6. Advancing Task-Technology Fit Theory: A formative measurement approach to determining task-channel fit for electronic banking channels

Hartmut Hoehle
Victoria University of Wellington

Sid Huff
Victoria University of Wellington

Abstract

Since the advent of contingency theory in organisational research, the notion of 'fit' has continuously grown in importance. The fit concept is evident in a variety of theories in information systems (IS) research as well. In particular, task-technology fit (TTF) theory is recognised as an important development in IS theory. The incorporation of fit constructs into IS models has led to a need to develop reliable and valid methods for measuring fit. In this chapter, we extend TTF theory by proposing and developing a model and measurement approach for task-*channel* fit (a variation on the TTF concept, concerned with electronic banking channels). We thoroughly test our conceptualisation of fit using a series of focus group discussions. Following a parallel-instruments approach, we develop and test a survey instrument for assessing task-channel fit, wherein TCF is modelled as a formative measure. Data gathered from 280 respondents are used to rigorously test the measurement model. Analysis of the data supports the overall soundness of the proposed deviation-score measurement approach. Opportunities for applying this approach in future research are discussed.

Introduction

More than three decades ago, Peter Keen emphasised the need for a 'cumulative tradition' in information systems (IS) research. He suggested that a cumulative tradition requires IS researchers to 'build on each other's work' (Keen, 1980).

Since his call, much attention has been paid to theory development in IS research. Evermann and Tate (2009) noted that prominent instances of successful theory development include the DeLone and McLean (1992) information systems success model, the technology acceptance model (TAM) (Davis, 1989), as well as the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003).

Task-technology fit (TTF) theory is also seen as an important development in IS theory (Evermann and Tate, 2009; Goodhue and Thompson, 1995). TTF can be defined as 'the degree to which a technology assists an individual in performing his or her portfolio of tasks' (Goodhue and Thompson, 1995).

Since Goodhue and Thompson's seminal TTF article was published in *MIS Quarterly* in 1995, much research has investigated *fit conceptualisation and measurement* in research disciplines including organisational management (Edwards, 2001), marketing/IS (Jiang et al., 2002) and IS (Chan et al., 1997). Two approaches in particular—deviation-score analysis and parallel instruments—have been frequently used to quantify *fit* between two or more variables (Edwards, 2001; Klein et al., 2009). Deviation-score analysis has been described as a superior fit-assessment technique because 'fit is specified without reference to a criterion variable' (Venkatraman, 1989, p. 430).

Despite a substantial body of knowledge on task-technology fit, to date there have been no rigorous studies assessing TTF via parallel instruments using 'matching' approaches. In the spirit of *building on each other's work*, we propose using a parallel instrument in combination with deviation-score analysis to assess task-technology fit.

We first revisit Goodhue and Thompson's (1995) TTF theory and discuss fit theory and measurement. TTF theory is then applied to electronic banking channels such as ATMs, telephone banking, Internet banking and mobile banking. We term this variant of TTF *task-channel fit (TCF)*. Then we discuss the TCF conceptualisation and explain the instrument development. Afterwards we describe the research methodology and outline how we collected data. The findings are discussed and the chapter concludes by providing managerial and research implications of this study. Finally, directions for future research are suggested.

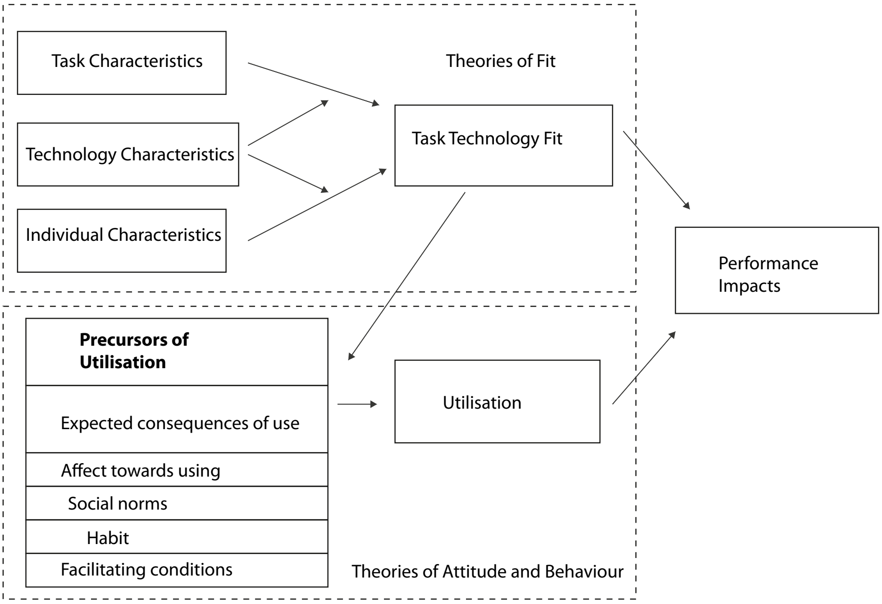

Figure 6.1 Task-to-Performance Chain

Source: Goodhue and Thompson (1995).

Literature Review

Goodhue and Thompson's Task-to-Performance Chain

In order to investigate the linkage between information technology (IT) and user performance, Goodhue and Thompson (1995) conceptualised a *task-to-performance chain* (TPC). This theoretical framework was based on two separate research streams: 1) the user adoption and acceptance research investigating user beliefs and attitudes to predict the utilisation of information systems (Bagozzi, 1982; Baroudi et al., 1986; Davis et al., 1989; Fishbein and Ajzen, 1975; Robey, 1979; Swanson, 1987); and 2) the 'fit focus' evident in research investigating the impact of data representation on the performance of individual IT users (Benbasat et al., 1986; Cooper and Zmud, 1990; Dickson et al., 1986; Jarvenpaa, 1989; Tornatzky and Klein, 1982; Vessey, 1991). Central to this framework was the task-technology fit construct (Goodhue and Thompson, 1995). Figure 6.1 displays the task-to-performance chain framework.

Starting from the left-hand side, the model theorised that task-technology fit is the correspondence between task requirements and individual abilities,

moderated by the functionality of the technology (Goodhue and Thompson, 1995). Task-technology fit was predicted to influence the 'precursors of utilisation' and also impact on the performance of the technology user. The conceptualised precursors of utilisation (including expected consequences of use, affect towards using, social norms, habit and facilitating conditions) in turn impacted on technology utilisation, which in turn affected user performance (Goodhue and Thompson, 1995).

The following section discusses literature related to task-to-performance chain/ task-technology fit.

Literature Researching TPC/TTF

Since its introduction, the TPC framework (or parts of it) and, in particular, the TTF construct have been used to study a diverse range of information systems in various contexts (D'Ambra and Wilson, 2004a, 2004b; Dishaw and Strong, 1999; Goodhue, 1998; Goodhue and Thompson, 1995; Karimi et al., 2004; Zigurs and Buckland, 1998; Zigurs et al., 1999).

Goodhue and Thompson (1995) tested a simplified TPC model investigating how TTF influences users in an organisational context. They found support for the hypothesised linkage between the TTF construct and users' performance but not for the causal relationship between the TTF variable and utilisation.

Ferratt and Vlahos (1998) investigated the fit between computer-based information systems (CBIS) and the needs of managers in their decision-making tasks. To measure the TTF, user evaluations of computer-based information systems were used to assess how these systems would support managers in their decision-making process.

Dishaw and Strong (1999) combined the TAM model with the TTF model and tested the extended version in an organisational use setting. The analyses showed that the extended model explained more variance than either TAM or TTF alone (Dishaw and Strong, 1999).

Klopping and McKinney (2004) treated consumer e-commerce as a technology-adoption process and evaluated the suitability of both TAM and TTF to understanding how and why people participate in electronic commerce. To better understand online shopping activity, this study tested a modified TAM model through a web-based survey of 263 undergraduate students (Klopping and McKinney, 2004). The results confirmed that a TTF construct was a valuable addition to the TAM model because the extended model explained more variance in the dependent variable.

