OASIS is too slow for my pace.
89 The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.
90 It is easy to print information in OASIS that I need to have on paper.
91 The OASIS training I receive is sufficient for my needs.
92 There is almost always a field or screen that corresponds to the information I need to enter.
93 It is easy to understand how to use a new screen or form that has been added to OASIS.
94 When OASIS logs me out I can count on the work I was doing to be saved.
95 Terms and definitions in OASIS are consistent with terms and definitions used in policy.
96 OASIS makes it easy to prioritize the work I need to do.
97 It is easy to change a case from one track or category to another without having to retype everything.
98 The kinds of reports and materials I need to prepare can be produced / printed from OASIS.
99 OASIS provides an effective way to remind me about things I need to track, like upcoming events or deadlines.
100 I can delete data when I need to.

APPENDIX E

AIM 2 – PRE-NOTIFICATION LETTER

[Date]

[Agency Address]

Dear [First Name] [Last Name]:

We are writing to ask for your help with an important study to help us learn more about what caseworkers need from OASIS. You are one of 48 caseworkers in Virginia who was randomly selected to participate in this study. We made sure to select a diverse group workers from both urban and rural areas in Virginia, and from CPS, foster care, and adoption.

In the next few days you will receive a request to participate in this project by completing a brief questionnaire and completing an online activity. We would like to do everything we can to make it easy and enjoyable for you to participate in the study. We are writing in advance because many people like to know ahead of time that they will be asked to participate in studies like this one.

To say thanks, you will receive a small token of appreciation with the request to participate. We hope you will take some time out of your busy schedule to help out. Most of all, we hope that you enjoy the questions and the opportunity to voice your thoughts and opinions about improving OASIS.

Best wishes,

[DSS Representative]
[DSS Representative Title, Address,
and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-580-2359
heislerkurt@gmail.com

APPENDIX F

AIM 2 – STUDY INVITATION LETTER

[Date]

[Agency Address]

Dear [First Name] [Last Name]:

We are writing to ask for your help in an important study being conducted to help us learn more about what caseworkers need from OASIS. The study is being led by Kurt Heisler, a researcher at the Division of Child Abuse Pediatrics in Eastern Virginia Medical School. He is a former social worker and has worked with us previously on a smaller study involving OASIS.

What is this Study About?

The purpose of this study is to develop a survey caseworkers can use to provide feedback about systems like OASIS. We plan to use this survey over time to identify what is and is not working with OASIS, and make more informed decisions about needed improvements.

You are one of 48 caseworkers in Virginia who was randomly selected to participate in this study. We made sure to select a diverse group of workers from both urban and rural areas in Virginia, and from CPS, foster care, and adoption.

What does this Study Involve?

- The first part involves filling out and returning the enclosed survey. The survey should take only about 10 minutes to complete. We included a self-addressed stamped envelope to make it easy to return.

- The second part involves completing an online activity. Just enter the web page address below in your internet browser, and follow the instructions included in this letter. The online activity will take about an hour, but you can save your progress and come back to it as needed.

Website:
http://www.conceptsystemsglobal.com/OASIS/sort/rate
Your Access Code: **555**

Participating in this study is your choice. Whether you participate will not affect your employment with your agency. The study director, Mr. Heisler, is the only one who will have access to your responses – they will not be shared with your supervisor, Matt Wade, or anyone else in the DSS.

The access code is used to remove you from the mailing list once you have completed the survey and online activity. The code is also on the back of the survey so we can connect workers' survey responses with the online responses, while protecting their anonymity. These access codes will be destroyed as soon as they are no longer needed, so that individual names can never be connected to the results in any way. The main risk involved in participating in this study is the unintended release of the information you provide. To protect against this, your responses will be stored securely and confidentially. This study has been reviewed and approved by the Eastern Virginia Medical School Institutional Review Board (IRB). If you have any questions pertaining to your rights as a research subject, you may contact a member of the IRB through the IRB office at (757) 446-8423. If you have any questions about the project, please contact the study director, Kurt Heisler, at 757-580-2359 or by email at heislerkurt@gmail.com.

We are enclosing a small token of appreciation as a way of saying thank you for helping in this important project. We hope you enjoy participating in this project and the opportunity to improve OASIS.

Many Thanks,

[DSS Representative]
[DSS Representative Title, Address, and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-668-6499
heislekw@evms.edu

APPENDIX G

AIM 2 – FOLLOW-UP REMINDER # 1

[Date]
[Agency Address]

STATUS	
Survey Returned	«CompleteSurvey»
Sorting Activity (online)	«CompleteSort»
Rating Activity (online)	«CompleteRate»

Dear [First Name] [Last Name]:

We recently sent you a packet and $5 bill asking you to complete a brief survey and online activity as a user of OASIS. We are still hoping to get your feedback on the above items marked "pending." Your responses are important and will help us improve OASIS and the related services we provide.

The survey is short (about 10 minutes) and the online activities can be done at your own pace. If you have not yet completed all three activities, we encourage you to take a few moments to do so.

If you need the survey re-sent to you, please contact Kurt Heisler and he will send one right away. For the online activity, please type the link below into your Internet browser, and then follow the online instructions. You will need your Access code so keep it handy.

Website: **http://www.conceptsystemsglobal.com/OASIS/sort/rate**
Your Access Code: **555**

Your response is very important to us. Getting direct feedback from caseworkers like you is crucial in improving OASIS so it can better support our workers. Thank you in advance for your help.

