TOO MUCH OF A GOOD THING? THE EFFECT OF INTERNAL CONTROL MONITORING SYSTEM ALERTS ON USER PERCEPTIONS OF TASK-TECHNOLOGY FIT

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Dedication

To my parents, Eduards Kokins and Natalija Kokina.

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by

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Abstract

Anecdotal and field study evidence points to both positive and negative effects of alerts produced by technology-enabled internal control monitoring systems (ICMS) (Alles et al. 2006, 2008; Debreceny et al. 2003, 2005; Perols and Murthy 2012). An important unanswered question is how those alerts impact users who process them and decide whether any corrective action should be taken. In this study I surveyed financial executives and accounting professionals to examine the impact of alerts on user perceptions of task-technology fit (TTF) (Goodhue and Thompson 1995). Alerts generated by ICMS can bring to the attention of company leadership indications of errors, exceptions, suspicious activity, or fraud, which can lead to improved decision-making and achievement of more efficient and effective operations. Moreover, greater frequency of alerts enables timely identification of irregularities which can result in more favorable user perceptions of TTF. However, too many alerts can diminish user perceptions of TTF due to information overload experienced by users who process the alerts. I also examine whether perceived user resources alleviate the negative effect of information overload. The results of this study indicate that accounting professionals who would receive more alerts are likely to experience higher information overload. However, availability of resources such as authorization, necessary knowledge, time, financial resources, available assistance and documentation is shown to decrease information overload associated with the large quantities of automated alerts. The results of this study should be of interest to regulators such as the Committee of Sponsoring Organizations of the Treadway Commission (COSO) as it continues to emphasize the critical role of technology and the associated fraud risks in the current business environment. Also, the results should be useful to the senior leadership and internal auditors of public and private companies as they make ICMS adoption and implementation decisions.

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Chapter 1: Introduction

This study investigates how the alerts generated by technology-enabled internal control monitoring systems (ICMS) influence user perceptions of information overload and Task-Technology Fit (Goodhue and Thompson 1995). Internal control monitoring systems are used by many organizations to strengthen risk management and control activities (Deloitte 2010). Moreover, an effective internal control environment is required by the Sarbanes-Oxley Act of 2002 (SOX), the Federal Sentencing Guidelines, and the Foreign Corrupt Practices Act of 1977. To ensure the establishment and maintenance of effective internal control systems, organizations are required to adopt a framework and to identify that framework in the management letter of the annual report (McNally 2013). Most have adopted the framework developed by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) (Pfister 2009; McNally 2013), which consists of five components: control environment, risk assessment, control activities, information and communication, and monitoring (COSO 2013). The monitoring of internal controls is designed to ensure that each control supporting the other four components are functioning properly (COSO 2013). Monitoring can be achieved through periodic and ongoing evaluations that can be both manual and/or computerized. Ongoing evaluations in which a technology application performs the control by evaluating *all* controls, transactions, and processes in real time is termed "continuous monitoring." Technology-enabled internal control monitoring has been an important growing area in today's business environment because technology makes it possible to evaluate controls more frequently, thereby improving the timeliness of error, exception, and fraud detection (FERF 2010).[1]

[1] A recent report released by PricewaterhouseCoopers notes that 50 percent of participating organizations reported that they performed continuous monitoring (PwC 2013). Moreover, almost 90 percent of organizations in the top 5 percent (i.e., organizations that stand out as high performing in risk management and internal audit) reported the use of continuous monitoring (PwC 2013).

Academic studies in the area of internal control monitoring mostly take a *technology* perspective because they examine how to enhance the functionality of technology to match business risks with appropriate alarms (Alles et al. 2006, 2008; Debreceny et al. 2003, 2005), or help create a technology architecture that can process large quantities of the generated alarms (Perols and Murthy 2012). An important overlooked area is the *user* perspective. It is essential to empirically examine how the alerts generated by technology-enabled ICMS are viewed by users who manually evaluate and process detected exceptions and use their judgment in determining whether corrective actions should be taken.[2] Although Alles et al. (2006, 2008), Debreceny et al. (2003, 2005), and Perols and Murthy (2012) raise the issue of the large number of alerts that these systems generate, it is unclear how often users expect to receive the alerts and whether the users perceive the quantity of the alerts to be a barrier to the optimal system use. Also, it is unclear whether organizational and personal resources alleviate the negative effect of perceived information overload. Because system-generated alerts guide the judgment and decision-making process at different levels within organizations, it is crucial to understand the nature of the user-system interactions through computerized alerts.

Research examining the use of technology-enabled decision aids documents both positive and negative effects on their users. Some studies find that the use of technology-enabled decision aids positively impacts decision-making ability, decision quality, decision consistency and efficiency of professionals (O'Leary 1987; Sutton and Byington 1993; Mascha and Smedley 2007). Similarly, alerts generated by ICMS can bring to the attention of company leadership indications of errors, exceptions, suspicious activity, or fraud which can lead to improved decision-making and achievement of more efficient and effective operations. Moreover, greater

[2] Following Debreceny et al. (2003), an alert consists of three elements: software (1) compares transactions against predetermined benchmarks, (2) copies transactions to a file, and (3) delivers the outcome to evaluators (171).

frequency of alerts enables timely identification of irregularities (Pathak et al. 2005; Groomer and Murthy 2003).

On the other hand, studies have reported that larger amounts of information negatively impacts the use of decision aids by experienced users (Schick et al. 1990) and that repeated exposure to exception messages can cause users to decrease attention paid to the message due to habituation effects (Amer and Maris 2007). The large number of detected anomalies from frequent monitoring can create information overload, which may diminish the efficiency and effectiveness of the ICMS (Debreceny et al. 2003, 2005; Alles et al. 2006, 2008; Perols and Murthy 2012).

This study contributes to the continuous auditing / continuous monitoring literature by addressing the call by Kogan et al. (1999) and Vasarhelyi et al. (2004) for additional research regarding alarm accuracy, alarm use and interpretation of the information supplied by the alarm.

To assess user perceptions of alerts, I develop a theoretical model of how 1) frequency of ICMS alerts, 2) perceived information overload, and 3) availability of user resources to modify alert frequency influence user perceptions of Goodhue and Thompson's (1995) Task-Technology Fit (TTF). Frequency refers to how often the ICMS users would receive alerts from various areas within the accounting cycle. The information overload refers to user inability to process large quantities of information in a timely manner due to working memory limitations (Rose et al. 2004; Hunter and Goebel 2008). Perceived user resources capture the extent to which ICMS users believe they have the resources needed to modify the frequency with which the ICMS generates alerts (Mathieson et al. 2001). Task-Technology Fit assesses whether the ICMS alerts meet user needs for the current status of internal control effectiveness in the organization. The model extends accounting information systems literature by incorporating perceived information overload as a mediating variable in the Task-Technology Fit model to demonstrate the negative effect of overabundance of information supplied by technology. The model also extends the literature by including user resources as a construct that reduces information overload.