Staples and Seddon (2004) tested the technology-to-performance chain in voluntary and mandatory use settings. The entire TPC research model (Goodhue and Thompson, 1995) was tested by surveying university staff (mandatory use) and students (voluntary use) regarding their usage of library services. In both settings, strong support was found for the impact of TCF on performance, as well as on attitudes and beliefs about use (Staples and Seddon, 2004).

While there are numerous other studies based on the TPC framework and the TTF construct, the above-mentioned examples illustrate their wide acceptance within the IS research discipline. Not surprisingly, TTF has even been referred to as 'one of the few prominent theories in our research discipline' (Evermann and Tate, 2009).

Our review of the literature on TPC/TTF indicates that task-technology fit measurement has been operationalised in a variety of different ways. The following section reviews 'fit theory' and discusses how the concept of 'fit' can be measured.

Fit Theory and Measurement

In a seminal article on fit assessment in strategy research, Venkatraman (1989) discussed six alternative measurement approaches for the concept of fit. This section discusses the approaches that are relevant to this study and briefly comments on literature using these techniques.

Fit as Moderation

According to the moderation perspective, the fit between the predictor and the moderator variable is the primary determinant of the criterion variable (Venkatraman, 1989). Figure 6.2 illustrates this conceptualisation of fit.

Mathematically, this can be represented as Equation 6.1.

Equation 6.1

$Z = f(X^*Y)$

In Equation 6.1, Z is the criterion variable, X is the moderator variable and Y is the predictor variable. Researchers applying this approach are assuming that the underlying theory 'specifies that the impact of the predictors (e.g. strategy) varies across the different levels of the moderator (e.g. environments)' (Venkatraman, 1989, p. 424). Moderation can be calculated with regression techniques or ANOVA interaction terms.

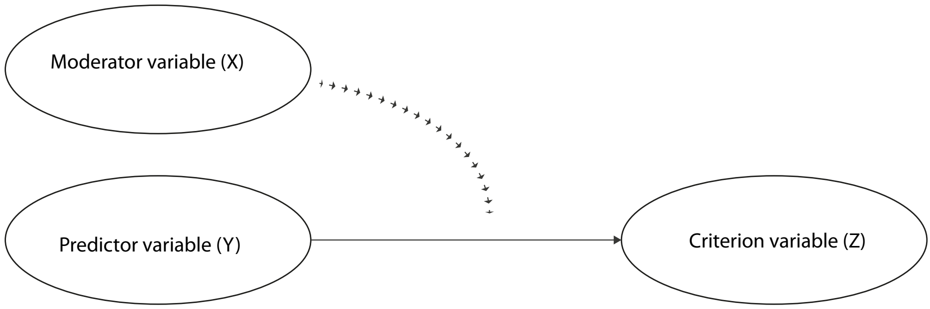

Figure 6.2 Fit as Moderation

Source: Venkatraman (1989).

Chan et al. (1997) applied the moderation approach to investigate IS strategic alignment between business strategic orientation and information systems strategic orientation. They developed a parallel instrument to assess the strategic orientation of business enterprises (STROBE) and the strategic orientation of the existing portfolio of IS applications (STROEPIS) (Chan et al., 1997). Both instruments tapped into eight distinctive strategic dimensions (aggressiveness, analysis, internal defensiveness, external defensiveness, futurity, proactiveness, risk aversion and innovativeness) and for each STROBE item a parallel STROEPIS measure was created. The following example illustrates two parallel items for a particular aspect of business strategic orientation.

Table 6.1 Parallel Items Used to Determine Strategic Alignment

STROBE	We are almost always searching for new business opportunities.
STROEPIS	The systems used in this business unit assist in the identification of new business opportunities.

Source: Chan et al. (1997).

Both items were measured using Likert scales with anchors 5 (strongly agree) to 1 (strongly disagree).

It was assumed that: 'STROEPIS moderated the relationship between STROBE and business performance. In a similar fashion, STROBE moderated the relationship between STROEPIS and IS effectiveness. It was the combination of, or synergy between, STROBE and STROEPIS rather than the difference between the two, that was most important' (Chan et al, 1997, p. 144). In order to calculate the moderation scores, STROBE*STROEPIS product terms were computed (Chan et al., 1997). The STROBE*STROEPIS fit scores were used to assess the structural aspects of the overall research model.

Moderation approaches have also been used to assess task-technology fit. For example, Goodhue (1995) investigated user evaluations of IS via task-technology fit. As part of the TTF model development, the author argued that 'the strength of the link between a system characteristic and user evaluations of it will depend upon how important that characteristic is, given the task demands and the capabilities of the user. This corresponds exactly to one of Venkatraman's categories of fit, fit as moderation' (Goodhue, 1995, p. 1834).

Similarly, Dishaw and Strong (1999) computed TTF by matching task characteristics and the supporting functionality of technology using the moderation (or interaction) approach. While not explained in detail, they argue that '[f]or the TTF model, task-technology fit is computed by matching characteristics of a maintenance task to supporting functionality in a software maintenance tool, using an interaction approach' (Dishaw and Strong, 1999).

Fit as Mediation

The fit as mediation perspective assumes the 'existence of a significant intervening mechanism (e.g. organisational structure) between an antecedent variable (e.g. strategy) and the consequent variable (e.g. performance)' (Venkatraman, 1989, p. 428). Fit as mediation can be represented visually as shown in Figure 6.3.

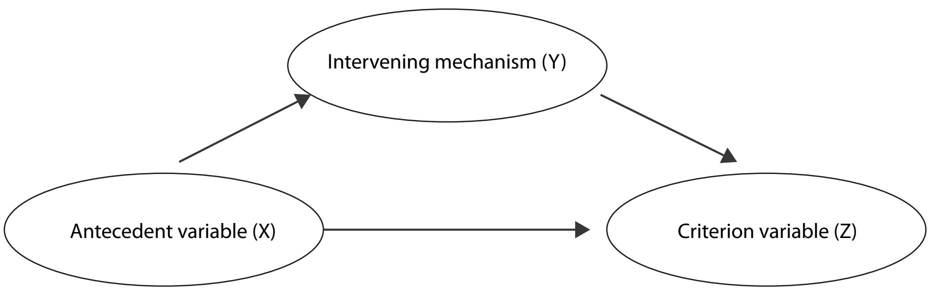

Figure 6.3 Fit as Mediation

Source: Venkatraman (1989).

As with moderation, this perspective is anchored with respect to a specific criterion variable; however, fit is viewed as indirect, making it less precise than the moderation perspective. The mediator variable (Y) accounts for a significant proportion of the relation between the predictor (X) and criterion variable (Z) (Venkatraman, 1989).

Thatcher (2001) studied the extent to which communication media and demographic diversity predict creativity. Identity-fit was predicted to mediate the relationships between the antecedents and creativity (Thatcher, 2001). The authors used hierarchical regression analyses to measure the mediation effects.

It should be noted that strategy researchers have traditionally embraced the moderation approach rather than using the mediation approach to assess fit (Venkatraman, 1989).

Fit as Matching

This perspective of fit suggests that fit is a theoretically defined match between two related variables (Venkatraman, 1989). Fit as matching is illustrated in Figure 6.4.

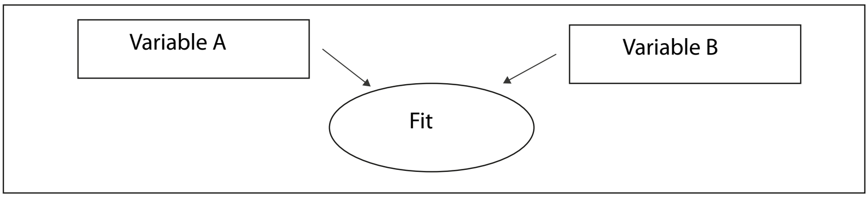

Figure 6.4 Fit as Matching

This approach is 'a major point of departure from fit as moderation and fit as mediation because fit is specified without reference to a criterion variable,' (Venkatraman, 1989, p. 430). Fit as matching can be operationalised using deviation-score analysis or regression residuals. The deviation-score analysis is based on the assumption that 'the absolute difference between the standardised scores of two variables indicates a lack of fit' (Venkatraman, 1989, p. 431).

