2011

# Exploring the Link between System Integration and Technology Usage

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## Abstract

*Recent developments in the area of electronic accounting information systems have enabled accounting firms to move their focus from paper-based, mandatory business reporting and book-keeping to value-added services, such as providing cash flow forecasts to their customer companies (typically SMEs). In this study, we explore the usage of cash flow forecasting systems in accounting firms. Drawing on the theories of technology acceptance and usage and empirical data from 108 accounting firms, we find that system integration is a key determinant in explaining the task-technology fit which, in turn, explains the usage of cash flow forecasting systems. Further analysis revealed that frequent users of cash flow forecasting systems relied on commercial, highly integrated solutions, whereas ad hoc users preferred spreadsheet programs.*

**Keywords**

Accounting information systems, cash flow forecasting, task-technology fit, integration, SEM

## INTRODUCTION

In the past, companies have made their financial processes more efficient by implementing information systems to automate various tasks. This has resulted in islands of information systems which are not necessarily integrated to each other. This phenomenon is especially visible in accounting firms where information systems have been implemented to automate, for example, the processing of customer companies' incoming and outgoing invoices, payroll management, book-keeping, and reporting processes. These systems enable the accounting firms to automate specific, individual processes; however, tasks that require data from several sources are difficult to perform. As a result, master data management and integration of the separate systems have become hot topics in the field of financial administration.

The above mentioned information systems have enabled accounting firms to perform their tasks more efficiently, freeing up resources to service the customer company in a better way. As a result, a trend in accounting firms is the shift in focus from paper-based, mandatory book-keeping and business reporting to offering value-added services to the customer companies. One such value-added service is projected to be cash flow forecasting; a recent study drawing on 258 CFOs and financial managers revealed that 95% of companies consider cash flow forecasting an important area of development (Basware 2009). However, while the importance of cash flow forecasting is evident, there seems to be a gap between the need for it and the actual effective use of it (GTNews 2009; GTNews2010).

Large corporations, often, have the luxury of resources and sophisticated information systems to support cash flow forecasting functions. On the other hand, micro companies with one or two employees seldom need any such forecasting services as their business is simple enough to manage without. In between, there are the traditional SMEs who are, typically, not doing cash flow forecasting, but would get added value from the forecasts. Therefore, in this paper, we focus on accounting firms which offer financial services to the SME sector. Another motivation for the study is the recent changes in the money markets, giving new meaning for cash and liquidity management in organizations. The availability of cash has decreased at the same time as the credit lines from banks have tightened. This means that the importance of operational cash flows has become greater. This behaviour strengthened especially during the financial crisis in 2008.

Our objective is to explore whether accounting firms offer cash flow forecasting services to their customer companies. More specifically, we are interested in exploring the link between technology characteristics (namely integration of separate systems) and usage of cash flow forecasting tools. We hypothesize that technology characteristics have an impact on usage. To find answers to the research questions, we build a

conceptual model, based on the theory of task-technology fit, and draw on a survey among accounting firms, yielding 108 usable responses.

The paper is organized as follows. After this introduction, in the second section, we present the theory of task-technology fit and build our conceptual model. Next, we present the methodological choices taken. After that, we proceed to describing the empirical study and present the results of the analysis. In the final sections, we draw conclusions and discuss avenues for further research.

## TASK-TECHNOLOGY FIT AND CASH FLOW FORECASTING SYSTEMS

The interest towards the post-adoption stage in the technology lifecycle began after the introduction of TAM (Davis 1989). One seminal study in this line of research was the Task-Technology Fit theory (TTF) by Goodhue and Thompson (1995). Their idea was to take adoption of technology for granted and focus instead on the usage and performance effects from a contingency perspective. According to the contingency theory, there is no one best way of doing a thing, but rather the internal and external conditions affect the optimal case (Goodhue et al. 1988). In the case of TTF, the conditions affecting the optimal solution are the requirements that tasks place for the technology and, on the other hand, the features of the technology that enable the fulfilment of tasks. Therefore, the technology does not have to be best one available, but it has to fit with the tasks of the specific case. Similar contingency approach for tasks and technology was considered earlier by Cooper and Zmud (1990) in a study of technology diffusion. They used the diffusion of innovation theory constructors but adjusted them for their study; compatibility was formed by task and technology characteristics and complexity from task and technology complexity.