Other theories that have been used in this area do not assess how users evaluate their interaction with the system through alerts or notifications (c.f. The DeLone and McLean Model of Information System Success (DeLone and McLean 1992, 2003), Theory of Cognitive Fit (Vessey 1991), and the Cognitive Load Theory (Sweller 1988)). It is important to assess user evaluations of alerts because, as Alles et al. (2008) note, the main concern does not lie with the functionality of the system but with the *user* whose attention to the alerts might be limited due to the overwhelming quantity of alerts. This limited attention, in turn, might "undo the objective of automation in the first place" (Alles et al. 2008, 205).

For example, theories that address information system success (e.g., DeLone and McLean's (1992, 2003) Model of Information System Success) focus on the organizational benefits such as cost savings, additional sales, and time savings associated with system use. Also, models examining the concept of fit (e.g., Theory of Cognitive Fit (Vessey 1991)) study individual benefits associated with the presentation of information in graphs as opposed to tables. Furthermore, Sweller's Cognitive Load Theory (1988) focuses on the improved learning process resulting from more congruent presentation of information. Perceived information overload as an extension of the Task-Technology Fit model is a more appropriate measure because the focus of the current study is not on the presentation of information but on the limitations imposed on the user by the quantity or frequency of alerts.

To test the model, I collect and analyze survey data from the managers and executives of a diverse cross-section of organizations who expect to receive ICMS alerts as part of the periodic or ongoing evaluations of internal control system effectiveness. The survey is conducted in collaboration with the Financial Executives Research Foundation which is the research affiliate of Financial Executives International.

The results of this study should be of interest to regulators such as the Committee of Sponsoring Organizations of the Treadway Commission (COSO) as it continues to emphasize the critical role of technology and the associated fraud risks in the current business environment. The results should also be useful to the senior leadership and internal auditors of public and private companies as they make decisions about ICMS adoption and implementation. The findings could serve as guidelines for organizations to evaluate whether their internal control monitoring systems meet the needs of their stakeholders. Also, the results should be relevant and provide insight to software vendors and developers.

Chapter 2: Background, Theory and Hypotheses Development

2.1 Legislation

The COSO Framework defines internal control as “a process, effected by an entity’s board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in the following categories: effectiveness and efficiency of operations, reliability of reporting, and compliance with applicable laws and regulations” (COSO 2013, 1). There are several pieces of legislation in which internal controls serve as key elements. The Foreign Corrupt Practices Act of 1977, which was enacted in order to prevent unlawful payments to foreign government officials in exchange for favorable treatment in business transactions, requires organizations whose securities are listed on the US stock exchanges to design and maintain a system of internal accounting controls (FCPA 2004). Further, the Federal Sentencing Guidelines address criminal conduct of corporate management. Chapter Eight of the guidelines provides a broad framework on how organizations can promote ethical conduct and compliance with the law. The guidelines state: “The organization shall take reasonable steps to ensure that organization’s compliance and ethics program is followed, including monitoring and auditing to detect criminal conduct” (USSG 2012). Finally, the Sarbanes-Oxley Act of 2002 (Sec. 302; Sec. 404) assigns the responsibility to company management for establishing, maintaining and evaluating internal controls. Moreover, corporate officers must indicate in a report whether or not any significant changes affecting internal controls took place in their organization. Finally, companies are required to disclose certain material changes on a real-time or current basis.

2.2 COSO Framework and Internal Control Monitoring

To ensure the establishment and maintenance of effective internal control systems, most organizations have adopted the framework developed by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) (Pfister 2009). According to the COSO framework, there are five components of internal control: control environment, risk assessment, control activities, information and communication, and monitoring activities (COSO 2011). Refer to Figure 2.1 for the visual representation of the Framework. Control environment refers to the tone at the top through which organizational leadership exemplifies its dedication to ethical values and serves as a foundation of organization's system of internal controls. Risk assessment is a process of identifying risks that could prevent an organization from achieving its objectives. Control activities are actions formalized in policies and procedures that are designed to mitigate the risks identified through risk assessment. Information and communication address the fact that in order to carry out internal control duties, an organization must obtain relevant and reliable information to be communicated to all employees.

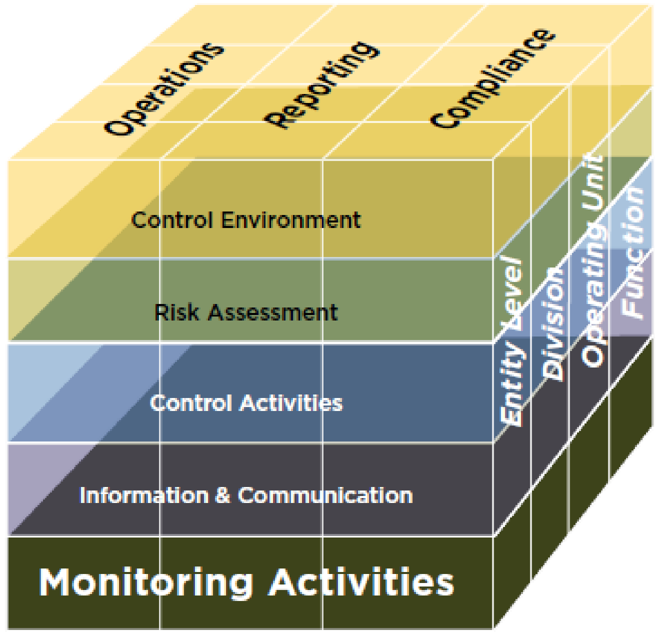

Figure 2.1: The COSO Framework (*Source:* COSO (2011, 108))

Monitoring activities are the fifth and final component of the Framework. They are designed to determine if all the components of the Framework are present and functioning as intended, providing assurance that internal controls continue to operate efficiently and effectively. More importantly, monitoring activities assist in determining the relevance of existing controls to current as well as new risks, and timely communication of any noted deficiencies to those responsible for taking corrective action (COSO 2009).