This form of fit assessment has frequently been applied in organisational, marketing and IS research. Most commonly, this approach is operationalised via parallel instruments. Parallel instruments can be used to collect responses for variable A (see Figure 6.4) separately from variable B. By comparing the responses obtained for variable A and variable B, a fit score can be computed (Edwards, 2001; Klein et al., 2009).

For example, Jiang et al. (2002) applied the ServQual instrument to study service quality in an IS setting. The original ServQual instrument consisted of five distinct dimensions (tangibles, reliability, responsiveness, assurance and empathy) and can be defined as the gap (or fit) between consumer expectations and perceived delivery (Jiang et al., 2002; Zeithaml et al., 1990). To assess this gap, Jiang et al. (2002) obtained a sample of IS professionals and matched IS users. Each respondent group answered parallel questions regarding their service expectations and actual service quality perceptions. Using deviation-score analysis, the authors computed the fit between service expectations and actual experience. Service quality was measured 'by the gap score (G), where G is the difference between corresponding perception of delivered service (P) and expectation of service (E) for each item (G=P–E)' (Jiang et al., 2002, p. 146).

Fit as Gestalts

Venkatraman (1989) suggested conceptualising 'fit as gestalts' when more than two variables are used. Gestalts could be defined as 'the degree of internal coherence among a set of theoretical attributes' (Venkatraman, 1989, p. 432). Gestalts could be arrived at by cluster analysing data (Venkatraman, 1989). Only a few studies in the IS research literature were identified that applied the fit-as-Gestalts approach (Buttermann et al., 2008; Lefebvre et al., 1997). Since this form of fit does not apply to the current study (TTF/TCF does not involve a 'set of theoretical attributes'), it is not further discussed here.

Fit as Profile Deviation

From the profile deviation perspective, fit is 'the degree of adherence to an externally specified profile' (Venkatraman, 1989, p. 433). This perspective of fit differs from the Gestalt perspective in that the 'profile' is anchored to a specific criterion, such as performance (Venkatraman, 1989). Evaluating fit as profile deviation is particularly useful for testing the effects of environment–strategy co-alignment since multiple variables are involved. Using interaction terms or moderating effects of variables can become cumbersome and problematic when multiple variables are involved (Sabberwal and Chan, 2001). Fit as profile deviation can be operationalised using pattern analysis, as demonstrated in a business alignment study by Sabherwal and Chan (2001). Since fit as profile deviation does not apply to the current study, it is not further discussed here.

Fit as Co-Variation

When fit is conceptualised as co-variation, 'fit is a pattern of covariation or internal consistency among a set of underlying theoretically related variables' (Venkatraman, 1989, p. 435). Co-variation can be computed using either exploratory or confirmatory factor analysis. Fit as co-variation involves identifying several dimensions based on the scores along a set of chosen variables.

This form of fit assessment has frequently been used by researchers investigating IS, including studies of task-technology fit. For example, Goodhue and Thompson (1995) assembled 48 items representing aspects of the fit between the tasks users perform and the technologies they use to perform these tasks. Using exploratory factor analysis, the authors first excluded 14 items and collapsed the remaining TTF measures into eight unique factors (quality, locatability, authorisation, compatibility, product timeliness, ease of use, ease of training and relationship with users). They argued that each dimension would represent a unique part of the task-technology fit. Using regression techniques, these facets of fit were linked to other constructs within the research model (for example, utilisation and performance impacts).

Staples and Seddon (2004) also used a multifaceted measure to identify a TTF within the context of their study. They used four facets of TTF originally proposed by Goodhue and Thompson (work compatibility, ease of use, ease of learning and information quality). To test these dimensions, 12 questions (three questions per facet) were used. The authors modelled the TTF construct as a second-order factor, with each facet of TTF being a first-order factor that formed the second-order factor.

D'Ambra and Wilson (2004a) also used a multidimensional construct to model the fit between Web usage and personal travel planning and purchase of flight tickets. To evaluate the TTF construct, the authors developed multiple items that specified the TTF in the context of the study. Next, the authors collected data and factor analysed the TTF items. Several TTF dimensions (uncertainty reduction, fun/flow, mediation, control, information resounds and locatability of information) were identified and used as first-order constructs. Next, the authors used partial least squares (PLS) to assess the structural relationships between these first-order dimensions and utilisation/performance impacts (D'Ambra and Wilson, 2004a).

While not specifically discussed by Venkatraman (1989), 'direct' measures to assess fit have also been used by many researchers. This approach is discussed below.

Direct (Reflective) Fit Measures

The direct measurement approach involves developing and utilising several reflective items that are tailored to elicit individuals' perceptions of the fit between two (or more) variables.

For instance, Bhattacherjee (2001) asked respondents to match their prior expectations to perceived performance of a system. The expectation/confirmation construct was assessed through the following items: '1) My experience with using [the system] was better than what I expected, 2) The service level provided by [the system] was better than what I expected, and 3) Overall, most of my expectations from using [the system] were confirmed' (Bhattacherjee 2001, p. 370).

Similarly, researchers studying TTF have used direct measurement approaches. For example, Klopping and McKinney (2004) created eight reflective items to assess the fit between Internet-based shopping malls and individuals' shopping preferences. The TTF construct was assessed through the following items.

1. Sufficiently detailed product information is maintained on product web sites.

2. On the web sites I visit, product information is either obvious or easy to find out.
3. I can get product information quickly and easily from a web site when I need it.
4. The online product information that I use or would like to use is accurate enough for my purposes.
5. The online product information is up to date for my purposes.
6. The online product information that I need is displayed in a readable and understandable form.
7. The online product information maintained at web sites is pretty much what I need to carry out my tasks.
8. The product information is stored in so many forms it is hard to know how to use it effectively (Klopping and McKinney, 2004).

They used the eight items to construct a scale to measure TTF and then applied structural equation modelling to test a research model that hypothesised relationships between the TTF construct and other variables such as perceived usefulness and intention to use (Klopping and McKinney, 2004).

Similarly, Ferratt and Vlahos (1998) used five direct TTF items to evaluate how computer-based information systems (CBIS) fit to support managers in their decision-making tasks. The measures were designed to assess managers regarding their decision-making habits.

The main advantage of the direct measurement approach is its simplicity. Including a set of reflective measures within a survey questionnaire instrument is straightforward. These constructs can be treated as reflectively measured latent variables, and component (PLS) or co-variance-based (Amos, Lisrel, EQS, and so on) structural equation modelling techniques can be used to evaluate the research models.

Despite the widespread acceptance of this approach, this technique has been criticised by various researchers (Edwards, 2001; Klein et al., 2009). Asking respondents about the perceived direct fit between two or more variables requires the respondents to conceive and mentally 'calculate' their perceptions of fit. Researchers must rely on the respondents' ability to reliably conduct this mental arithmetic as they respond to the fit questions (Kristof, 1996).

Literature Review: Summary and identification of research gap

Table 6.2 summarises the various approaches researchers have employed to assess fit in different research settings.