Goodhue and Thompson (1995) used the Task-Technology Fit to measure the level of utilization and performance impacts. According to the model, the better the fit is, the higher the rate of utilization and the performance impacts are. The relationships can be seen in Figure 1, our focus being the link between technology characteristics, task-technology fit, and usage. Goodhue and Thompson (1995) performed their study in two organizations with multiple departments and technologies, and found eight key constructors for the fit of task and technology: quality, locatability, authorization, compatibility, ease of use and training, production timeliness, systems reliability, and relationship with users.

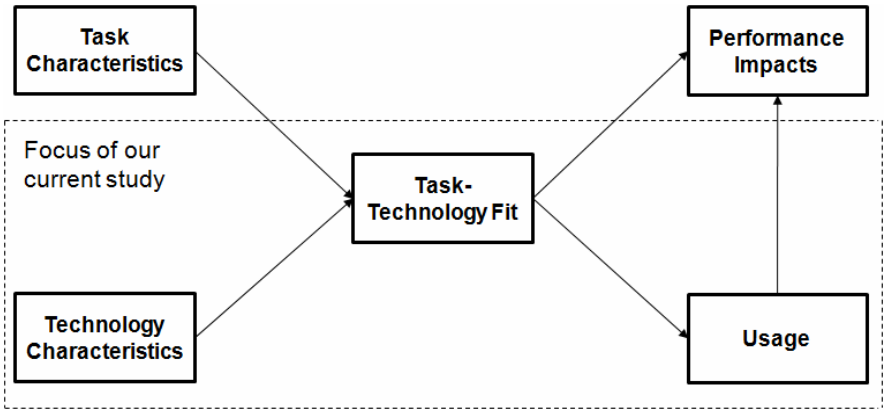


Figure 1: Original Task-Technology Fit Model (Goodhue and Thompson 1995)

The Task-Technology Fit model by Goodhue and Thompson (1995) initiated a new line of research for the technology utilization and performance in a task contingency setting. Since its publication, the model has been extended with various theories such as TAM (Dishaw and Strong 1999; Klopping and McKinney 2004; Chang 2010; Yen et al. 2010), UTAUT (Zhou et al. 2010), computer self-efficacy (Strong et al. 2006), individual differences (Lee et al. 2007), social cognitive theory (Lin and Huang 2008) and empowering leadership (Kuo and Lee 2011). These are not the only extensions and integrations of the TTF model; Liang et al. (2007) proposed a fit-viability model to study the performance of technology adoption within organizations. A different perspective was taken also by Junglas et al. (2008) who studied tasks and technologies from the conditions of under-, over-, and ideal fit.

The TTF model has been applied to different contexts. This is important for the evolution of the theory because the theory itself states the importance of contingency perspective; each different task setting gives insight how the TTF constructors and their relative importance are affected in that setting. The originating authors, Goodhue and Thompson (1995), Goodhue (1998) and Goodhue et al. (2000) applied TTF into managerial decision making tasks with quantitative information in large organizations. The technologies in their studies can be categorized as

decision support systems. Zigurs and Buckland (1998) and D'Ambra and Rice (2001) studied the interaction of tasks and technologies for group support systems. The former developed the general theory of TTF in the GSS context and the latter applied it for group communication technologies. Dennis et al. (2001) introduced a fit-appropriation model for the GSS context and used a meta-analysis to evaluate it. The fit perspective in this model is based on the original TTF theory. Other application contexts have been mobile and e-commerce (Lee et al. 2007; Yen et al. 2010), online web services (D'Ambra and Rice 2001), online shopping for consumers (Klopping and McKinney 2004), mobile locatable services (Junglas et al. 2008), mobile banking services (Zhou et al. 2010), online auction and client technology (Chang 2010), and knowledge management systems (Lin and Huang 2008; Kuo and Lee 2011).