Monitoring activities can be performed as separate or ongoing evaluations, or a combination of both. Separate evaluations refer to periodic checks that are not built into the routine operations of the organization. Separate evaluations occur with varying frequencies depending on management's judgment of risks involved and the importance of the processes to the organization. Ongoing evaluations, on the other hand, refer to routine monitoring activities that are built into the operations of the organization. Ongoing evaluations include "regular management and supervisory activities, peer comparisons and trend analysis using internal and external data, reconciliations, and other routine actions" (COSO 2009, 12). Both separate and ongoing evaluations can be performed manually (by a user) or with the help of software (automated). Manual processes require human involvement to actually perform an internal control using information that is supplied by the software. In manual separate evaluations, an employee evaluates a control with varying frequencies *after* the control, the transactions or the processes take place (ISACA 2010). In manual ongoing evaluations, the employee uses software *every* time a control operates and approves *every* change to that software (ISACA 2010). In automated separate evaluations, software periodically performs integrity checks (i.e., every N transactions or after X amount of time). Automated ongoing evaluations are also termed continuous monitoring because the software performs internal controls by evaluating all controls, all transactions and all processes in real time (e.g., the software checks transactions against baselines and flags transactions with conflicts) (ISACA 2010). The main benefit associated with the continuous control monitoring is that it often offers the first opportunity to identify and remedy control deficiencies. For example, continuous monitoring software can flag invalid transactions and prevent further processing (ISACA 2010). Figure 2.2 provides an overview of manual and automated internal control monitoring in two areas: separate evaluations and ongoing evaluations.

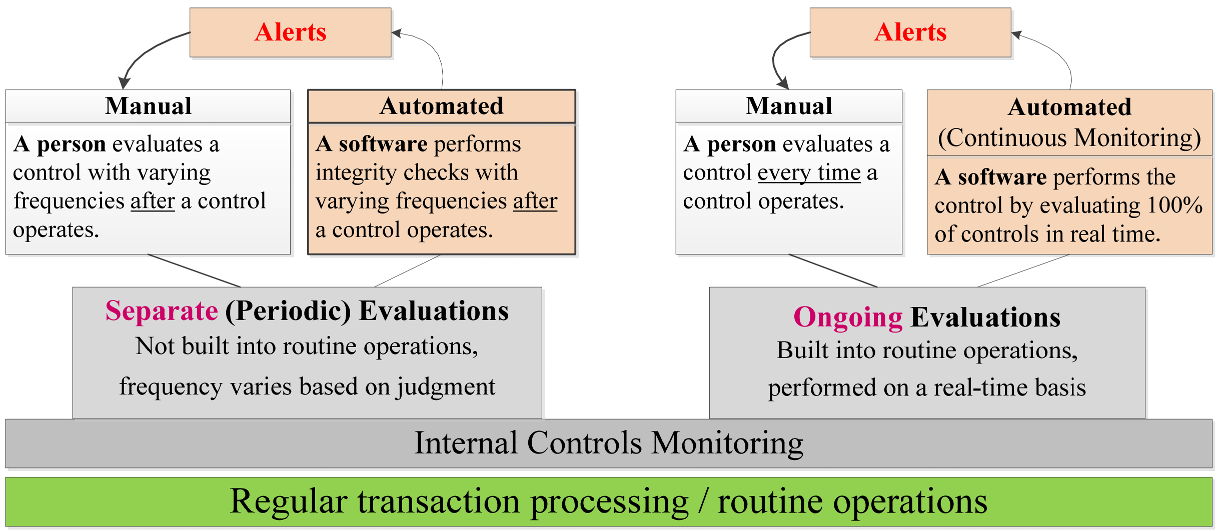

Figure 2.2: Internal Control Monitoring

When automated internal control evaluations are used, the software generates an automated alert or alarm to inform the user, an employee responsible for evaluating controls, of uncovered deficiencies. Vasarhelyi and Halper (1991, 117) define the alert as "an attention-directing action triggered, for example, when the value of a metric exceeds the standard". More specifically, Debreceny et al. (2003) define an alert as one consisting of three elements: (1) software compares transactions against predetermined benchmarks, (2) copies transactions to a file, and (3) delivers the outcome to evaluators. Figure 2.2 displays alerts as a product of automated evaluations delivered to those persons responsible for taking corrective action. Alerts can be delivered to the end users by e-mail, through a dashboard, or they can be printed in the form of reports (Kuhn and Sutton 2010; Byrnes et al. 2012).

Finally, it is important to note that the alerts can be a part of two separate but related processes: continuous auditing/continuous assurance, or continuous monitoring. Both continuous auditing (CA) and continuous monitoring (CM) are automated ongoing evaluations of internal controls. The main difference between the two is that CM "enables *management* to continually review business processes for adherence to and deviations from their intended levels of performance and effectiveness" while CA "enables *internal audit* to continually gather from processes data that supports auditing activities" (Deloitte 2010, 2). Moreover, CM can be valuable to organizations in a variety of ways that include improved governance, risk management, and compliance achieved through improved performance, cost reduction, strengthened internal controls, and more efficient and effective business processes (FERF 2011). Also, it is important to note that currently even small or medium-size organizations can employ CA/CM techniques (Dull 2014).

From the technology perspective, both ongoing and periodic evaluations for automated control monitoring can be conducted using software built into an ERP information system which is referred to as Embedded Audit Modules (EAM) (e.g., SAP), or using external software modules called Monitoring Control Layers (MCL) (e.g., Approva) (Kuhn and Sutton 2010). To achieve "organic design and implementation", it is desirable that automated control monitoring is built into business processes at the system's inception in contrast to installing bolt-on monitoring components after the fact (FERF 2011, 20). Despite the differences in the design of the software applications used for automated control monitoring, they are all set up to automatically notify the user of rule violations through alerts. Because of the similarities in the notification methods through alerts among the different software applications, the alerts contain many common characteristics and pose similar challenges to the users.

2.3 Studies on Internal Control Monitoring Alerts

Vasarhelyi and Halper (1991) divide the monitoring process into three essential components: (1) Measurement, (2) Monitoring, and (3) Analysis. Measurement and monitoring components focus on *technology* development while the analysis component places attention on the technology *user* or alert recipient who decides if there is a need for further review or corrective action. Specifically, measurement refers to the generation of reports with various metrics. Monitoring is the process of comparing those metrics to the standards and generating alerts when discrepancies occur. Finally, analysis involves alert review and investigation, if necessary, by management, auditors, or other alert recipients.

Following the three components of monitoring, research in the area of internal control monitoring has mainly taken a *technology* perspective because it has focused on enhancing the functionality of technology to enable and streamline the monitoring process. Specifically, research has focused on presenting the methodology for automated control monitoring (Groomer and Murthy 1989), providing insight into the actual implementation of the monitoring technology in various organizations (e.g., Vasarhelyi and Halper 1991; Alles et al. 2006, 2008), developing audit modules that match business risks with appropriate alarms (e.g., Debreceny et al. 2003, 2005), designing procedures for continuous auditing in a well-known historical financial fraud case (e.g., Kuhn and Sutton 2006), or creating a technology architecture that can process large quantities of the generated alarms (e.g., Perols and Murthy 2012). Also, because automated monitoring of internal controls is a developing area, several studies provide a roadmap for future research highlighting issues of critical importance (e.g., Kogan et al. 1999; Brown et al. 2007; Kuhn and Sutton 2010). Overall, studies examining internal control monitoring technology emphasize the importance of alerts built into the system and the crucial role the alerts play in influencing the scope and the capacity of the audit (Alles et al. 2004, 190).