Table 6.2 Fit Conceptualisation Used in Reference Disciplines and IS Research

	Reference disciplines/IS research	TPC/TTF
Fit as moderation	(Chan et al., 1997; Parker and van Witteloostuijn, 2010; Prescott, 1986)	(Dishaw and Strong, 1999; Goodhue, 1995)
Fit as mediation	(Parker and van Witteloostuijn, 2010; Thatcher, 2001)	n.a.
Fit as matching	(Jiang et al. 2002; Tesch et al., 2003)	n.a.
Fit as Gestalts	(Buttermann et al., 2008; Lefebvre et al., 1997)	n.a.
Fit as profile deviation	(Conrad et al., 1997; Parker et al., 2010; Sabberwal and Chan, 2001)	n.a.
Fit as co-variation	(McKinney et al., 2002; Mitchell et al., 2007)	(D'Ambra et al., 2004a; Goodhue and Thompson, 1995; Staples and Seddon, 2004)
Fit directly assessed	(Bhattacherjee, 2001; Limayem et al., 2007; Lin et al., 2005)	(Ferratt and Vlahos, 1998; Klopping and McKinney, 2004)

Each of the fit conceptualisations should be carefully scrutinised before applying it in a specific research context. For instance, *fit as mediation* assumes that the fit variable has a mediating effect on the dependent variable. Given Goodhue and Thompson's (1995) TPC model, this fit conceptualisation seems to be inappropriate for studying TTF due to the underlying theoretical assumptions. Goodhue and Thompson (1995) theorised that TTF would influence certain precursors of utilisation (such as attitude towards technology). Reversing this causal relationship would be theoretically unjustified and illogical (for example, stating that TTF would be influenced by users' attitudes).

Likewise, fit as Gestalts would be inappropriate for measuring TTF since only three variables 'Gestalt' (*Gestalt* is the German word for 'forming') the fit between a given technology, specific tasks and individuals' attributes. The same underlying principle applies to fit as a profile deviation (as explained previously). Thus, *fit as Gestalt* as well as *fit as profile deviation* should be carefully scrutinised before applying these approaches in investigations of TTF theory in IS contexts.

Further, despite the fact that *fit as co-variation* has been often used in IS research, there are conceptual issues with this approach. For instance, Staples and Seddon (2004) used this technique to assess *task performance chain* theory. Building upon Goodhue and Thompson's (1995) work, Staples and Seddon (2004) conceptualised four different TTF dimensions (work compatibility, ease of use, ease of learning and information quality). Each TTF dimension was measured through three reflective items. The dimensions were then used as first-order constructs comprising the second-order TTF variable. Next, statistical correlations were investigated between the TTF construct and the remaining variables in the research model. This approach has conceptual flaws as the fit is not specified numerically when investigating causal relationships with other variables. For instance, the authors collected data for three *ease of use* items as part of their TTF conceptualisation: '1) the system is easy to use, 2) the system is user friendly, 3) it is easy to get the system to do what I want it to do' (Staples and Seddon, 2004, p. 34). When scrutinising these items carefully, it becomes clear that *tasks* users perform were not considered in these items. The responses collected for these items might, however, co-vary with other variables in the research model (and perhaps the dependent variable–system utilisation), and it appears to be problematic to derive TTF from non–task-specific *ease of use* items. It is important to note that multiple other TTF-related studies (for example, Goodhue and Thompson, 1995) also used *ease of use* items to specify TTF.

Directly assessing fit can also be problematic (Venkatesh and Goyal, 2010) because 'measures that elicit direct comparisons merely shift the onus of creating a difference score from the researcher to the respondent' (Edwards, 2001, p. 268). Researchers commonly use response scales (ranging from negative to positive numbers) to collect data and they ask the respondent to mentally calculate the difference of the fit components themselves.

Finally, fit researchers have also argued that *fit moderation* approaches should be treated with care. Edwards (2001) expressed concern that many researchers have resorted to product terms when confronted with problems with difference scores: 'The use of product terms as a substitute for difference scores is alluring, given that product terms analysed hierarchically capture the interaction between two variables, and the terms interaction and fit often have been used jointly, if not interchangeably, in congruence research.' While not discussed in detail here, Edwards (2001, p. 270) provides an in-depth discussion of why there are mathematical issues when replacing deviation scores through product terms.

Given these arguments, using deviation-score analysis in combination with a parallel instrument appears to be a superior technique for measuring TTF in an IS research context. Using a parallel instrument would allow collecting

responses for 'both sides' of the fit construct separately. The deviation-score analysis could be used to match the responses without 'priming the respondent to mentally subtract the components' (Edwards, 2001, p. 268).

Despite the relatively large number of research studies on task-technology fit, to our knowledge, no study has attempted to quantify the fit between a given technology and a specific task via deviation-score analysis (*matching* approach). Thus, we report here a study of task-channel fit (a variation on TTF) in which we develop a deviation-score approach to measuring fit, utilising parallel instruments. The task-channel fit conceptualisation is now explained in more depth.

Task-Channel Fit Conceptualisation

Since the early 1970s, the proliferation of new information and communication technologies within the financial industry has significantly influenced the way banks service consumers. In particular, self-service technologies have enabled banks to pursue an electronically mediated multi-channel strategy. Nowadays ATMs, telephone banking, Internet banking and mobile banking are all efficient means for selling products and servicing customers.

For the consumer, these electronic banking channels largely eliminate the need to visit a branch and offer convenient access to bank accounts. Banks also benefit from self-service technologies as they can cut costs incurred by the traditional branch network.

Usage rates suggest, however, that banks are missing out on the opportunity to move even more customers to electronic banking services. For example, each month 73 per cent of all European banking customers use ATM machines, although only 24 per cent use Internet banking services (Deutsche Bank Research, 2006). Similarly, although most North American and Australasian retail banks offer phone banking and mobile banking services, only 5–10 per cent of all consumers have used them (Forrester Research, 2007).

Moreover, consumers favour specific electronic banking technologies for specific product categories. For instance, Internet banking applications are used for simple product categories (for example, domestic transactions) as well as more complicated product categories such as international payments, credit card applications and financial loans (Deutsche Bank Research, 2006; Forrester Research, 2007). In contrast, complex financial transactions are seen to be difficult to perform on mobile phones due to their hardware limitations such as small screens and clumsy input mechanisms. In consequence, consumers tend to use mobile devices for simple banking transactions in situations where they

need instant access to their accounts and other banking channels are not in reach (for example, checking their account balance before purchasing goods at a point of sale).

These varying usage patterns indicate that each electronic banking channel has inherent capabilities that align with certain types of banking tasks—and clash with others. This suggests the notion of a 'fit' between a given electronic banking technology and specific banking tasks. Furthermore, it seems reasonable to assume that the better the fit between electronic banking technology and banking task, the higher will be the adoption and utilisation of the service.

Despite a substantial body of knowledge on electronic banking services, to date there have been no rigorous studies investigating the fit between electronic banking channels and banking tasks. In an attempt to address this gap, we have conceptualised task-technology fit for electronic banking channels (which we refer to as task-channel fit, or TCF) and have operationalised a deviation-score (matching) approach for measuring this construct.

Task-Technology Fit of Electronic Banking Technologies

Drawing from the task-technology fit definition, task-channel fit is defined as *the user's perception of the suitability of a particular electronic banking channel to support a particular banking task*.

Banking tasks include the various kinds of financial and non-financial transactions a consumer wishes to conduct with his or her bank. The existing literature suggests that banking tasks can be characterised along a variety of dimensions. Five such dimensions have been identified.

Dimension One: Task complexity

Several studies using the TTF concept categorised tasks into simple versus complex tasks (Shirani et al., 1999; Zigurs and Buckland, 1998). For example, Zigurs and Buckland (1998) emphasised the importance of task complexity when considering task-technology fit for group support systems. As the literature has shown, banking tasks also vary in their complexity (for example, account inquiries are considered simple tasks, while securing a financial loan is a complex task) (Sayar and Wolfe, 2007; Tan and Thompson, 2000).

Dimension Two: Task effort

Using Wood's (1986) and Campbell's (1988) task complexity frameworks, Nadkarni and Gupta (2007) argued that certain tasks require a considerable

amount of effort without requiring much cognitive workload from the person performing the task (Campbell, 1988; Nadkarni and Gupta, 2007; Wood, 1986). Likewise, conducting some financial transactions entails more effort than others without necessarily being more complicated. For instance, filling out forms for international transactions is as conceptually simple as conducting domestic transactions, but a bank usually requires much more information to process overseas remittances.