Sincerely,

[DSS Representative]
[DSS Representative Title, Address, and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-668-6499
heislekw@evms.edu

APPENDIX H

AIM 2 – FOLLOW-UP REMINDER # 2

[Date]

[Agency Address]

STATUS	
Survey Returned	**Completed (Thank You!)**
Sorting Activity (online)	**Pending**
Rating Activity (online)	**Pending**

Dear [First Name] [Last Name]:

Fall is a busy time for caseworkers, and we understand how valuable your spare time is during this season. We are still hoping you may be able to give a few minutes of your time to help us develop a survey to evaluate how well OASIS meets workers' needs.

If you have already completed the survey and online activity, we really appreciate your participation. If you have not yet responded, we still very much welcome your feedback. We plan to end this study in a couple of weeks, so we wanted to contact everyone who has not responded to make sure you had a chance to participate.

If we have not received your questionnaire, another copy is enclosed. Please return it using the self-addressed stamped envelope. If you have not completed the online activity, please enter the URL below into your Internet browser, and follow the instructions included in this letter.

Website:
http://www.conceptsystemsglobal.com/OASIS/sort/rate
Your Access Code: **555**

Thank you in advance for your participation. Your responses are important! Caseworkers are the best source of information to help improve OASIS.

Sincerely,

[DSS Representative]
[DSS Representative Title, Address, and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-668-6499
heislekw@evms.edu

APPENDIX I

AIM 2 – INFORMED CONSENT PAGE

Thank you for your assistance with this OASIS project.

You are one of 48 caseworkers in Virginia who was randomly selected to participate. We made sure to select a diverse group workers from both urban and rural areas in Virginia, and from CPS, foster care, and adoption.

The purpose of this project is to develop a survey tool caseworkers can use to provide feedback about systems like OASIS. We started by asking several of your fellow caseworkers to discuss what they need from OASIS and related services (e.g., tech support, training) when performing casework. They came up with a list of statements that reflect their needs.

We would now like your feedback about this list of statements. Instructions will appear in each section. Your invitation letter provides some more details about this study, as well.

If you have any questions, my name and contact information are below (and also on your letter). Please don't hesitate to contact me at any point if you have questions. Confidentiality is very important to me and to this project. Your responses will not be shared with your supervisor, Matt Wade, or anyone else at Virginia DSS.

Your participation is voluntary and whether you participate will not affect your employment with your agency.

If you would like to assist in this project, please select "Agree" to continue. Thank you in advance for any assistance you can provide.

Kurt Heisler, M.S., M.P.H.
Instructor, Eastern Virginia Medical School
Division of Child Abuse Pediatrics
757-580-2359
heislerkurt@gmail.com

APPENDIX J

AIM 2 – SORTING INSTRUCTIONS

INSTRUCTIONS: On the left is a list of statements that several of your fellow caseworkers made when asked to respond to the following prompt:

> *"Generate short statements that describe the kinds of things you need from OASIS and OASIS services (e.g., training, tech support, etc.) when performing casework."*

In this activity, you are asked to categorize the statements, according to your view of their meaning or theme. To do this, you will sort each statement into piles in a way that makes sense to you.

1. First, read through the statements in the Unsorted Statements column on the left.

2. Next, sort each statement into a pile you create. (By dragging and dropping them with your mouse into the white area.) Group the statements for how similar in meaning or theme they are to one another. Give each pile a name that describes its theme or contents (you can always change this name later).

There are only two rules to keep in mind:

1. Do **NOT** create piles according to priority, or value, such as 'Important' or 'Hard To Do.' The piles should be based on the *underlying need or issue* the statement addresses.

2. Do **NOT** create piles such as 'Miscellaneous' or 'Other' that group together dissimilar statements. Put a statement alone in its own pile if it is unrelated to all the other statements. Make sure every statement is put somewhere. Do not leave any statements in the Unsorted Statements column.

People vary in how many piles they create. Usually 8 to 20 piles works well to organize this number of statements.

I've created a brief video of this sorting task. If you are unsure of what to do, please check out the brief video here: www.screencast.com/t/gJfVbr1vER.

APPENDIX K

AIM 2 – RATING INSTRUCTIONS

The purpose of this project is to develop a survey to assess how well OASIS and related services (e.g., training, tech support) meet the needs of caseworkers when performing case work. Below is a list of statements that may reflect some of all of these needs. (These are the same statements that you sorted into groups in the previous task.)

QUESTION: In your opinion, how important or unimportant is each statement when it comes to measuring how well OASIS and related services (e.g., training, tech support) meet caseworkers' needs?

Rate each statement on a 1 to 5 scale, where:

1 = Relatively unimportant

2 = Somewhat unimportant

3 = Moderately important

4 = Very important

5 = Extremely important

APPENDIX L

AIM 3 – OASIS SURVEY

* Item taken or adapted from the 2004 National Study of Licensed Social Workers (Whitaker et al., 2006).
** Item taken or adapted from Seddon and Kiew's use question (1996).
*** Item taken or adapted from Dishaw and Strong's (2003) 3-item Tool Experience scale.
**** Item taken or adapted from Gebauer and Tang's 3-Item Mobility Scale (2008, p. 338).