Groomer and Murthy (1989), one of the earliest papers in the area of automated control monitoring, present an approach to address various control and security risks. The authors describe a “pre-alert” environment in which Embedded Audit Modules stored encountered errors in tables that were periodically accessed by auditors. At the time of the Groomer and Murthy (1989) publication the main concerns associated with automated control monitoring were technology-related: adverse system performance, substantial overhead attributable to running the control checks, and costly online storage.

Subsequent research provides insight into several real-world implementations of monitoring technology. Vasarhelyi and Halper (1991) discuss automated alerts that were designed as part of the implementation of a Continuous Process Auditing System in the internal audit department at AT&T. This system was designed to perform analyses of actual data, compare them to the standards, and send alerts when it encountered discrepancies. The authors suggest implementing several levels of alerts that are differentiated based on risk: from level 1 alerts, pointing to system functionality issues, to level 4 alerts warning top management of a significant crisis. Because it was an early paper in the area of CA/CM, the authors suggested that more research was necessary on the best practices in CA/CM implementation in the context of internal and external audits. Alles et al. (2006) describe the implementation of automated internal control monitoring at the Siemens Corporation. The authors state that the frequency (e.g., daily, hourly) with which the system compares the business process control settings with the benchmarks is a critical parameter of the monitoring system. Kuhn and Sutton (2006) design an automated control monitoring methodology that could have detected the fraudulent transactions in WorldCom. Alles et al. (2008) note that even though initially they believed that more efficient external audits would drive the adoption of continuous auditing, the main reason for Siemens' adoption was operational—expected labor savings due to automation. They conclude that in order for continuous auditing to be effective, it has to be introduced as a profit driver that can accommodate the needs of management and assurance needs.

Debreceny et al. (2003) address the process of designing and building of alerts. The authors emphasize the importance of setting appropriate thresholds to ensure the effectiveness and efficiency of alerts. Also, they discuss the need for a balance between the two risks: risks of incorrect acceptance and risks of incorrect rejection. To demonstrate the process of alert creation, the authors develop ten examples of alerts that address various types of fraud risks in firm-level business processes. Debreceny et al. (2003, 183) call for future research to examine alerts from a user perspective by assessing the ability of users "to respond to the results of the alerts within a normal work environment". Debreceny et al. (2005) test several Embedded Audit Module (EAM) alerts in various Enterprise Resource Planning environments in order to gain insight into implementation challenges. The study finds that although EAMs are technically feasible, significant improvements needed to be made in the development of generic EAM tools that could be easily adapted to different organizations. Perols and Murthy (2012) address the issue of exception processing by proposing more sophisticated technology—continuous assurance fusion which is an architecture for continuous assurance that has the capacity to detect, aggregate, and analyze exceptions.

An important overlooked area of internal controls' research is an empirical examination of the *user* perspective. Alert users analyze the alerts and decide if there is a need for further review or corrective action. Kuhn and Sutton (2006, 78) state: "automated continuous assurance does not eliminate the human component as interpretation of information still exists, but rather shifts the auditor's role to a certain degree as the auditor must learn how to sift through audit alerts, identify alerts that detect real problems, and determine appropriate follow-up procedures for unusual events detected on a continuous basis". In a similar vein, Brown et al. (2007, 2) state: "similar to traditional auditing or assurance practices, the evidence gathered from continuous auditing must ultimately be interpreted by people with requisite levels of judgment".

Several studies bring to the forefront the issue of potential information overload associated with the use of automated alerts. While Debreceny et al. (2005) emphasize the beneficial use of embedded audit modules in enterprise resource planning environments, they state that information overload is a concern associated with improperly designed queries. They highlight the negative effects of overload on user effectiveness as well as system performance. Alles et al. (2006) also state that effective management of system alarms is often not addressed by software developers, delaying the adoption of continuous monitoring systems in the marketplace. Moreover, Alles et al. (2006, 160) emphasize their "… study identifies the management of audit alarms and the prevention of the alarm floods as critical tasks in the CMBPC [continuous monitoring of business process controls] implementation process". Alles et al. (2008) also reemphasize that it is crucial to address the issue of "alarm floods." According to Alles et al. (2008, 205), the main concern does not lie with the functionality of the system but with the *user* whose attention to the alerts might be limited due to the overwhelming quantity of alerts. This limited attention, in turn, might "undo the objective of automation in the first place". Also, the authors argue that even in the best organizations, alarm floods might exist due to the complexity of the ERP system and the changing nature of the modern business environment. Finally, Alles et al. (2008, 205) state: "The process for handling alarms is clearly a very complex subject that warrants further research, and the insight into the role of alarms in CA is an important finding from the Siemens project". Perols and Murthy (2012, 36) identify information overload as a critical issue associated with continuous assurance. The authors note that "although the implemented continuous assurance systems were effective in detecting anomalies, there were simply too many anomalies generated for the users to process, leading to information overload. Thus, "to the extent that the task of aggregation and analysis of detected exceptions is left to humans, the overall effectiveness and efficiency of any continuous auditing system will be limited".

Studies presenting the roadmap for research in the area of continuous auditing and monitoring highlight the areas that future research should address with regard to automated alerts. Kogan et al. (1999) propose research to examine the difficulties in alarm interpretation and evaluation. The authors encourage rigorous investigation of behavioral changes and cognitive effects resulting from continuous online auditing. Specifically, the authors call for future research to examine whether higher frequency auditing produces information overload experienced by the users who analyze the output of continuous auditing software (Kogan et al. 1999, 99). Brown et al. (2007) further state that future research should focus on examining actual implementations of automated control monitoring in organizations in order to identify the most successful technologies and refine monitoring methodologies and theories. Brown et al. (2007) state that future research should examine human and organizational behavior changes associated with CA/CM adoption. They emphasize that CM as a system of management control inevitably impacts its users. Furthermore, Kuhn and Sutton (2006) urge researchers to apply existing information processing theories to examine the role of information overload in the automated control monitoring environment. Finally, Kuhn and Sutton (2010) outline a number of challenges for future research among which is a recommendation for future research to examine how users cope with "alert flood."