Dimension Three: Task frequency

Researchers in various disciplines have investigated how recurring behaviour impacts on individuals' actions (Rangan et al., 1992; Reinsch and Beswick, 1990). For instance, Rangan et al. (1992) argued that frequency of purchase impacts on consumers' channel selection. Behavioural frequency has also been noted by IS researchers studying the impact of regular or habitual system usage (Limayem et al., 2007; Ortiz de Guinea and Markus, 2009). In the context of electronic banking, consumers perform certain banking tasks more often than others. For instance, most individuals check their account balances frequently while they seldom apply for mortgages.

Dimension Four: Task importance

Consumers view certain transactions as being more salient than others (Reinsch and Beswick, 1990). For example, high-value transactions (like those involving hundreds of dollars) are often viewed as more important than transactions with very low values (Sayar and Wolfe, 2007). Also, transactions such as mortgages or financial loans impact significantly and over a longer time span on a consumer's personal life, hence are perceived as being of high importance, while account inquiries are often seen as low-importance tasks.

Dimension Five: Task time criticality

The level of time criticality is a fifth important aspect of financial transactions (Kleijnen et al., 2004; Liao and Cheung, 2002; Tan and Thompson, 2000). Financial transactions such as foreign exchange trades or share purchases are highly time sensitive due to market volatility, and often require immediate execution. On the other hand, tasks such as transfers, loan applications or insurance acquisitions are less time critical for consumers.

Task-channel fit, then, is conceptualised as the aggregate correspondence between a consumer's perception of the characteristics of a banking task (in terms of the five dimensions above) and the suitability of a particular banking channel to support a banking task with those characteristics. Figure 6.5 illustrates the TCF concept.

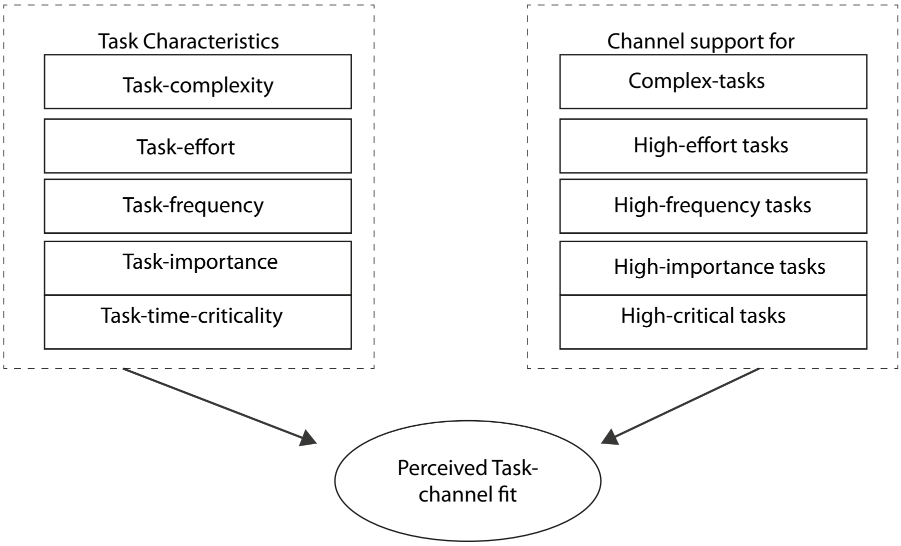

Figure 6.5 Perceived Task-Channel Fit Conceptualisation

Since these dimensions were solely based upon the existing literature, focus group sessions were conducted to further validate the TCF dimensions.

Focus Group Discussions

Five exploratory focus groups (each consisting of five electronic banking users) were carried out. The primary goal of these sessions was to develop an understanding of how consumers perceive the task-channel fit of electronic banking channels. Theoretically motivated purposive sampling methods were employed in selecting participants for this study (Calder, 1977). The focus groups were selected so as to achieve a wide variety of individual characteristics across the different user groups.

Research participants were contacted via email, telephone or face-to-face conversations. A prerequisite for participation within the focus groups was that each participant had used at least one electronic banking channel (ATM, telephone, Internet or mobile banking) for their banking needs and that they were familiar with the most common functionalities of that specific channel. Also, all participants were involved in the purchasing of financial products in their own household. The age of participants ranged between twenty-four and sixty-one years and the focus groups included 11 men and 15 women. Educational levels ranged from high school education to PhDs in engineering science.

Data collection was carried out through focus group discussions featuring open-ended questions. An example of the questions presented to the focus group panels is given below.

> What banking transactions/products do you perform on each electronic banking channel, and why?

The focus group discussions lasted between 60 and 90 minutes each and were recorded and transcribed afterwards. To analyse the data, coding techniques commonly used for grounded theory studies were applied (Strauss and Corbin, 1998). The codes were visualised in a data matrix to highlight similarities and differences between the various codes (Miles and Huberman, 1994).

Overall, the focus group discussions confirmed the task-channel fit dimensions described above. During the focus group discussions, task complexity, task effort, task frequency, task importance and task time criticality were repeatedly identified as important factors influencing the suitability of electronic banking channels to support specific banking tasks.

For instance, many respondents argued that electronic banking channels differ in terms of their ability to support complex banking tasks. One participant stated:

> Telephone banking is much less developed than Internet banking. I'd say it is much more archaic and I used telephone banking back in the days when I was a student. I only had one account and never used it to transfer money between accounts. I use Internet banking for all my transactions nowadays. I could never do on telephone banking what I do on the Internet banking; telephone banking is just not suited for more complicated banking services.

The level of time criticality was considered another important aspect of financial transactions. Most participants indicated that they perceived some banking transactions as urgent while others were seen as less time critical. In addition, some electronic banking channels were seen as supporting time-critical tasks particularly well (for example, Internet and mobile banking) whereas others were seen as less suited for urgent matters (for example, ATM banking).

> The other day I was out at a bar and realised that I hadn't paid my phone bill. That was an urgent matter for me so I just used my text-banking and paid the bill. That's 24 and on the go…so, for me, mobile banking is something for quick and easy day-to-day tasks.

The focus groups also suggested that consumers execute some banking tasks more frequently than others. Depending on the frequency of performing a given banking task, consumers would view certain banking channels as more

suited than others. The participants also indicated that they would develop a routine if they performed tasks regularly on a given banking channel, which would influence their perceptions of that channel. After they repeated the banking tasks several times on a specific channel, they would perform these tasks automatically because of learning. Task frequency was also a recurring concept within most focus group discussions.

One participant argued:

> I think regularity and how often you have to perform each banking task is very important when using electronic banking channels. Once you have learned how to use them and if you do them frequently…the process becomes habitual. For example, I know exactly which buttons to press when using ATMs or telephone banking. That's because I use them quite often. The procedure stays the same and I know exactly what to do.

In summary, the focus group discussions supported the initial conceptualisation of the task-channel fit of electronic banking channels. The following section describes the instrument development for measuring the TCF construct.

Instrument Development

This research intended to create two sets of TCF measures—one formative and one reflective. The formative set aimed to measure specific dimensions of the task-channel fit construct. These items intended to capture different aspects of TCF and should individually represent a finer level of measurement granularity compared with the reflective items.

When measuring constructs via formative indicators, it is important to understand that the content validity of a construct correlates highly with the indicators used to measure the construct. Each item contributes to 'form' the construct so it is essential that the entire domain is covered (Diamantopoulos et al., 2008; Petter et al., 2007). To assure that each TCF dimension was captured adequately, two items were included for each TCF dimension (displayed in Table 6.3).

We also included four global TCF items. These items were intended to measure consumers' views on the overall fit between Internet banking and financial loans/account inquiries. Since these items were designed to tap into consumers' overall perception of the TCF, the measures were necessarily somewhat more abstract.