BACKGROUND

What is your gender? * ☐ Female ☐ Male
What is your age (in years)? * Age in years: _____
What is your ethnicity? ☐ Hispanic or Latino ☐ Not Hispanic or Latino
What is your race? *
- ☐ Asian/Pacific Islander
- ☐ Black/African-American
- ☐ Native American/Alaskan Native
- ☐ White
- ☐ Other (please specify): ____________________

What formal education programs have you *completed*? (Check all that apply.) *
- ☐ Bachelor's degree in social work (i.e., BSW)
- ☐ Other bachelor's degree
- ☐ Master's degree in social work (i.e., MSW)
- ☐ Other master's degree
- ☐ Doctoral degree in social work (i.e., DSW)
- ☐ Other doctoral degree
- ☐ Other (please specify): ___________________________

SOCIAL WORK PRACTICE

Do you hold a social work license in Virginia? ☐ Yes ☐ No
Approximately how many years have you worked for your current agency?
Years ____ Months ____
In what area(s) of child welfare to you *primarily* work? (Check all that apply.)
☐ CPS ☐ Foster Care ☐ Adoption ☐ Other (please specify): ____________________
Approximately how many years have you worked in this area(s) of child welfare (not just in your current position, but in your entire career)?
Years ____ Months ____
In a typical month, what is the approximate size of your caseload? * ____________________

OASIS EXPERIENCE

Approximately how long have you been using OASIS?
Years ____ Months ____
How frequently do you use OASIS for casework-related tasks? ***

None of the time	Hardly any of the time	A small part of time	About half of the time	A large part of the time	Most of the time	All of the time
☐	☐	☐	☐	☐	☐	☐

How much experience do you have with OASIS? ***

Very little experience	A little experience	Some experience	An average amount of experience	A fair bit of experience	A lot of experience	Very much experience
☐	☐	☐	☐	☐	☐	☐

Approximately what percent of your time do you spend on OASIS? **

Percent of your time ____

NATURE OF WORK

To what extent do you agree or disagree with the following statements?

[*Note.* The following 17 questions were randomly ordered and presented as one block of questions. For clarity here, however, they are grouped according to the scale/construct they are designed to measure. The response scale included 7-points: Strongly Disagree, Disagree, Slightly Disagree, Neither Agree nor Disagree, Slightly Agree, Agree, Strongly Agree.]

Mobility
I frequently perform my job outside of a standard office environment.
I frequently work away from an office environment for long periods of time.
I am frequently in places that are far away from my office due to work-related travel.
Work Compatibility
Using OASIS is compatible with all aspects of my work.
I think that using OASIS fits well with the way I like to work.
Using OASIS fits into my work style.
Task Difficulty
I frequently deal with ill-defined case management problems.
I frequently deal with ad-hoc, non-routine case management problems.
Frequently the case management problems I work on involve answering questions that have never been asked in quite that form before.
Task Interdependence
The problems I deal with frequently involve more than one case management function.
The problems I deal with frequently involve more than one office, group of people, agency, organization, etc.
Individual Performance
Using OASIS enables me to accomplish my tasks more quickly.
Using OASIS improves my job performance.
Using OASIS increases my productivity.
Using OASIS enhances my effectiveness in the job.
Using OASIS makes it easier to do my job.
Overall, I find OASIS useful to my job.

OPINIONS ABOUT OASIS

To what extent do you agree or disagree with the following statements?
[*Note.* The following 66 TTF questions were randomly ordered and presented in the order shown below. The response scale included 7-points: Strongly Disagree, Disagree, Slightly Disagree, Neither Agree nor Disagree, Slightly Agree, Agree, Strongly Agree.]

Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.
Tracking the status of deadlines, due dates, and other time sensitive items is easy in OASIS.
When I need to exchange data between OASIS and another program, it is difficult or impossible.
OASIS is "temperamental."

OASIS allows me to document enough information to track the progress of a case.
When I need to change information in OASIS I can do so without too much of a problem.
OASIS keeps me informed of new information and assignments that I need to be aware of.
I can count on OASIS to be "up" and available when I need it.
The screens and options in OASIS are for the most part relevant to my tasks.
OASIS is easy to use.
I like the data entry forms in OASIS.
Accomplishing tasks in OASIS is straightforward.
Sometimes it is difficult to view or access information I need because it is inaccessible for one reason or another.
In OASIS it is easy to see how a person is connected to other people and other cases.
The definition or meaning of data fields related to my tasks are clear.
Sometimes I have to enter the same information multiple times in different places.
I can enter information in OASIS at the level of detail that I think is needed.
Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field.
It is easy to get access to the information I need.
If OASIS crashes while I'm working on it, I can count on not losing too much data.
The information in OASIS is up-to-date enough for my purposes.
Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.
The OASIS training is specific enough for my purposes.
It is easy to find data that I need to locate.
OASIS streamlines the kind of documentation I need streamlined.
I can count on tech support having the knowledge to fix the issue I'm having.
OASIS helps me check that the data I enter are free of spelling and grammatical errors.
The ability to make changes to data in OASIS is adequate for my needs.
The fields and items for which I need to provide information are available in OASIS.
It is easy to understand how to use a new screen or form that has been added to OASIS.
It is easy to find the screen or screens I need to use for most tasks.
It is clear to me what fields/data are required and what fields/data are not.
It is easy to access my case information in OASIS from any computer.
When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.
It is easy to delete data that is no longer relevant to my needs.
The size of text fields and text boxes correspond well to the amount of information I need to enter.
The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.
The ways to find information in OASIS is intuitive enough for my needs.
It is easy to get IT support in a timely way.
The OASIS training I receive is sufficient for my needs.
Reports and other information I need from OASIS are provided in an efficient way.
It is easy to see when a case I am involved in is waiting for or needs someone's input or action.
When I need to get information from other sources or documents into OASIS it is easy enough to do.
It is easy to get direct access to IT support.
It is easy to correct information in OASIS that needs to be corrected.
It is easy to save data that I enter in OASIS so I can use it later.
OASIS is too slow for my pace.
It is easy to see what has and still needs to be done for a particular case.
The ways to search for or find data in OASIS are sufficient for my needs.
It is easy to view information connected to many records without having to "drill down" into each one.
The kinds of reports and output I need from OASIS are available to me in a useful format.
My tasks are presented in a way that makes it easy to prioritize them.
OASIS helps me structure and organize the information I enter.
The data in OASIS is up-to-date enough for my purposes.