2.4 Advantages of Frequent Information Delivery

Various studies document increased market demand for more frequent reporting to better meet users' needs for timely information (e.g., Elliott 2002; Rezaee et al. 2002; Alles et al. 2002). Extant research documents various benefits of timely information achieved through more frequent financial reporting and disclosure. Overall, more frequent information delivery makes the information more timely and, therefore, more valuable to users. An experimental study of auditors, controllers, investors, and sell-side analysts conducted by Hunton et al. (2007) finds that a transition from quarterly to monthly and daily reporting cycle is likely to reduce management's use of discretionary accruals, improve earnings quality, lower the cost of capital, and increase the overall decision usefulness of financial information. Debreceny and Rahman (2005) analyze announcements of 334 corporations on stock exchange websites over a period of 15 months. They find that higher frequency of online disclosure by organizations positively associates with agency costs, earnings, and analyst following. Fu et al. (2012) examine how the frequency of issued financial reports affects the decision-making of organizational stakeholders. To study the issue, the authors collect interim reporting frequency data for the period 1951-1973. During this time period the SEC only required semi-annual reporting, yet many companies chose to report quarterly. The results of the study indicate that organizations with greater frequency of reporting enjoy lower information asymmetry and lower cost of equity. Also, Sankaraguruswamy et al. (2013) find that organizations with more frequent news releases achieve lower information asymmetry which is expressed in increased trading by uninformed investors.

2.5 Advantages of Technology-Enabled Decision Aids

Another stream of research has focused on the benefits of acquiring timely information with the help of technology and technology-enabled decision aids. Masli et al. (2010) study archival data to examine the potential favorable impacts of auditee-adopted internal control monitoring technology related to SOX compliance on external assurance outcomes. By conducting keyword searches of public sources, they identify 152 companies that announced implementation of such technology from 2003-2006. The findings of the study indicate that companies that implement internal control monitoring technology enjoy such benefits as stronger internal controls due to lower occurrence of material weaknesses and increased external audit timeliness and efficiency compared to the other companies in the study.

Similarly to audit decision aids described by Dowling and Leech (2007), an internal control monitoring alert is a decision aid because it transforms data into information in the form of a notification to assist the user in the identification of risks. Therefore, it is relevant to mention studies examining the benefits of the use of technology-enabled decision aids. Studies in this area find that the use of technology-enabled decision aids positively impacts decision-making ability, decision quality, decision consistency and efficiency of professionals (O'Leary 1987; Sutton and Byington 1993).

2.6 PERCEIVED TASK-TECHNOLOGY FIT

Considering the need for timelier information, it is important to empirically examine whether user intentions to receive alerts with greater frequency are better able to meet the needs of their users. In order to empirically examine how the alerts generated by technology-enabled ICMS are viewed by users who manually evaluate and process information contained in those alerts, I test and extend the Theory of Task-Technology Fit (TTF) (Goodhue and Thompson 1995). This theory provides a framework for determining whether technology meets the needs of its users. The TTF is defined as "the degree to which a technology assists an individual in performing his or her portfolio of tasks" (Goodhue and Thompson 1995, 216). Although the TTF assesses user evaluations along eight factors: data quality, locatability, authorization, compatibility, production timeliness, systems reliability, ease of use / training, and relationship with users, the current study focuses on the data quality factor.[3] According to Goodhue and Thompson (1995), data quality consists of three dimensions: currency dimension, right data dimension, and right level of detail dimension. Data currency indicates whether data received by the user are current enough to meet the needs of the user. The right data dimension refers to the maintenance of the necessary fields or elements of data. The right level of detail dimension addresses maintaining data at the appropriate level of detail for management to make decisions.

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[3]Locatability, which is one of the eight TTF factors, consists of two dimensions of locatability and meaning. Locatability refers to the ease of determining availability of data and their location while meaning refers to the ease of understanding how the data were calculated and what they represent. Authorization assesses user perception of being authorized to access necessary data. Compatibility refers to how data from various sources can be compared. Production timeliness refers to the ability of an information system to follow production turnaround schedules. Systems reliability addresses dependability of a system. Ease of use assesses the ease of using hardware and software for work with data and training refers to user evaluation of availability of quality computer training. Relationship with users refers to information system's understanding of the user's business; interest in customer support; responsiveness to requests for service; availability of technical consulting; ability of the system to deliver in terms of performance.

As a determinant of individual performance, the TTF is part of a more comprehensive model of Technology-to-Performance Chain (TPC) that states that information systems positively influence individual performance when the functionality of the system matches the task requirements of users (Goodhue and Thompson 1995). Technology is the tools (e.g., hardware, software, data, and user support services) that individuals employ to accomplish various tasks. Tasks are "actions carried out by individuals in turning inputs into outputs" (Goodhue 1995, 1828). Figure 2.3 presents an integrated TTF and TPC model from Goodhue and Thompson (1995).

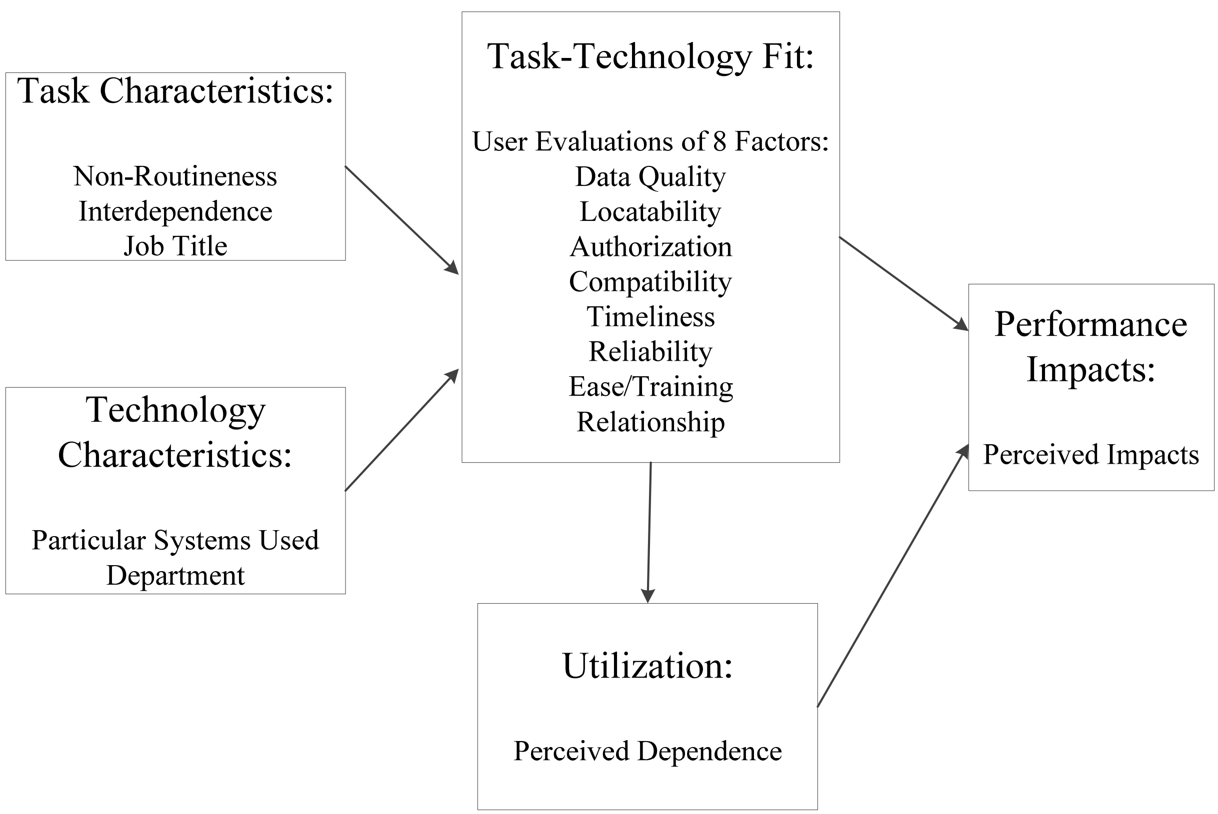

Figure 2.3: Technology-to-Performance Chain (*Source*: Goodhue and Thompson 1995, 225)