Although the TTF model has been used extensively in the area of ISS research, it has received criticism for not including the concepts related to attitudes toward IT in the model (Dishaw and Strong 1999) and issues with metering performance (Goodhue et al. 2000).

**Integration**

Another perspective to examine the information system usage was proposed by DeLone and McLean (1992) by reviewing existing IS success related literature. Their synthesized model considered system and information quality as the determinants of IS usage and user satisfaction, consequently affecting the individual and organizational performance. One of the measurement items in system quality was system integration. Similarly, Wixom and Watson (2001) and Wixom and Todd (2005) found integration as a significant measurement of system quality and, therefore, affecting the user satisfaction of information quality. Seddon et al. (2010) identified three key factors affecting the organizational benefits from enterprise systems, integration being one of them.

Integration can be defined as linkages of organizational resources through shared data, processes and systems (Seddon et al. 2010). Ross et al. (2006) emphasize the importance of data sharing and name it as the biggest challenge in integration of systems for end-to-end transaction processing. More recently, cloud services have become common practice in many industries, specifically addressing the problem of data integration through improved, centralized data hosting procedures and standardized interfaces for system integration. Therefore, we find it especially interesting to study the effect of data integration on task-technology fit and usage of cash flow forecasting systems in accounting information systems.

**Operationalization of Task-Technology Fit to Cash Flow Forecasting**

Cash flow forecasting is one important subset in the cash and liquidity management which has been identified as one of the key success factors for small businesses (Welsh and White 1981). This challenge is not as acute among large corporations since they often have enough resources and competence available and their ERP systems support cash flow forecasting processes. But the situation with small and medium-sized companies (SMEs) is not so good. In a study about Finnish SMEs' cash and liquidity management behaviour, 25% of the respondents had no forecasting process in place and over one third used spreadsheets as the primary tool (Kaipiainen 2008). In the same study, respondents evaluated cash flow forecasting to be the most important function for improving the cash and liquidity management of their company.

Triggered by the recent developments towards cloud services, we developed a conceptual model linking system integration to the level of task-technology fit and further to system usage. Based on the theory of task-technology fit (Goodhue and Thompson 1995) and the IS success model (DeLone and McLean 1992), we hypothesize that (H1) integration of accounting information systems leads to improved task-technology fit, and that (2) improved task-technology fit leads to increased usage rates of cash flow forecasting systems.

*H1: Integration of accounting information systems leads to improved task-technology fit*

*H2: Improved task-technology fit leads to higher usage rates of cash flow forecasting systems*

The following figure (Figure 2) depicts the conceptual model of our research.

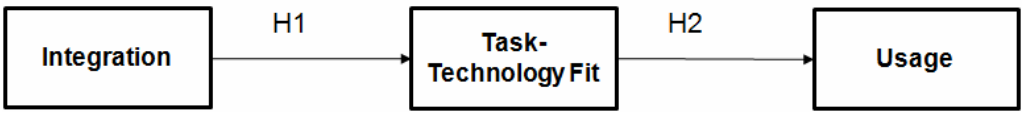


Figure 2: Conceptual framework (Goodhue and Thompson 1995; DeLone and Mclean1992; Seddon 2010)

To operationalize the constructs, we explored the literature on integration and task-technology fit and used items from earlier research where possible. In addition, we conducted expert interviews at accounting firms and industry service providers. We developed five items to the integration construct and four items to the task-technology fit construct. Out of the eight original TTF constructs, we decided to use the items related to quality and locatability. This decision was made based on the expert interviews as the constructs (quality and locatability) were considered the most relevant to our research. When making cash flow forecasts, it is crucial to locate the data needed (locatability) and that the data used in the forecasts is accurate (quality). Some of the original TTF constructs such as authorization and production timeliness were not considered useful to the context of accounting firms and cash flow forecasting by the experts interviewed for this study. Usage was measured as a single item construct. The following table (Table 1) provides the operationalization of the constructs used in this study.