Entering data is straightforward and efficient for my purposes.
Information needed for similar purposes is consolidated on one or a few screens.
New information that I need to know about is clearly presented to me in OASIS.
OASIS is compatible with other software programs that I need to use in my work.
When I need to, I can access OASIS no matter where I am (e.g., out in the field, at home, while traveling, etc.)
Tasks that I start but don't finish in OASIS are easy to save and resume later.
Terms and definitions in OASIS are consistent with terms and definitions used in policy.
Information that is essential to my work can be entered in OASIS.
OASIS makes it easy to prioritize the work I need to do.
I can edit / update data when I need to.
Notifications about system updates and changes are presented to me in a concise way.
When OASIS logs me out I can count on the work I was doing to be saved.

CASEWORK TASKS

In a typical month, what percent of time do you spend on the following casework-related tasks?

Task	0%	1-20%	21-40%	41-60%	61-80%	81+%
Intake *(screening and accepting reports of child abuse and neglect)*	☐	☐	☐	☐	☐	☐
Investigations *(determining if child abuse and neglect occurred)*	☐	☐	☐	☐	☐	☐
Family Assessments *(assessing family strengths and needs)*	☐	☐	☐	☐	☐	☐
Risk and Safety Assessments *(evaluating a child's safety and risk)*	☐	☐	☐	☐	☐	☐
Case Planning *(developing case plans; identifying goals and outcomes)*	☐	☐	☐	☐	☐	☐
Service Provision *(arranging, providing, and coordinating delivery of services)*	☐	☐	☐	☐	☐	☐
Ongoing Case Monitoring, Evaluation, and Follow-Up	☐	☐	☐	☐	☐	☐
Case Closure	☐	☐	☐	☐	☐	☐
Administrative *(e.g., supervisory meetings, staff meetings)*	☐	☐	☐	☐	☐	☐
Court-Related Activities *(e.g., preparing reports, waiting in court, appearances)*	☐	☐	☐	☐	☐	☐
Training	☐	☐	☐	☐	☐	☐
Traveling *(time spent in vehicle carrying out tasks, such as going to and from visits, interviews, court, etc.)*	☐	☐	☐	☐	☐	☐
Other (please specify): ______________						

APPENDIX M

AIM 3 – PRE-NOTIFICATION LETTER

[Date]

[Agency Address]

Dear [First Name] [Last Name]:

We are writing to ask for your help with an important study to help us learn more about what caseworkers need from OASIS. You are one of 500 caseworkers in Virginia who was randomly selected to participate in this study. We made sure to select a diverse group of workers from both urban and rural areas in Virginia, and from CPS, foster care, and adoption.

In the next few days you will receive a request to participate in this project by completing a brief survey. We would like to do everything we can to make it easy and enjoyable for you to participate. We are writing in advance because many people like to know ahead of time that they will be asked to participate in studies like this one.

To say thanks, you will receive a small token of appreciation with the request to participate. We hope you will take some time out of your busy schedule to help out. Most of all, we hope that you enjoy the questions and the opportunity to voice your thoughts and opinions about improving OASIS.

Best wishes,

[DSS Representative]
[DSS Representative Title, Address,
and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-580-2359
heislerkurt@gmail.com

APPENDIX N

AIM 3 – STUDY INVITATION LETTER

[Date]

[Agency Address]

Dear [First Name] [Last Name]:

We are writing to ask for your help in an important study being conducted to help us learn more about what caseworkers need from OASIS. The study is being led by Kurt Heisler, a researcher at the Division of Child Abuse Pediatrics in Eastern Virginia Medical School. He is a former social worker and has worked with us previously on a smaller study involving OASIS.

What is this Study About?

The purpose of this study is to develop a tool caseworkers can use to provide feedback about systems like OASIS. We plan to use this tool to identify what is and is not working with OASIS, and make more informed decisions about needed improvements.

You are one of 500 caseworkers in Virginia who was randomly selected to participate in this study. We made sure to select a diverse group of workers from both urban and rural areas in Virginia, and from CPS, foster care, and adoption.

What does this Study Involve?

This study involves completing a survey. To complete the survey enter the web page address below in your internet browser, then enter your access code to begin. The survey will take about 30 minutes to complete.

https://www.surveymonkey.com/s/VAOASIS

Your Access Code: **555**

Participating in this study is your choice. Whether you participate will not affect your employment with your agency. The study director, Mr. Heisler, is the only one who will have access to your responses – they will not be shared with your supervisor, Alex Kamberis, or anyone else in the DSS.

The access code is used to remove you from the mailing list once you have completed the survey. These access codes will be destroyed as soon as they are no longer needed, so that individual names can never be connected to the results in any way. The main risk involved in participating in this study is the unintended release of the information you provide. To protect against this, your responses will be stored securely and confidentially. This study has been reviewed and approved by the Old Dominion University Institutional Review Board (IRB). If you have any questions about any aspect of this study, please contact the study director, Kurt Heisler, at 757-580-2359 or by email at heislerkurt@gmail.com.

We are enclosing a small token of appreciation as a way of saying thank you for helping in this important project. We hope you enjoy participating in this project and the opportunity to improve OASIS.

Many Thanks,

[DSS Representative]
[DSS Representative Title, Address, and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-668-6499
heislekw@evms.edu

APPENDIX O

AIM 3 – FOLLOW-UP REMINDER # 1

[Date]

[Agency Address]

Dear [First Name] [Last Name]:

We recently sent you a letter and $1 bill asking you to complete a brief survey as an OASIS user.
If you have already responded, thank you for your response and please disregard this letter.

If you have not responded, we are still hoping to get your feedback. Your responses are important and will help us improve OASIS and the related services we provide.