In terms of the automated monitoring of internal controls, I conceptualize the technology characteristics as the frequency with which potential ICMS users expect to receive the alerts, and task characteristics are held constant (i.e., each survey participant is asked to provide responses regarding the same task—internal control monitoring). I conceptualize the TTF as the degree to which the ICMS meets user needs for the *current* status of internal control effectiveness in the organization. Therefore, a higher degree of TTF would occur when the ICMS users would expect to receive alerts at greater frequency because it ensures the users are notified of errors, exceptions, suspicious activity and fraud in a timely manner. If alerts are sent only occasionally, errors that occur between monitoring periods are likely to go undetected (Pathak et al. 2005; Groomer and Murthy 2003). Also, the ability of automated control monitoring to generate alerts at greater frequency increases the timeliness and relevance of monitoring results (Brown et al. 2007).

This leads to the first hypothesis:

H1: The frequency of computerized alerts is positively associated with perceived task-technology fit.

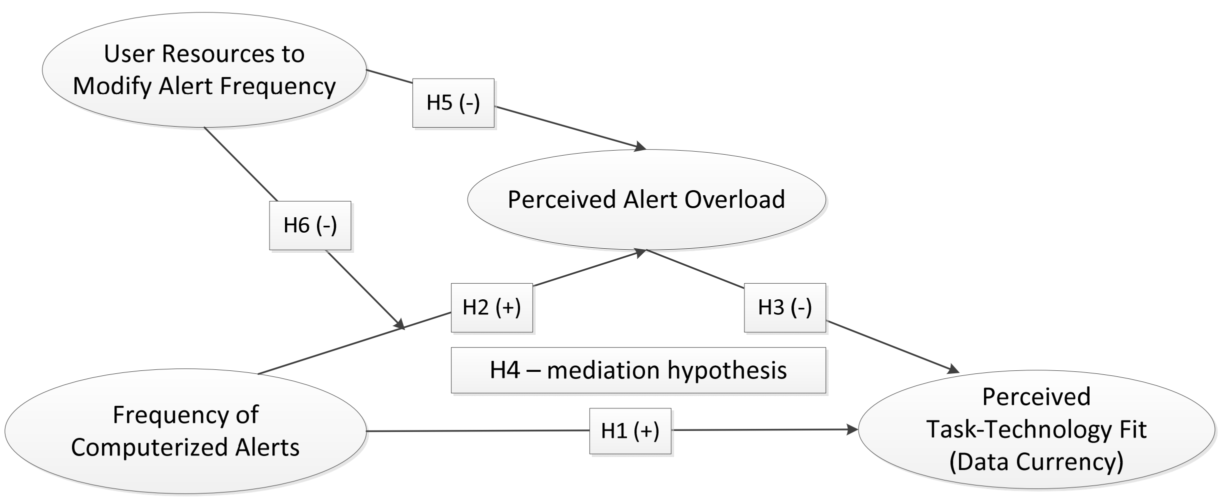

Figure 2.4: Structural Model

Figure 2.4 demonstrates an overview of the structural model that I tested in the current study. The focus of the model is on three constructs that could positively and negatively influence perceived TTF in terms of data currency. The first construct is the frequency of computerized alerts which is conceptualized as the frequency with which potential users of ICMSs expect to monitor internal controls in different areas of the accounting cycle. The frequency of alerts is hypothesized to have a positive influence on the TTF. A negative influence on the TTF is exemplified by the perceived alert overload which is defined as the user inability to process large quantities of information in a timely manner due to working memory limitations. Further, user resources to modify alert frequency are hypothesized to reduce information overload which is a positive influence. User resources are defined as the extent to which the ICMS users believe they have the resources needed to modify the frequency with which they expect to receive the alerts. This model is consistent with the views expressed in the accounting information systems literature that points to both favorable and unfavorable influence of technology on the user.

2.7 Disadvantages of Frequent Information Delivery

Although many studies document benefits of greater reporting and disclosure frequency, some point to the negative effects of greater information frequency on user judgment. Bhojraj and Libby (2005) conduct an experiment with experienced financial managers that finds greater managerial myopia associated with greater disclosure frequency. Pitre (2012) examines how the frequency of reporting (weekly versus quarterly) influences the judgment and decision-making process of nonprofessional investors. The study documents that more frequent reporting results in poorer decision-making such as quarterly earnings predictions of lesser accuracy and greater dispersion.

Studies find that larger amounts of information negatively impact the use of decision aids by experienced users (Schick et al. 1990) and that repeated exposure to exception messages causes users to decrease attention paid to the message due to habituation effects (Amer and Maris 2007). Mascha and Smedley (2007) find that the use of computerized decision aids can result in decreased accuracy of decisions. Speier et al. (1999) conduct an experiment to examine the influence of information overload associated with frequent technology-related interruptions on user decision-making. They state that information overload is largely attributable to the development of technology because it can supply greater quantities of information in shorter periods of time. Interruptions in this study were delivered on a computer screen in the form of a manager's message requesting the user to locate specific information. The study finds that increased interruption frequency lowers decision accuracy and increases decision time.

2.8 Perceived Information Overload

Information overload refers to user inability to process large quantities of information in a timely manner due to working memory limitations (Rose et al. 2004; Hunter and Goebel 2008). Studies conducted by Kogan et al. (1999), Debreceny et al. (2005), Alles et al. (2006, 2008), Kuhn and Sutton (2006, 2010), and Perols and Murthy (2012) identify the issue of information overload associated with the use of automated alerts as the issue of critical importance.