Table 1. Operationalization of the constructs

| Construct | Question | Scale | Reference |
|---|---|---|---|
| Integration | The cash flow forecasting tool supports automation of data transfer from the customer's information systems (INT1) | LIKERT 1-7 | Wixom and Todd (2005), Expert interviews |
| | The cash flow forecasting tool is easily available to the accounting firm and its customer (e.g. through a cloud service) (INT2) | LIKERT 1-7 | Expert interviews |
| | The cash flow forecasting tool supports the use of electronic invoicing data (INT3) | LIKERT 1-7 | Expert interviews |
| | The customer company's information systems are easily integrated with the forecasting tool (INT4) | LIKERT 1-7 | Wixom and Todd (2005), Expert interviews |
| | Customer company's enterprise architecture is compatible with the cash flow forecasting tool without additional changes to the systems (INT5) | LIKERT 1-7 | Expert interviews |
| Task-Technology Fit | Cash flow forecast contains all the information the customer needs and is up to date (QUAL1) | LIKERT 1-7 | Goodhue and Thompson (1995), Expert interviews |
| | The information received from customer used for the cash flow forecast fulfils the requirements and is sufficiently up to date (QUAL2) | LIKERT 1-7 | Goodhue and Thompson (1995), Expert interviews |
| | It is easy for the customer to locate necessary information from the cash flow forecast and understand its meaning (LOCAT1) | LIKERT 1-7 | Goodhue and Thompson (1995) , Expert interviews |
| | The information needed for the cash flow forecast is easy to locate and understand (LOCAT2) | LIKERT 1-7 | Goodhue and Thompson (1995) , Expert interviews |
| Usage | What proportion of the clientele is offered cash flow forecasts (UTIL) | Percentage (10% intervals) | Expert interviews |

## METHODOLOGY

To test the hypotheses, we decided to formulate a survey and use quantitative methods for analysing the results. The survey was built using both practical and theoretical knowledge. First, preliminary expert interviews were conducted with accounting professionals, cash flow forecasting solution providers, and representatives from companies which used cash flow forecasting services. The results of these interviews were reflected with the information systems theories of technology adoption and usage and used for the development of the survey. Before sending out the survey, it was pilot-tested with two accounting professionals and two academics. Based on the received feedback the questions and structure were revised.

The two main constructs in our study, integration and task-technology fit, are formulated as reflective constructs. Reflective constructs (as opposed to formative constructs) are manifestations of the unobservable constructs and are interpreted as causing the changes in the observed items (Petter et al. 2007). The dependent variable, usage of cash flow forecasting systems, is formulated as a single item. Where feasible, we used the existing items from earlier research to formulate the constructs (see table above for details). To analyse the data, we use structural equation modelling (SEM), more specifically, LISREL 8.80. The use of SEM poses somewhat tight restrictions on the data sample; we will address these issues in the next section.

Accounting firms offer financial services, especially, to SME sector. In our study, we are interested in exploring the link between integration of accounting information systems to usage of cash flow forecasting. Therefore, we decided to use accounting firms as informants to the survey. We asked the accounting firm to project one of its clients when responding to the questions in the survey that related to customer specific information. In this way, we ensured that the projection contained information of only one client, attributing to the improved validity of the responses.

## EMPIRICAL STUDY

In order to test the propositions, we conducted a survey among Finnish accounting firms and received 108 responses out of 580 recipients, yielding a response rate of 19%. All the participants of the survey had an accounting certificate from the National Accounting Federation of Finland to ensure an adequate level of knowledge to answer the questions. The survey was provided online and the participants were approached with an email. To increase the motivation for participation, a lottery of accounting related prizes were offered for all respondents. Additionally, reminder emails were sent during the online time frame of the survey.

Table below (Table 2) shows the respondents' demographic information. The results show that most of the respondents were female (71%) between 40 and 60 years old (79%). The most common job description was entrepreneur (72%) which is also supported by the number of employees: little under half (41%) worked as single-person companies and one third (34%) had between 2 and 5 employees. Revenue figures showed that more than half (61%) of the respondent accounting companies made less than 200,000€ per year, and only 10% over 1,000,000€ per year.