While there are issues with measuring the TCF directly through a set of reflective items (see the discussion in the 'Literature Review' subsection above), nevertheless we decided to include the direct TCF measures as they allowed us to check the reliability of the formative measurement approach. The construct reliability of a formative construct can be evaluated through the use of a two construct model that integrates an additional phantom variable, which represents the construct's reflective operationalisation (Diamantopoulos and Winklhofer, 2001; Goetz et al., 2010).

Goetz et al. (2010) elaborated on this and suggested that product quality can be measured by means of formative indicators such as 'appealing design', 'high-quality functionality' and 'adequate product weight'. Product quality can also be measured through reflective indicators to determine the formative operationalisation's error term. Such items could include 'the product is of high quality', 'my quality expectations have been met', 'I will not complain about the product' and 'my quality expectations have been exceeded' (Goetz et al., 2010).

For the current study, the formative TCF measures intended to specify why consumers perceive a fit between a given banking task and an electronic banking channel. This approach is much more detailed and provides a more robust and rich picture of the TCF construct. In contrast, the set of reflective items provides a higher-level overview of perceived TCF.

We regard the formative measurement approach as superior since it provides a more detailed picture (and also avoids the cognitive load on respondents of having to calculate or otherwise determine TCF). Since this is the first attempt to formatively measure the perceived TCF of electronic banking channels, it seemed reasonable, however, to retain both sets of measures until more is known about the relationship of each TCF dimension and the perceived TCF construct.

The development of the measurement scales was conducted in three stages. We first screened the existing literature for items that had been validated by prior research. No items could be identified that matched the construct dimensions. Therefore, we developed new items for the TCF dimensions based on their construct definitions.

To do this, a spreadsheet was established listing the TCF construct definitions. Next, the existing literature and transcripts of the focus group discussions were reviewed for potential keywords describing the TCF dimensions. For instance, time-critical tasks were often referred to as being 'urgent' in the existing literature (Gattiker and Goodhue, 2005; Jenkins et al., 1971; Junglas et al., 2009; Landry et al., 1991; Park et al., 2008; Yuan et al., 2010). Hence, items tapping time criticality were created to reflect that dimension.

Likewise, many focus group participants suggested that certain banking tasks required instant execution and should be performed immediately. Hence, the concepts of 'instant execution' and 'immediacy' were also integrated into time-criticality items. The same procedure was followed for the remaining TCF dimensions.

The initial pool of TCF items was carefully reassessed for conceptual similarities and the wording of each item. For instance, the initial items included the following measures

- a financial loan is a complicated banking transaction
- a financial loan requires a lot of time.

While the first item clearly tapped into the task complexity dimension, the second item—while originally intended to also measure task complexity—was later recognised as being merely concerned about the length of time individuals require to perform the banking task, which is not necessarily a reflection of complexity. Due to this, it was decided to exclude the latter item. Similar steps were performed for the remaining items/TCF dimensions.

The second stage of the instrument development involved two judgment rounds utilising experts relevant to the study's context. The main goal of these expert rounds was to assess the content validity of the scales as well as the wording of the items. The eight judges included two marketing professors, two senior IS researchers, two bank staff and a finance professor as well as a currency trader. The judgment rounds were organised as face-to-face interviews lasting between 60 and 90 minutes each. Each judge was asked to evaluate the content validity of the TCF dimensions as well as to re-examine the items collected for this study. Subsequent to the interviews, the scales were refined appropriately in light of the experts' recommendations.

The third stage of scale development involved two pre-tests of the survey questionnaire instrument. The first pre-test involved five university staff (two administrative staff, one academic staff member and two PhD students) who were asked to complete the survey questionnaire in paper form. Subsequently each respondent was interviewed and questioned about whether they found items unclear or ambiguous, or if they felt confused by some sections of the questionnaire. This feedback was then used to adjust the survey questionnaire instrument. The second pre-test included 15 university staff/PhD students researching information systems. These participants were asked to test the online survey and provide feedback about the structure of the survey and wording of the items. The second pre-test led to the final measures used for this research, summarised in Table 6.3.

Data Collection

In an ideal situation, the TCF scales would be tested by gathering data from respondents for all electronic banking channels, and for a variety of banking tasks; however, this research design appeared infeasible for two reasons. First, combining items for a number of banking transactions (for example, account inquiries, domestic transactions, international payments, applying for credit cards and/or mortgages) with four electronic banking channels (ATMs, telephone, Internet and mobile banking) would lead to a very repetitive and lengthy survey questionnaire. Second, due to varying adoption rates, it seemed unlikely that respondents would be able to reply to questions related to all electronic banking channels.

Table 6.3 Items Used in Constructing the Construct Measures

Construct	Items
TCF—task characteristics	
COMP1	A financial loan (account inquiry) is a complicated banking transaction.
COMP2	Applying for a financial loan (account inquiry) is an easy-to-do banking task.
EFFORT1	I have to provide a lot of information to my bank when applying for a financial loan (account inquiry).
EFFORT2	A loan application (account inquiry) is a banking transaction that requires filling out many forms.
FREQ1	I often apply for a financial loan (account inquiry).
FREQ2	A loan application (account inquiry) is a banking transaction I frequently do.
IMPORT1	A loan application (account inquiry) is an ordinary banking transaction to me.
IMPORT2	Applying for a loan (account inquiry) is a common banking task.
TIME1	I seldom face situations in which I need to apply for a bank loan (account inquiry) urgently.
TIME2	I often need to apply for a financial loan (account inquiry) immediately.
TCF—channel suitability	
	<u>Internet banking is well suited for:</u>
CCOMP1	Complicated banking transactions.
CCOMP2	Easy-to-do banking tasks.
CEFFORT1	Banking transactions for which I have to provide a lot of information to my bank.
CEFFORT2	Banking transactions that do not require filling out many forms.
CFREQ1	Banking transactions I perform often.
CFREQ2	Banking transactions I perform frequently.
CIMPORT1	Ordinary banking transactions.
CIMPORT2	Common banking tasks.
CTIME1	Urgent banking transactions.
CTIME2	Banking transactions I have to do immediately.
Task-channel fit (direct measures)	
TCF1	I think Internet banking would be well suited for loan applications (account inquiry).
TCF2	Internet banking would be a good medium for loan applications (account inquiry).
TCF3	Internet banking would fit well for loan applications (account inquiry).
TCF4	I think Internet banking would be a good way to apply for financial loans (account inquiry).

For this study, then, we focused on a single banking channel and on two different banking tasks. Internet banking was selected as the banking channel. First, most consumers in New Zealand have experience with Internet banking applications and should have well-formed beliefs about most common functionalities of these services. Second, all New Zealand banks offer a wide range of financial products via Internet banking, including simple, medium and complex banking products.

In order to create a meaningful comparison, account inquiries (checking account balance, viewing transaction history, inspecting account statements, and so on) and financial loan applications (applying for bank overdrafts, home loans, personal loans, mortgages, and so on) were selected to test the perceived TCF scales regarding Internet banking services. We operationalised the data collection by using two different versions of the questionnaire instrument (one for account inquiries and another for financial loan applications). The two versions differed slightly, reflecting the nature of the corresponding banking task. Table 6.3 lists the items used to assess the TCF for financial loan applications. As indicated within the table, 'loan applications' was replaced with 'account inquiries' for the second version of the survey questionnaire.

The survey questionnaire instrument was administered to students, faculty and administrative staff at a university in New Zealand. To encourage participation within the study, the survey questionnaire was posted within a university newsletter that is sent out weekly to all staff and students. We received 315 responses. A number of research participants indicated that they felt unfamiliar with either the banking task in question or Internet banking services. These responses were excluded from the data analysis, resulting in 140 responses for each banking task (280 in total).