Hunter and Goebel (2008) conceptualize overload as a construct consisting of two dimensions: affective dimension and errors dimension. The affective dimension represents negative affects such as confusion and frustration resulting from information overload. The errors dimension refers to increasing errors that are associated with information overload. Following Hunter and Goebel (2008), information overload associated with the ICMS alerts in the current study is conceptualized in terms of two dimensions: the affective dimension and the errors dimensions. The affective dimension addresses frustration with the large number of alerts. The errors dimension refers to alert evaluation challenges associated with the large number of alerts such as omissions in alert investigations, challenges in distinguishing which alerts to investigate, and overlooking potentially significant alerts. Greater frequency with which the ICMS generates alerts will cause the user to receive and evaluate larger quantities of information which will likely result in greater user perception of information overload. This is also likely to result in lower user perception of task-technology fit because large quantities of alerts that users perceive as frustrating are likely to not meet user needs for the current status of internal control effectiveness.

This leads to the second and third hypotheses:

H2: The frequency of computerized alerts is positively associated with perceived information overload.

H3: Perceived information overload is negatively associated with perceived task-technology fit.

Because information overload intervenes between the two related constructs of frequency of computerized alerts and task-technology fit, the information overload is modeled as a construct producing a mediating effect. This leads to the fourth hypothesis:

H4: The direct relationship between the frequency of computerized alerts and perceived task-technology fit is mediated by perceived information overload.

2.9 User Resources to Modify Alert Frequency

The current study examines the role of perceived user resources in dealing with information overload. Mathieson (1991) and Mathieson et al. (2001) suggest that users' access to resources influences how an information system is used. Moreover, Kuhn and Sutton (2010, 99) state the following: "To be efficient and manageable, a continuous auditing system needs to allow the auditor to dynamically adjust metrics, turn off the monitoring during periods where certain accounts may be in flux and the auditor is not interested in the adjusting and correcting entries, or as certain accounts fluctuate based on the normal business cycles of the client." Perceived user resources capture the extent to which the ICMS users believe they have the resources needed to modify the frequency with which the ICMS generates alerts. Following Mathieson et al. (2001), perceived user resources include both organizational and personal resources. Organizational resources consist of authorization to modify the frequency of alerts, financial resources, documentation, and available assistance; and personal resources consist of the necessary knowledge and time. Absent these resources, users might not be able to adjust the frequency or thresholds of alerts to their preferences as a way of reducing information overload. Users with more resources, on the other hand, are less likely to encounter information overload. This leads to the fifth hypothesis:

H5: Perceived user resources to modify alert frequency are negatively associated with alert overload.

Because perceived user resources exist independently of the frequency of ICMS alerts, I hypothesize a moderating effect of resources on user perceptions of information overload. This leads to the sixth hypothesis:

H6: The positive association between the frequency of computerized alerts and perceived information overload is negatively moderated by perceived user resources.

2.10 Control Variables

Following Arnold et al. (2012) and Elbashir et al. (2011), survey respondents were asked to provide the following demographic information: gender, age, experience with current employer, current position, organizational structure, organizational size measured by both number of employees and gross revenue of the firm, and industry. In addition, respondents were asked to state how long they have used technology to monitor internal controls in their organizations, and how they normally access the technology.

Chapter 3: Research Method

3.1 Participants

I collected survey data from three main sources: members of the Financial Executives International (FEI), members of the Institute of Internal Auditors (IIA), and clients of CaseWare Analytics. The FEI is an organization that consists of approximately 15,000 members who represent companies from various industries. The IIA is an organization of internal auditors with 70,000 members in the United States. CaseWare Analytics is an international company that provides software solutions to accounting professionals. The participants associated with these three organizations are appropriate for this study because they possess the necessary knowledge of key business areas, including the monitoring of internal controls in those areas.

3.2 Instrument development and administration

I adapt the scale for the frequency of automated alerts from the measure of communication frequency developed by Kacmar et al. (2003). In Kacmar et al. (2003), the perception of communication frequency with supervisors is assessed by asking subordinates to indicate how frequently they 1) write to or receive memos or electronic messages from their boss, 2) call or receive phone calls from their boss, and 3) initiate or engage in face-to-face conversations. Similar to Kacmar et al. (2003), in the current study the frequency construct is a formative construct because the *overall* frequency of alerts is caused by the frequency of alerts ICMS users expect to receive from each unique area of the overall accounting cycle (i.e., quotation and order management, order fulfillment and delivery, billing and invoicing, receiving payments and collections, purchasing/procurement, receiving, and accounts payable and payment processing).

I adapt the information overload measure from Hunter and Goebel (2008) and adapt TTF scales from prior TTF studies (Goodhue and Thompson 1995; Karimi et al. 2004) to measure the task-technology fit construct. I assess the construct by focusing on the data currency dimension. Both task-technology fit and information overload are reflective constructs. I adapt the construct of user resources to modify alert frequency from Mathieson et al. (2001). Following Mathieson et al. (2001), user resources can be more objectively measured using a formative construct because it measures user perceptions of real-world artifacts. Table 3.1 presents each construct of the current study along with each construct's type, definition, and source. Appendix A presents the survey instrument used in the current study.

Table 3.1: Summary of Constructs

Construct Name	**Type**	**Definition**	**Source**
Task-Technology Fit (alert currency)	Reflective	The degree to which the ICMS meets user needs for the *current* status of internal control effectiveness in the organization.	Goodhue and Thompson (1995)
Frequency of Computerized Alerts	Formative	Frequency with which potential users of ICMSs expect to monitor internal controls in different areas of the accounting cycle.	Kacmar et al. (2003)
Perceived Information Overload	Reflective	User inability to process large quantities of information in a timely manner due to working memory limitations.	Hunter and Goebel (2008)
User Resources to Modify Alert Frequency	Formative	The extent to which the ICMS users believe they have the resources needed to modify the frequency with which they expect to receive the alerts.	Mathieson et al. (2001)

The primary difference between reflective and formative constructs is that reflective constructs are measures that are latent or unobservable (i.e., the construct causes its indicators) while formative constructs are composed of indicators that determine a construct (i.e., the construct is being caused by indicators) (Jarvis et al. 2003; Petter et al. 2007). The reliability of reflective constructs is measured with Cronbach's alpha. In contrast, measuring reliability of formative constructs is not necessary (Petter et al. 2007). While multicollinearity is problematic in formative constructs, it is desirable in reflective ones (Petter et al. 2007). Also, individual items can be removed from reflective constructs without affecting the construct's content validity while improving construct validity. Removing items from formative constructs, however, could result in omission of a distinct aspect of that variable which could result in measures that explain a smaller portion of the variance (Petter et al. 2007). If at least one construct in a model is formative, the model is considered to be a formative model (Petter et al. 2007).

3.3 Instrument administration

The survey instrument was designed for both current users and potential users of automated alerts. A screening question at the beginning of the survey asked respondents to classify themselves into one of three groups. Group one consisted of participants with direct experience in receiving automated alerts, group two consisted of respondents whose organizations used automated alerts but who were not direct recipients, and group three consisted of respondents whose organizations did not currently use automated alerts. The survey of the first group consisted of 27 short questions while surveys addressed to the second and third group consisted of 24 short questions. Also, at the end of the survey, respondents were asked to respond to nine brief demographic questions. The survey collected no identifying information;

however, respondents could choose to provide an email address to receive a copy of the final report outlining aggregated findings. The survey was designed using Qualtrics software and took users approximately 5 to 10 minutes to complete.