To complete the survey, simply enter the web page address below in your internet browser, then enter your access code to begin. The survey will take about 30 minutes to complete.

https://www.surveymonkey.com/s/VAOASIS

Your Access Code: **555**

Your response is very important to us. Getting direct feedback from caseworkers like you is crucial in improving OASIS so it can better support our workers. Thank you in advance for your help.

Sincerely,

[DSS Representative]
[DSS Representative Title, Address, and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-668-6499
heislekw@evms.edu

APPENDIX P

AIM 3 – FOLLOW-UP REMINDER # 2

[Date]

[Agency Address]

Dear [First Name] [Last Name]:

Spring is a busy time for caseworkers, and we understand how valuable your spare time is during this season. We are still hoping you may be able to give a few minutes of your time to help us with a survey to evaluate how well OASIS meets workers' needs.

If you have already completed the survey, we really appreciate your participation. If you have not yet responded, we still very much welcome your feedback. We plan to end this study in a couple of weeks, so we wanted to contact everyone who has not responded to make sure you had a chance to participate.

To complete the survey simply enter the web page address below in your internet browser, then enter your access code to begin. The survey will take about 30 minutes to complete.

https://www.surveymonkey.com/s/VAOASIS

Your Access Code: **555**

Thank you in advance for your participation. Your responses are important! Caseworkers are the best source of information to help improve OASIS.

Sincerely,

[DSS Representative]
[DSS Representative Title, Address, and Contact Information]

Kurt Heisler, M.S., M.P.H.
Division of Child Abuse Pediatrics
Eastern Virginia Medical School
757-668-6499
heislekw@evms.edu

APPENDIX Q

AIM 3 – MULTIDIMENSIONAL SCALING POINT MAP OF STATEMENTS

The figure below shows the point map created the MDS analysis. Statements (represented by points) that are closer together were sorted together more frequently and therefore judged to be more similar. As an illustration, Statements 84, 23, and 48 (the three somewhat indistinguishable points on the far left of the map) are very close together, indicating that workers' frequently sorted them into the same pile.

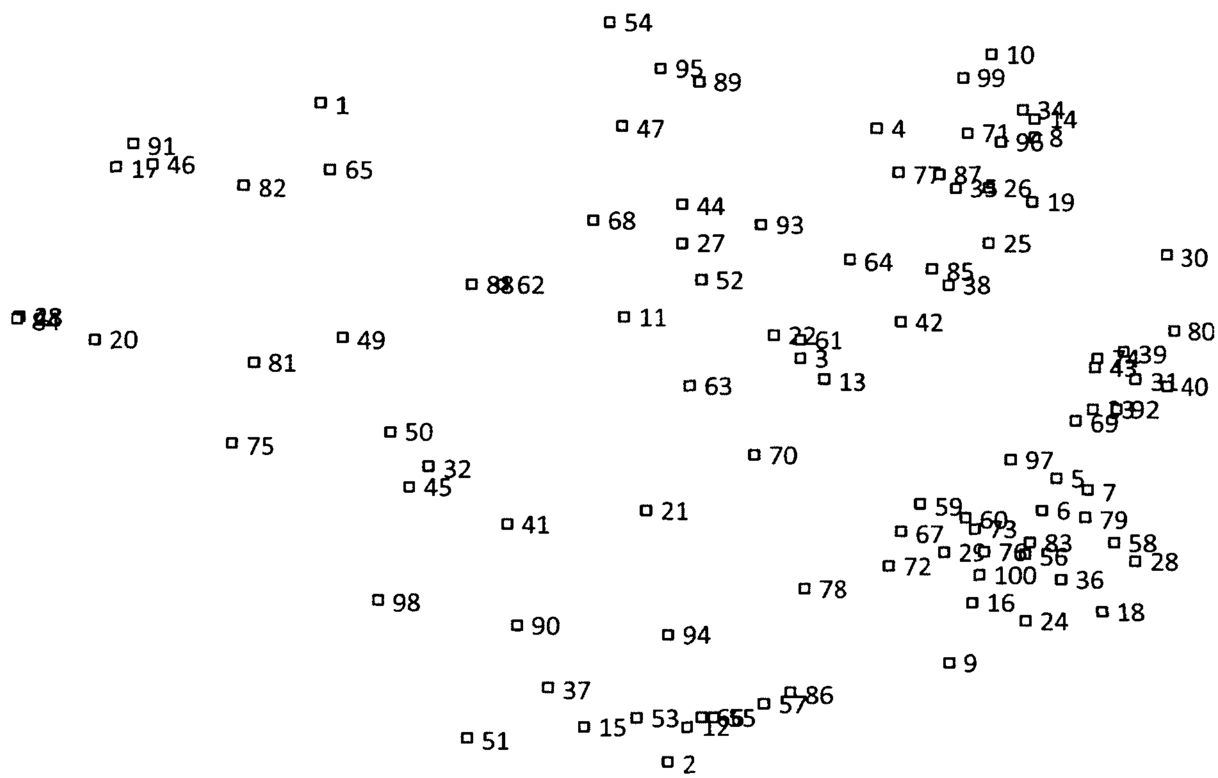

Figure 19. Aim 2 – Multidimensional Scaling Point Map of Statements.

APPENDIX R

AIM 3 – STATEMENTS SORTED BY BRIDGING VALUES

Table 65 lists from lowest to highest the bridging values for every statement. Statements with lower bridging values were sorted together more frequently (i.e., had more agreement among sorters); statements with higher values were difficult to sort and had less agreement. The table groups the statements by low, medium, and high bridging values using thresholds suggested by Baldwin, Kroesen, Trochim, and Bell (2004).