Table 2. Demographics of the respondents (accounting firms)

| Demographic variables | | Sample composition (N = 108) | |
|---|---|---|---|
| **Gender** | | **Number of employees** | |
| Male | 31 (29%) | 1 | 44 (41%) |
| Female | 77 (71%) | 2 – 5 | 37 (34%) |
| **Age** | | 6 - 10 | 9 (8%) |
| Under 30 | 2 (2%) | 11 - 20 | 9 (8%) |
| 31 – 40 | 11 (10%) | 21 - 50 | 5 (5%) |
| 41 – 50 | 41 (38%) | 51 - 100 | 2 (2%) |
| 51 – 60 | 44 (41%) | 101 - 200 | 1 (1%) |
| Over 60 | 10 (9%) | Over 200 | 1 (1%) |
| **Job description** | | **Revenue** | |
| Entrepreneur | 78 (72%) | Under 200,000 € | 66 (61%) |
| Top management | 12 (11%) | 200,000 – 500,000 € | 19 (18%) |
| Middle management | 4 (4%) | 500,000 – 1,000,000 € | 12 (11%) |
| Specialist | 14 (13%) | 1,000,000 – 2,000,000 € | 5 (5%) |
| | | 2,000,000 – 5,000,000 € | 1 (1%) |
| | | 5,000,000 – 10,000,000 € | 3 (3%) |
| | | Over 10,000,000 € | 2 (2%) |

**Data analysis**

Based on the two-step approach recommended by Anderson and Gerbing (1988), we first analysed the measurement model to ensure the reliability and validity of our research instrument and then analysed the structural model to test our research model. We used LISREL 8.80 in our analyses. According to Gefen et al. (2000), at least 100-150 respondents are needed to conduct the SEM using LISREL. We had 108 respondents so we acknowledge the limitations of our sample size. However, the model in itself is very simple, including only three constructs (one being a single item construct). In the final model, in total 18 parameters were estimated, yielding an adequate ratio of data per parameter estimates at 6 (108/18) with communalities between 0.45 and 1.00 (MacCallum et al. 1999). Therefore, we conclude that, although our sample is relatively small, SEM can be used to analyse the data.

**Measurement model**

First, we conducted a confirmatory factor analysis (CFA) to ensure the reliability and validity of the constructs (including convergent validity and discriminant validity). Convergent validity shows whether each factor can be reflected by its own items (Campbell and Fiske 1959; Gefen et al. 2000). Table below depicts the standardized item loadings, t-values, average variance extracted (AVE), composite reliability (CR), and Cronbach's Alpha values. As shown in the table, most item loadings were larger than 0.7 and significant at 0.001. All AVEs, CRs, and Alphas exceed the recommended threshold values of 0.5, 0.7, and 0.7, respectively (Bagozzi and Yi 1988; Gefen et al. 2000; Nunnally 1978). The measurement model, therefore, shows good convergent validity and reliability. In the course of building the measurement model, we dropped two items from the integration construct (INT4 and INT5) as they did not qualify as determinants of the construct.

Table 3. Measurement model

| Construct | Item | Standardized loading | t-value | Communalities (squared loading) | AVE | CR | Alpha |
|---|---|---|---|---|---|---|---|
| Usage | UTIL | 1.00 | 14.63 | 1.00 | 1 | 1 | single item |
| Integration | INT1 | 0.72 | 7.90 | 0.52 | 0.634 | 0.835 | 0.816 |
| | INT2 | 0.97 | 11.34 | 0.94 | | | |
| | INT3 | 0.67 | 7.27 | 0.45 | | | |
| TTF | QUAL1 | 0.73 | 8.21 | 0.53 | 0.601 | 0.857 | 0.855 |
| | QUAL2 | 0.74 | 8.48 | 0.55 | | | |
| | LOCAT1 | 0.82 | 9.70 | 0.67 | | | |
| | LOCAT2 | 0.81 | 9.51 | 0.66 | | | |

Discriminant validity reflects whether two constructs are statistically different (Campbell and Fiske 1959; Gefen et al. 2000). To test the discriminant validity of our constructs, we calculated the square root of AVE for each construct and compared it to the correlation coefficients of the constructs. Table below (Table 4) shows that, for each construct, the square root of AVE was larger than its correlation coefficients with other factors. Therefore, the scales had good discriminant validity (Boudreau et al. 2001; Fornell and Larcker 1981).