Data Analysis

Regression Analysis of the Fit Components

Before discussing the TCF assessment, the two 'sides' of TCF—task characteristics and channel suitability for a particular characteristic—were evaluated using linear regression.[1] Klein et al. (2009) suggested analytical guidelines for assessing difference scores in IS research. As part of this, the authors proposed examining

1 There was no compelling theoretical or empirical reason to expect nonlinearity. Therefore, we assumed a linear relationship between the component scores.

whether both component scores of the fit have dissimilar weights. Unequally weighted fit components would indicate that a deviation-score analysis would lead to more significant results (Klein et al., 2009).

We followed these recommendations and conducted a linear regression to assess whether the two components of the TCF (task characteristics and channel suitability) would be unequally weighted. SPSS (Version 17.0) was used to perform the regression analysis. Table 6.4 shows the results. One of the direct measurement items was used as the dependent variable to perform the regression analysis.

Table 6.4 Linear Regression Coefficients/Separate Fit Component Analysis

	Separate components	
	Task characteristics	**Channel suitability**
Loan/complexity	3.907*** (T: 6.721)	1.398 (T: 1.869)
Loan/effort	3.937*** (T: 9.069)	2.668*** (T: 5.038)
Loan/frequency	3.014*** (T: 13.672)	1.582 * (T: 2.359)
Loan/importance	2.797*** (T: 7.737)	1.315* (T: 1.967)
Loan/time criticality	3.548*** (T: 7.823)	1.947*** (T: 3.519)
Acc. inquiry/complexity	3.202*** (T: 5.203)	2.221*** (T: 3.982)
Acc. inquiry/effort	5.209*** (T: 28.575)	3.756*** (T: 8.280)
Acc. inquiry/frequency	3.040*** (T: 9.662)	1.596** (T: 3.013)
Acc. inquiry/importance	2.786*** (T: 4.562)	1.625** (T: 2.920)
Acc. inquiry/time criticality	4.657*** (T: 9.749)	2.943*** (T: 6.506)

* significant at $p < 0.05$

** significant at $p < 0.01$

*** significant at $p < 0.001$

The results confirm that the two components of the task-channel fit are unequally weighted. For both banking tasks (financial loans and account inquiries), there is an unequal weight distribution between both fit components (task characteristics and channel suitability). All task-characteristic items were highly significant; however, certain of the channel suitability sub-components were less significant (for example, loan/frequency).

TCF Calculation

As indicated earlier, we felt that computing a fit score by matching the responses obtained via the parallel instrument approach would yield a richer and more robust measure of TCF than attempting to assess it directly via a set of reflective indicators (Chan et al., 1997; Venkatraman, 1989). Therefore, the task characteristic and channel suitability items (see Table 6.3) were designed

to parallel each other. For each individual task characteristic item, a parallel channel suitability item was created so as to allow us to determine the extent of the fit (or lack thereof) the respondent perceived between the task and the channel for that specific task dimension. For instance, COMP1 asks individuals whether they view financial loan applications as complicated. CCOMP1 then inquires whether the individual views Internet banking as well suited for complicated banking transactions. The responses to these two items can be compared to determine an indicator of the fit of the particular channel to that aspect, or dimension, of the particular task. The larger the difference (either positive or negative) between the two ratings, the lower is the degree of fit.

Following this approach, fit scores were calculated for each TCF dimension (for example, TCFcomp2, TCFeffort1, TCFeffort2, and so on). These values were subsequently used as formative indicators for TCF, as they 'formed' the perceived TCF construct. The details of how this was done are explained next.

Data Analysis

Partial least squares (PLS) was used to analyse the data. Partial least squares simultaneously analyses how well the measures relate to each construct and whether the hypotheses at the theoretical level are true. In contrast, with co-variance-based structural equation modelling (SEM) techniques, PLS can handle formative indicators that are required to evaluate the TCF construct using the matching approach. SmartPLS was selected as the software package to perform the data analysis.

The data analysis for the TCF model was assessed for account inquiries and financial loans separately. Aggregating the answers for both versions of the questionnaire would not be meaningful since the perceived TCF would be expected to differ from task to task.

The matching scores for this study were computed for both datasets and used as formative measures for the perceived TCF construct, as illustrated in Figure 6.6.

As suggested by Cenfetelli and Bassellier (2009), all formative measures were initially assessed for multi-collinearity. In contrast with reflective items, multi-collinearity is undesirable for formative measures. Variance inflation factor (VIF) statistics were used to assess all items. A VIF of three or greater indicates the presence of a significant degree of multi-collinearity among the items (Petter et al., 2007). Variance inflation factor statistics can be computed using linear regression methods using SPSS. Table 6.5 shows the scores obtained for these tests.

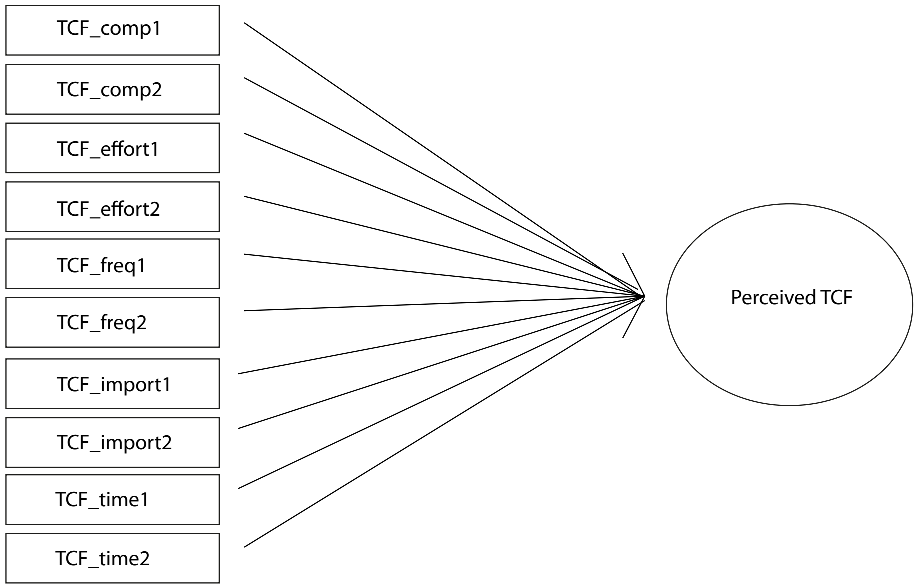

Figure 6.6 Formative Items Measuring the Perceived TCF Construct

Table 6.5 VIF Statistics for Formative Measures—Deviation Scores

Formative item	VIF_loans	VIF_account inquiries
TCF_comp1	1.51	1.40
TCF_comp2	1.67	1.31
TCF_effort1	1.42	1.43
TCF_effort2	1.33	1.23
TCF_import1	1.64	1.39
TCF_import2	1.56	1.25
TCF_time1	1.10	1.20
TCF_time2	1.63	1.24
TCF_freq1	2.83	1.72
TCF_freq2	2.51	1.86

All VIF values (for the financial loan and account inquiry dataset) ranged between 1.1 and 2.8, indicating that multi-collinearity is not present among the formative measures.

Next, the t-values and weights for the formative measures were produced using SmartPLS. Tests of significance were performed using a bootstrap re-sampling procedure.

Table 6.6 Formative Measures, t-values and Item Weights—Deviation Scores

	Financial loans		Account inquiries	
Formative measure	**T-statistic**	**Weight**	**T-statistic**	**Weight**
TCF_comp1 -> TCF	2.69**	0.56	1.73	0.31
TCF_comp2 -> TCF	1.29	0.29	0.28	0.05
TCF_effort1 -> TCF	0.13	0.03	1.46	0.26
TCF_effort2 -> TCF	0.15	0.03	1.99*	0.33
TCF_freq1 -> TCF	0.73	−0.21	2.15*	0.40
TCF_freq2 -> TCF	1.97*	0.47	0.94	−0.21
TCF_import1 -> TCF	0.83	−0.18	0.16	0.04
TCF_import2 -> TCF	0.82	0.16	1.23	0.24
TCF_time1 -> TCF	3.68***	0.61	3.42***	0.49
TCF_time2 -> TCF	1.02	−0.22	0.47	0.09

* significant at $p < 0.05$

** significant at $p < 0.01$

*** significant at $p < 0.001$

Table 6.6 illustrates that only three items showed significant t-statistics (TCF_comp1, TCF_freq2 and TCF_time1) for the financial loan dataset, and three for the account inquiry dataset (TCF_effort2, TCF_freq1 and TCF_time1). In addition, several item weights were relatively low and four item weights were negative.