Table 65

Aim 2 – Statements Sorted by Bridging Values

ID#	Statement	Bridging Value
Low bridging values (≤ .24)		
84	I can count on tech support having the knowledge to fix the issue I'm having.	0.00
23	It is easy to get direct access to IT support.	0.02
48	It is easy to get IT support in a timely way.	0.02
6	The size of text fields and text boxes correspond well to the amount of information I need to enter.	0.10
76	It is easy to delete data that is no longer relevant to my needs.	0.10
83	Entering data is straightforward and efficient for my purposes.	0.11
73	It is easy to correct information in OASIS that needs to be corrected.	0.11
79	I can enter information in OASIS at the level of detail that I think is needed.	0.11
100	I can delete data when I need to.	0.12
7	The ways to enter data in OASIS are sufficient for my needs.	0.12
29	It is easy to save data that I enter in OASIS so I can use it later.	0.13
60	OASIS helps me check that the data I enter are free of spelling and grammatical errors.	0.13
56	Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field.	0.15
59	It is easy to delete information that I know no longer needs to be in OASIS.	0.15
97	It is easy to change a case from one track or category to another without having to retype everything.	0.16
5	Sometimes I have to enter the same information multiple times in different screens and reports.	0.16
16	When I need to change information in OASIS I can do so without too much of a	0.17

	problem.	
67	When I need to delete information in OASIS, I can do so without any problem.	0.17
18	OASIS allows me to enter data to the level of detail that I think is important.	0.19
91	The OASIS training I receive is sufficient for my needs.	0.20
33	I often have to enter the same exact information in multiple places.	0.21
69	The fields for which I need to provide information are available in OASIS.	0.21
17	The OASIS training is specific enough for my purposes.	0.22
13	The search options in OASIS are sufficient for my needs.	0.22
74	I often have to enter the same information multiple times because several fields often ask for the same kind of information.	0.23
42	Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.	0.23
92	There is almost always a field or screen that corresponds to the information I need to enter.	0.23
72	I can edit / update data when I need to.	0.23
61	It is easy to get access to the information I need.	0.24
36	It is clear to me what fields/data are required and what fields/data are not.	0.24
Medium bridging values (> .24 and < .54)		
38	OASIS's search feature(s) is easy to use.	0.25
3	Information needed for similar purposes is consolidated on one or a few screens.	0.25
39	I can enter information only once and count on OASIS to "populate it" as needed into other forms that ask for the same information.	0.26
26	It is easy to see what I need to do before closing a case or moving it to the next level.	0.26
58	OASIS allows me to document enough information to track the progress of a case.	0.26
35	In OASIS it is easy to see how a person is connected to other people and other cases.	0.27
31	When OASIS gives me a list of choices, like in a drop down list or check boxes, the choices(s) I need to select are usually available.	0.27
43	OASIS helps me structure and organize the information I enter.	0.27
85	It is easy to get access to the data that I need.	0.27
24	Information that is essential to my work can be entered in OASIS.	0.28
8	My tasks are presented in a way that makes it easy to prioritize them.	0.29
77	It is easy to find the screen or screens I need to use for most tasks.	0.29
87	Tracking the status of cases is easy in OASIS.	0.30
78	Forms and reports that I start are easy to save for later.	0.30
96	OASIS makes it easy to prioritize the work I need to do.	0.31
25	Accomplishing tasks in OASIS is straightforward.	0.31
40	The fields I see on OASIS screens are relevant to me and the data I need to enter.	0.31
28	I like the data entry forms in OASIS.	0.32
71	It is easy to see what has and still needs to be done for a particular case.	0.33
70	OASIS automatically pre-fills letters and forms with known information.	0.34
63	OASIS's search function is intuitive enough for my needs.	0.34
57	I can easily upload and store important external documents in OASIS.	0.34
46	The OASIS training I receive is adequate for my needs.	0.35
52	It is easy to view information connected to many records without having to "drill down" into each one.	0.35
12	I can easily get information from other documents (e.g., external reports) into OASIS when I need them to be part of the record.	0.35
55	When I need to get information from written reports into OASIS, it is easy to upload or scan them in.	0.36
66	I can easily upload and store pictures and images related to the case in OASIS.	0.36

22	The information in OASIS is up-to-date enough for my purposes.	0.36
27	Sometimes it is difficult to view information on cases I need to read because the case is locked for one reason or another.	0.36
80	Data that needs to be repeated elsewhere in the system is automatically populated.	0.37
19	The screens and options in OASIS are for the most part relevant to my tasks.	0.38
9	Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.	0.39
11	Sometimes it is difficult to access case details that I need because I don't have permission to view the case.	0.39
64	The definition and meaning of OASIS data fields related to my tasks are clear.	0.39
14	OASIS makes tracking deadlines easy by automatically calculating events like end dates and deadlines.	0.40
34	It is easy to see in OASIS what tasks have higher priorities.	0.40
4	It is easy to see when a case is waiting for someone's input or action (like a supervisor review, a request to another agency or person, etc.)	0.41
44	It is easy to get access to case information that I need.	0.41
2	OASIS is compatible with other software programs (e.g., Word) that I need to use in my work.	0.43
93	It is easy to understand how to use a new screen or form that has been added to OASIS.	0.43
86	Sometimes it is difficult to "marry" paper files with OASIS.	0.43
99	OASIS provides an effective way to remind me about things I need to track, like upcoming events or deadlines.	0.45
20	I can get tech support quickly when I need it.	0.45
53	Sometimes is it difficult or impossible to exchange data between OASIS and another program due to compatibility issues.	0.46
30	OASIS streamlines the kind of documentation I need streamlined.	0.46
62	It is easy to access my case information in OASIS from any computer.	0.49
10	My deadlines and due dates are easy to track in OASIS.	0.51
94	When OASIS logs me out I can count on the work I was doing to be saved.	0.51
37	It is easy to access information from other documents through OASIS.	0.53
High bridging values (≥ .54 (Baldwin et al., 2004))		
21	The data in OASIS is up-to-date enough for my purposes.	0.54
88	OASIS is too slow for my pace.	0.56
49	When I need to, I can access OASIS no matter where I am (e.g., out in the field, on a laptop while traveling, etc.)	0.57
15	It is easy to reference or link non-OASIS documents and materials with the corresponding case in OASIS.	0.57
68	OASIS is easy to use.	0.58
1	The way OASIS training is provided is adequate enough for my needs.	0.61
89	The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.	0.61
47	New information that I need to know about is clearly presented to me in OASIS.	0.62
90	It is easy to print information in OASIS that I need to have on paper.	0.64
51	OASIS is compatible with other software programs I need to use in connection with OASIS (e.g. Word).	0.66
45	I can count on OASIS to be "up" and available when I need it.	0.68
65	When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.	0.68
32	If OASIS crashes while I'm working on it, I can count on not losing too much data.	0.68
41	When I need something printed out OASIS can automatically prefill a lot of the details using information that's already entered.	0.69
75	I can access OASIS whenever I need to.	0.70