Table 4. Discriminant validity. Square roots of AVE on diagonal.

| | Usage | Integration | Data quality |
|---|---|---|---|
| Usage | **1** | | |
| Integration | 0.169 | **0.796** | |
| Data quality | 0.320 | 0.321 | **0.775** |

The fit between the data and the proposed measurement model can be tested with a chi-square goodness-of-fit (GFI) test where a probability greater than or equal of 0.9 indicates a satisfactory fit (Hu and Bentler 1999). The

GFI calculated was 0.952. Therefore, the measurement model demonstrated good fit of the data. In addition to the GFI, a number of other measures generated by LISREL were used to evaluate the goodness-of-fit of the measurement model (Chau 1996) including chi-square/degrees of freedom ratio, Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA). The table below lists the recommended values of various measures of model fit as suggested by Segars and Grover (1993) and readapted by Chau (1996). All goodness-of-fit values show good model fit.

Table 5. Fit indices for measurement and structural model

| Measure of model fit | Measurement model | Structural model | Recommended value |
|---|---|---|---|
| Chi-square | 21.81 | 22.23 | - |
| Degrees of freedom | 18 | 19 | - |
| Chi-square / df | 1.21 | 1.17 | < 2 |
| Goodness-of-fit index (GFI) | 0.952 | 0.951 | > 0.9 |
| Normed Fit Index (NFI) | 0.949 | 0.948 | > 0.9 |
| Non-normed Fit Index (NNFI) | 0.983 | 0.986 | > 0.9 |
| Comparative Fit Index (CFI) | 0.989 | 0.990 | > 0.9 |
| Root Mean Square Error of Approximation (RMSEA) | 0.045 | 0.040 | < 0.08 |

**Structural model**

The causal structure of the proposed research model was tested using structural equation modelling (SEM). The results are shown in the figure below (Figure 3). We find significant t-values to the two hypotheses in our research model. The goodness-of-fit indices show good model fit overall. The actual structural model and the recommended values of fit indices are listed in the previous table (Table 5).

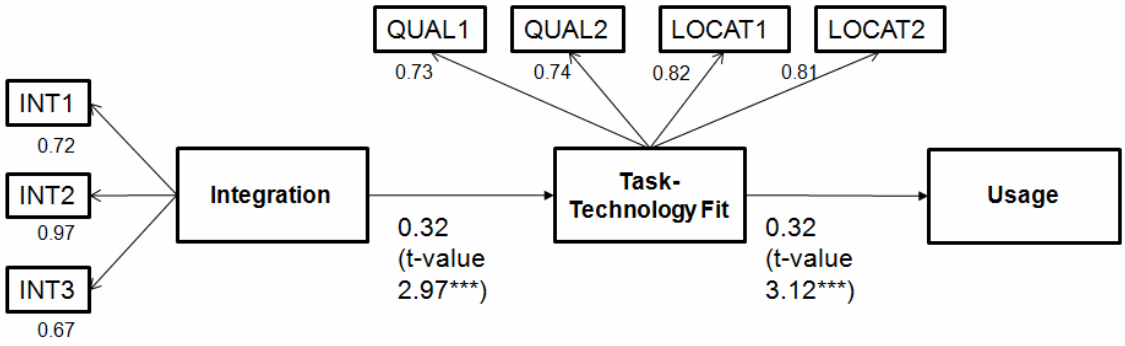


Figure 3: Main findings (Note. *** p < 0.01, df = 19)