Cenfetelli and Bassellier (2009, p. 697) recommend that 'if the negatively weighted items are (a) not suppressors or (b) not collinear, they should be included in the remaining analysis and potentially culled over time if they repeatedly behave differently than other indicators'. As shown in Table 6.6, none of the weights was negative in *both* datasets (financial loans and account inquiries). Thus, it seemed reasonable to conclude that no suppressor effects were present. In addition, since multi-collinearity problems were not evident, none of the negative weights was excluded from further analysis.

Finally, the TCF scales were inspected for their portability, or generalisability (Cenfetelli and Bassellier, 2009). Mathieson et al. (2001) suggested linking the formatively assessed construct to a reflectively measured variable *measuring a conceptually equivalent concept*.

Therefore, the inter-construct correlation between the formatively measured TCF construct and its reflectively assessed counterpart was assessed. SmartPLS was used for this purpose. Table 6.7 displays the results.

Table 6.7 Redundancy Analysis—Deviation-Score Analysis

	Financial loans		Account inquiries	
Construct relations	T-statistic	Correlation coefficient	T-statistic	Correlation coefficient
TCF (all items) –> TCF reflective	6.89***	0.43	7.68***	0.46
TCF (reduced set of items) –> TCF reflective	6.23***	0.43	6.39***	0.45

* significant at $p < 0.05$

** significant at $p < 0.01$

*** significant at $p < 0.001$

Table 6.7 shows that the formatively measured TCF construct was significantly correlated with the reflective directly measured TCF construct (for both datasets). Cenfetelli and Bassellier (2009) suggested that inter-construct correlation coefficients should exceed a 0.80 threshold. This guideline was provided in reference to the ServQual instrument. This instrument is one of the most validated instruments in the marketing/IS literature. Since the TCF survey questionnaire instrument is newly developed, however, correlation coefficients greater than 0.4 were accepted as adequate.

It is important to note that the inter-construct correlations do not differ significantly when using the reduced set of formative measures (excluding TCF_comp2, TCF_effort1, TCF_import1 and TCF_import2 and TCF_time2). This suggests that the exclusion of these items in future studies when conceptualising the TCF construct with deviation scores would be acceptable.

Discussion

This study employed a parallel-instrument approach to formatively measure the perceived TCF of electronic banking channels. This approach addresses shortcomings of several fit measurement approaches outlined by Venkatraman (1989) including direct fit measurement and fit as co-variation (as explained in the 'Literature Review' section above). Both approaches have been commonly used by IS researchers to assess TTF despite well-known conceptual and analytical issues with them.

The approach illustrated here has several advantages over the fit measurements traditionally employed by TTF researchers. For instance, the parallel-instrument approach advances direct-fit measurement since respondents are not asked to mentally 'calculate' a fit between a given technology (for example, Internet

banking) and tasks (for example, account inquiries and mortgages) they perform with it. Instead, individuals are required to answer questions regarding a given variable, A (task-characteristics), and a given variable, B (channel suitability). While the focus of this chapter is on the TCF of electronic banking channels, future research could investigate further tasks and technology combinations (for example, work-related tasks and enterprise resource planning systems) using parallel instruments.

What is more, deviation-score analysis allows researchers to determine a numerically calculated fit between two variables. This advances the fit as co-variation measurement since researchers can numerically quantify fit when investigating statistical correlations with other variables specified in TTF-related research models.

To assess the transportability of the formatively measured TCF construct, a set of reflective TCF measures was created for this study in order to assess consumers' overall perceptions of the task-channel fit. The redundancy analysis showed a strong correlation (approximately 0.45) between both constructs. This suggests that the formatively measured TCF variable captured the most essential aspects of consumers' overall perceptions of the TCF.

Future studies could extend the scope of this research by investigating possible causal relationships between the formatively measured TCF construct and other variables influencing consumers to use electronic banking channels. Following Goodhue and Thompson's (1995) TPC framework, such variables could include expected consequences, affect, social norms, habit and facilitating conditions related to IS (or electronic banking channel) usage.

Likewise, the formatively measured TCF construct could be linked to well-established IS acceptance theories such as TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003). Dishaw and Strong (1999) have verified a theoretical linkage between TTF and TAM theory. Hence, causal relationships between the formatively measured TCF construct and constructs such as perceived usefulness and ease of use should be investigated in future research.

Another avenue for future research is to apply the TCF measurement approach to different industries deploying similar self-service technologies as banks (for example, the airline industry, supermarkets, and so on). The conceptualised TCF dimensions seem to apply to the activities individuals perform in these use settings as well.

For instance, ordering an airline ticket is often seen as more complicated than checking flight arrival times online (D'Ambra and Wilson, 2004a). Similarly, checking arrival times for aircraft appears to be a time-critical activity whereas consumers usually plan holidays ahead. Likewise, ordering flight tickets

includes more effort than checking arrival times since individuals are required to fill out more forms when performing these activities online. These examples outline how the conceptualised TCF dimensions could be reapplied to different e-commerce contexts.

Concluding Comments

The focus of our chapter has been the development of an approach to measuring task-channel fit for electronic banking channels. The TCF was initially conceptualised following extant literature and subsequently reassessed via five exploratory focus group discussions. Next, a parallel instrument was developed using two judgment rounds and two pre-test evaluations. Following this, the instrument was used in a survey; 140 responses for each banking task (account inquiries and financial loans) were gathered. The respondents were New Zealand consumers using Internet banking channels.

An important theoretical contribution of this research is a quantitative assessment of the TCF concept first suggested by Hoehle and Huff (2009). Task-channel fit adapts the task-technology fit theory (Goodhue and Thompson, 1995) to study an online delivery channel rather than a specific technology. To date, no previous study has used TTF theory for this purpose.

Our study also contributes to construct specification and measurement. The TTF theory was originally developed within an organisational context characterised by involuntary use. So far, very little is known about how this concept can be applied at the individual level (Staples and Seddon, 2004). We have addressed this issue by developing and validating a survey questionnaire instrument to measure the TCF of electronic banking channels.

Our third contribution is to banks and financial institutions distributing their products and services through electronic banking channels. Prior to the research reported in this chapter, we conducted relevance checks with several senior managers working for three German banks regarding their perceptions of the TCF concept (Hoehle and Huff, 2009). Those interviews indicated that a measure of task-channel fit would be highly valuable for banking practitioners since it would enable them to better judge which banking products to offer on each of the channels their bank supports (Hoehle and Huff, 2009).

Limitations and Suggestions for Future Research

The data used in the analysis were collected in a university environment. University staff and students are usually technology-savvy and have easy access

to computers and the Internet. This might bias the results. A replication of the study drawing from the general population of users of electronic banking channels is essential before the findings can be generalised to a broader audience.

Second, only two tasks (account inquiries and financial loans) were used in combination with Internet banking to test the TCF model. Future research should extend these results by examining TCF in the context of other electronic banking channels (ATMs, phone banking and mobile banking) and other banking tasks.

Third, not all of the formative measure item weights were significant. Further improvement in the TCF measurement items is required to improve the psychometric properties of the TCF construct measure.

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Zigurs, I., Buckland, B. K., Connolly, J., & Wilson, E. V. (1999). A test of task-technology fit theory for group support systems. *Data Base for Advances in Information Systems, 30*(3–4), 34–50.Table 6.3 Items Used in Constructing the Construct Measures