81	OASIS is "temperamental."	0.71
82	Notifications about system updates and changes are presented to me in a concise way.	0.76
95	Terms and definitions in OASIS are consistent with terms and definitions used in policy.	0.81
54	OASIS keeps me informed of new information and assignments that I need to be aware of.	0.85
50	The role of supervisor approval in closing or editing a case is appropriate enough for my needs.	0.89
98	The kinds of reports and materials I need to prepare can be produced / printed from OASIS.	1.00

APPENDIX S

AIM 3 – 11-CLUSTER SOLUTION WITH CLUSTERS, ITEMS, AND DESCRIPTIVE STATISTICS

Clusters			Bridging Value	Rating Value
Cluster 1:	*Training and Support*	*Average*	*.47*	*3.74*
91	The OASIS training I receive is sufficient for my needs.		.20	3.82
17	The OASIS training is specific enough for my purposes.		.22	3.59
46	The OASIS training I receive is adequate for my needs.		.35	3.65
1	The way OASIS training is provided is adequate enough for my needs.		.61	3.35
65	When I'm not sure how to do something in OASIS, it is easy to find simple instructions to do it.		.68	4.24
82	Notifications about system updates and changes are presented to me in a concise way.		.76	3.76
Cluster 2:	*IT Assistance*	*Average*	*.12*	*4.15*
84	I can count on tech support having the knowledge to fix the issue I'm having.		.00	4.18
23	It is easy to get direct access to IT support.		.02	4.12
48	It is easy to get IT support in a timely way.		.02	4.06
20	I can get tech support quickly when I need it.		.45	4.24
Cluster 3:	*Data & Document Exchange*	*Average*	*.44*	*4.29*
78	Forms and reports that I start are easy to save for later.		.30	4.53
57	I can easily upload and store important external documents in OASIS.		.34	4.06
12	I can easily get information from other documents (e.g., external reports) into OASIS when I need them to be part of the record.		.35	4.41
55	When I need to get information from written reports into OASIS, it is easy to upload or scan them in.		.36	4.41
66	I can easily upload and store pictures and images related to the case in OASIS.		.36	4.24
2	OASIS is compatible with other software programs (e.g., Word) that I need to use in my work.		.43	4.65
86	Sometimes it is difficult to "marry" paper files with OASIS.		.43	3.76
53	Sometimes is it difficult or impossible to exchange data between OASIS and another program due to compatibility issues.		.46	4.12
94	When OASIS logs me out I can count on the work I was doing to be saved.		.51	4.59
37	It is easy to access information from other documents through OASIS.		.53	4.00
15	It is easy to reference or link non-OASIS documents and materials with the corresponding case in OASIS.		.57	4.12
51	OASIS is compatible with other software programs I need to use in connection with OASIS (e.g. Word).		.66	4.53
Cluster 4:	*Report Production*	*Average*	*.72*	*4.22*
21	The data in OASIS is up-to-date enough for my purposes.		.54	4.24
90	It is easy to print information in OASIS that I need to have on paper.		.64	4.29
41	When I need something printed out OASIS can automatically prefill a lot of the details using information that's already entered.		.69	4.18
98	The kinds of reports and materials I need to prepare can be produced / printed from OASIS.		1.00	4.18