**Cash flow forecasting tools**

In the questionnaire, we asked the accounting firms (respondents) to cite the tool that they use for making cash flow forecasts to the customer companies. In the case that the accounting firm did not provide cash flow forecasting services, the respondent was advised to answer which tool she would be most likely to use. Going through the answers, we categorized the tools into three groups: spreadsheet, own solution, and commercial. Spreadsheet tools were tools based on general spreadsheet programs. Own solution means that the accounting firm had developed a proprietary system for creating the cash flow forecasts. Commercial means that the accounting firm had purchased a third party software or solution for making the forecasts.

We grouped the accounting firms into three categories based on the level of usage. First, we identified accounting firms that did not offer cash flow forecasting services to their customers. We named this group as “non users”. Second, we identified firms that offered cash flow forecasting services to up to 10 percent of their

customer base. We named this group as "ad hoc users". Finally, we identified firms that offered cash flow forecasting services to more than 10 percent of their customers. We named this group as "frequent users".

Table below (Table 6) shows the summary of different cash flow forecasting tools for these groups. Intuitively, frequent users employ more commercial software for the forecasts. However, the use of spreadsheet programs is the most common way of providing the forecasts. Additionally, we can assume that non users are unfamiliar with commercial solutions as enablers of cash flow forecasting services, as they prefer spreadsheet solutions.

Table 6. Summary of cash flow forecasting tools

| Solution type | All (N=108) | Non users (N=48) * | Ad hoc users (N=38) | Frequent users (N=22) |
|---|---|---|---|---|
| None | 26 (24%) | 25 (52%) | 1 (3%) | 0 (0%) |
| Spreadsheet | 52 (48%) | 19 (40%) | 26 (68%) | 7 (32%) |
| Own solution | 8 (7%) | 2 (4%) | 3 (8%) | 3 (14%) |
| Commercial | 22 (20%) | 2 (4%) | 8 (21%) | 12 (55%) |

* Non users group was to answer which would be the most likely solution.

When taking a closer look at the commercial systems, we find that the most popular software were based on cloud services with efficient integration interfaces to the most common book-keeping systems. We interpret this as a further support for our hypothesis that systems that exhibit high level of integration translate to higher usage rates. In the context of accounting information systems, the main draw-back of non-cloud services (such as traditional deployed software) is the high level of granularity of the systems and the resulting limited integration between the separate systems addressing specific accounting tasks.

## DISCUSSION AND CONCLUSIONS

In this paper, we set out to explore the link between integration and usage of cash flow forecasts in accounting information systems. Based on the theories of technology acceptance and usage, we formulated a conceptual framework linking integration to usage mediated by the task-technology fit construct. We conducted a survey among accounting firms and used structural equation modelling to test the model. Concerning the measurement model, the integration construct comprised of three items, highlighting the importance of cloud services, automation of information exchange, and systems integration. For the task-technology fit construct, the model included two items on data quality and two items on locatability of data.

As a result of the path analysis, we found significant effect of integration on task-technology fit construct as well as of task-technology fit on usage of cash flow forecasting services. In addition, we explored the effect of task-technology fit on performance indicators but found no support for this. In our future research, we will take a closer look at performance issues.

Our study has its limitations. First, the sample consists of 108 usable responses, enabling the use of simple structural equation models. As a result, we decided to take a somewhat narrow focus on the integration construct, not including other determinants of enterprise system benefits. Going forward, we plan to collect more data to enable the use of more elaborate structural equation models and to incorporate performance indicators to the model allowing a more holistic view. Second, the respondents to the survey were accounting firms and we asked them to project one of their clients on issues related to cash flow forecasting services. Demand from customer companies is used in our study as a proxy for the use of forecasting services. While the setup of the study is somewhat complicated including answers by the accounting firms projecting the customer company, we argue that the findings shed light on the importance of integration in the usage of cash flow forecasting tools. In our future research, we plan to conduct interviews at the customer companies to get more accurate insights on the actual usage of these forecasts.

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