Clusters			Bridging Value	Rating Value
Cluster 5: System Access & Reliability		*Average*	*.71*	*4.19*
49	When I need to, I can access OASIS no matter where I am (e.g., out in the field, on a laptop while traveling, etc.)		.57	4.06
45	I can count on OASIS to be "up" and available when I need it.		.68	4.59
32	If OASIS crashes while I'm working on it, I can count on not losing too much data.		.68	4.71
75	I can access OASIS whenever I need to.		.70	4.24
81	OASIS is "temperamental."		.71	3.65
50	The role of supervisor approval in closing or editing a case is appropriate enough for my needs.		.89	3.88
Cluster 6: Locating & Accessing Information		*Average*	*.29*	*4.12*
13	The search options in OASIS are sufficient for my needs.		.22	3.82
42	Certain kinds of information that I need to access are not available to me in OASIS for one reason or another.		.23	3.94
61	It is easy to get access to the information I need.		.24	4.59
38	OASIS's search feature(s) is easy to use.		.25	4.12
3	Information needed for similar purposes is consolidated on one or a few screens.		.25	4.35
85	It is easy to get access to the data that I need.		.27	4.29
70	OASIS automatically pre-fills letters and forms with known information.		.34	4.24
63	OASIS's search function is intuitive enough for my needs.		.34	3.53
22	The information in OASIS is up-to-date enough for my purposes.		.36	4.12
64	The definition and meaning of OASIS data fields related to my tasks are clear.		.39	4.18
Cluster 7: Viewing Information		*Average*	*.45*	*4.17*
52	It is easy to view information connected to many records without having to "drill down" into each one.		.35	4.41
27	Sometimes it is difficult to view information on cases I need to read because the case is locked for one reason or another.		.36	3.71
11	Sometimes it is difficult to access case details that I need because I don't have permission to view the case.		.39	3.82
44	It is easy to get access to case information that I need.		.41	4.35
93	It is easy to understand how to use a new screen or form that has been added to OASIS.		.43	4.24
62	It is easy to access my case information in OASIS from any computer.		.49	4.35
88	OASIS is too slow for my pace.		.56	3.94
68	OASIS is easy to use.		.58	4.53
Cluster 8: Miscellaneous#1		*Average*	*.72*	*4.24*
89	The meaning of buttons in OASIS (i.e., what they will do when I click them) is clear.		.61	4.29
47	New information that I need to know about is clearly presented to me in OASIS.		.62	3.88
95	Terms and definitions in OASIS are consistent with terms and definitions used in policy.		.81	4.59
54	OASIS keeps me informed of new information and assignments that I need to be aware of.		.85	4.18

Clusters			Bridging Value	Rating Value
Cluster 9: Case Tracking & Prioritizing		*Average*	*.35*	*4.07*
26	It is easy to see what I need to do before closing a case or moving it to the next level.		.26	4.12
35	In OASIS it is easy to see how a person is connected to other people and other cases.		.27	4.29
8	My tasks are presented in a way that makes it easy to prioritize them.		.29	3.94
77	It is easy to find the screen or screens I need to use for most tasks.		.29	4.35
87	Tracking the status of cases is easy in OASIS.		.30	3.94
96	OASIS makes it easy to prioritize the work I need to do.		.31	3.88
25	Accomplishing tasks in OASIS is straightforward.		.31	4.29
71	It is easy to see what has and still needs to be done for a particular case.		.33	4.06
19	The screens and options in OASIS are for the most part relevant to my tasks.		.38	4.24
14	OASIS makes tracking deadlines easy by automatically calculating events like end dates and deadlines.		.40	4.12
34	It is easy to see in OASIS what tasks have higher priorities.		.40	4.06
4	It is easy to see when a case is waiting for someone's input or action (like a supervisor review, a request to another agency or person, etc.)		.41	3.76
99	OASIS provides an effective way to remind me about things I need to track, like upcoming events or deadlines.		.45	3.82
10	My deadlines and due dates are easy to track in OASIS.		.51	4.06
Cluster 10: Entering & Editing Data		*Average*	*.18*	*4.18*
6	The size of text fields and text boxes correspond well to the amount of information I need to enter.		.10	3.88
76	It is easy to delete data that is no longer relevant to my needs.		.10	3.71
83	Entering data is straightforward and efficient for my purposes.		.11	4.53
73	It is easy to correct information in OASIS that needs to be corrected.		.11	4.12
79	I can enter information in OASIS at the level of detail that I think is needed.		.11	4.18
100	I can delete data when I need to.		.12	3.88
7	The ways to enter data in OASIS are sufficient for my needs.		.12	3.94
29	It is easy to save data that I enter in OASIS so I can use it later.		.13	4.53
60	OASIS helps me check that the data I enter are free of spelling and grammatical errors.		.13	4.24
56	Sometimes OASIS forces me to enter information that is fake or unsure just to move to another screen or field.		.15	4.12
59	It is easy to delete information that I know no longer needs to be in OASIS.		.15	3.76
97	It is easy to change a case from one track or category to another without having to retype everything.		.16	4.47
5	Sometimes I have to enter the same information multiple times in different screens and reports.		.16	4.24
16	When I need to change information in OASIS I can do so without too much of a problem.		.17	4.24
67	When I need to delete information in OASIS, I can do so without any problem.		.17	3.76
18	OASIS allows me to enter data to the level of detail that I think is important.		.19	4.24
72	I can edit / update data when I need to.		.23	4.71
36	It is clear to me what fields/data are required and what fields/data are not.		.24	4.24
58	OASIS allows me to document enough information to track the progress of a		.26	4.41

Clusters		Bridging Value	Rating Value
	case.		
24	Information that is essential to my work can be entered in OASIS.	.28	4.71
28	I like the data entry forms in OASIS.	.32	3.47
9	Data that I enter sometimes has to be reentered because it wasn't or couldn't be saved.	.39	4.53
Cluster 11: Miscellaneous #2 (Multiple themes related to data entry	*Average*	*.28*	*4.32*
33	I often have to enter the same exact information in multiple places.	.21	4.06
69	The fields for which I need to provide information are available in OASIS.	.21	4.47
74	I often have to enter the same information multiple times because several fields often ask for the same kind of information.	.23	4.35
92	There is almost always a field or screen that corresponds to the information I need to enter.	.23	4.29
39	I can enter information only once and count on OASIS to "populate it" as needed into other forms that ask for the same information.	.26	4.53
31	When OASIS gives me a list of choices, like in a drop down list or check boxes, the choices(s) I need to select are usually available.	.27	4.53
43	OASIS helps me structure and organize the information I enter.	.27	4.18
40	The fields I see on OASIS screens are relevant to me and the data I need to enter.	.31	4.24
80	Data that needs to be repeated elsewhere in the system is automatically populated.	.37	4.47
30	OASIS streamlines the kind of documentation I need streamlined.	.46	4.12

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Education

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Professional Experience

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