3.4 Pretests and Pilot Study

Prior to data collection I conducted several pretests in order to assess the newly-adapted measures and the functionality of the survey in the electronic software. Generally, a pretest is "a preliminary trial of some or all aspects of the instrument to ensure that there are no unanticipated difficulties" while a pilot study is a preliminary survey that tests "the instrumentation before the project details are finalized and the larger, final survey administered" (Boudreau et al. 2001, 4). To perform these preliminary assessments, I conducted several interviews with the Internal Audit Director of a publicly traded corporation, and discussed the survey with various faculty members in accounting and management. After each stage of the pretest, I refined the instrument so that each subsequent set of respondents completed an improved instrument.

I conducted a small pilot study to make sure that the instrument is functional and clear. Among the respondents were a Chief Audit Executive, a Controller, Managers, Directors, and Internal Auditors. Both pretests and the pilot study helped ensure that the final instrument contained clear instructions and that instrument items did not cause ambiguity or confusion and that they were relevant to the ultimate respondents.

3.5 Data Collection

To reach respondents from the Financial Executives International, an electronic message with the link to the survey was sent to the members of the organization. Members of the Institute of Internal Auditors were reached by individually contacting the leadership of various chapters whose contact information was available on the IIA website. Overall, the IIA chapters of El Paso, Phoenix, Albuquerque, Ak Sar Ben, Middle Georgia, and Mobile agreed to participate in the survey. A group of CaseWare Analytics clients were contacted by the Marketing Content Coordinator at the request of the FEI.

3.6 Sample Description

I received a total of 161 responses; 28 responses were incomplete and were removed from further analysis, with a net of 133 valid responses. Six respondents indicated that they were direct recipients of the internal control monitoring alerts. Twenty respondents indicated that their organizations were using the software to monitor internal controls but they, personally, did not receive those alerts. Finally, there were 107 respondents whose organizations did not currently use the software to monitor internal controls. Table 3.2 below presents a detailed overview of the overall sample as well as the overview of each subgroup of respondents. The majority of respondents were male (58.6%). The dominant age groups for the overall sample were 30-39 (24.8%), 40-49 (27.8%), and 50-59 (31.6%). It is important to note that the majority of respondents had over 11 years of professional work experience. Specifically, 38.3 percent of respondents indicated that they had between 11 and 20 years of experience, while 26.3 percent indicated that they had 21 to 30 years of experience, and 17.3 percent stated that they had over 30 years of experience. Also, the careers of the majority of the sample were related to internal audit: internal auditors comprised 49.6 percent of the sample and chief audit executives comprised 9.8 percent. Respondents were employed at both public (29.3%) and non-public organizations (67.7%) of large size in terms of both the number of employees and revenue.

Industries that were represented the most were Financial Services, Banking, or Insurance (18.8%), Education (16.5%), and Government (12.7%).

Respondents whose organizations currently use automated alerts (i.e., group one (6 respondents) and two (20 respondents)) indicated that the most widely used software was Oracle (8 organizations) followed by ACL (7 organizations), CaseWare (6 organizations), and SAP (5 organizations). The software adoption in most organizations is fairly recent: five organizations have used automated alerts for less than two years, ten organizations have used them for less than five years, and six organizations for less than nine years. Among the alert users, the most common form of receiving alerts was through dashboard-type reports. Those who are not currently receiving automated alerts also indicated a preference for dashboard-type reports, followed by alerts received by email.

Table 3.2: Descriptive Statistics

Item	(n=133)		(n=6)		(n=20)		(n=107)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Gender								
Male	78	58.6	6	100	13	65	59	55.1
Female	54	40.6	0	0	7	35	47	43.9
Did not answer	1	0.8	0	0	0	0	1	1
Age								
25-29	4	3	0	0	0	0	4	3.7
30-39	33	24.8	1	16.7	11	55	21	19.6
40-49	37	27.8	2	33.3	0	0	35	32.7
50-59	42	31.6	3	50	8	40	31	29
Over 60	16	12	0	0	1	5	15	14
Did not answer	1	0.8	0	0	0	0	1	1
Professional work experience								
1-2 years	5	3.8	0	0	1	5	4	3.7
3-10 years	18	13.5	1	16.7	5	25	12	11.2
11-20 years	51	38.3	2	33.3	5	25	44	41.1

21-30 years	35	26.3	2	33.3	6	30	27	25.2
Over 30 years	23	17.3	1	16.7	3	15	19	17.8
Did not answer	1	0.8	0	0	0	0	1	1
Current Position								
Chief Executive Officer	3	2.2	0	0	0	0	3	2.8
Chief Financial Officer	8	6	1	16.7	0	0	7	6.5
Chief Information Officer	1	0.8	0	0	0	0	1	1
Chief Operating Officer	1	0.8	0	0	0	0	1	1
Chief Audit Executive	13	9.8	0	0	1	5	12	11.2
Chief Risk Officer	3	2.2	2	33.3	0	0	1	1
Vice President/Director	12	9	0	0	2	10	10	9.3
Controller	6	4.5	0	0	0	0	6	5.6
Manager	7	5.3	1	16.7	0	0	6	5.6
Internal Auditor	66	49.6	2	33.3	16	80	48	44.8
Analyst	3	2.3	0	0	0	0	3	2.8
Other	9	6.7	0	0	1	5	8	7.4
Did not answer	1	0.8	0	0	0	0	1	1
Organizational Structure								
Publicly Traded	39	29.3	3	50	9	45	27	25.2
Not Publicly Traded	90	67.7	3	50	11	55	76	71.1
Did not answer	4	3	0	0	0	0	4	3.7

Item	(n=133)		(n=6)		(n=20)		(n=107)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Organizational Size (Employees)								
Less than 50 employees	5	3.8	0	0	0	0	5	4.7
51-100 employees	3	2.2	0	0	1	5	2	1.9
101-500 employees	16	12	2	33.3	0	0	14	13.1
501-1,000 employees	15	11.3	0	0	1	5	14	13.1
1,001 - 5,000 employees	36	27.1	1	16.7	6	30	29	27.1
5,001 - 20,000 employees	34	25.6	1	16.7	8	40	25	23.4
More than 20,000 employees	20	15	2	33.3	4	20	14	13
Did not answer	4	3	0	0	0	0	4	3.7
Organizational Size (Revenue)								
Less than 1 million	5	3.8	0	0	0	0	5	4.7
1-250 million	31	23.3	2	33.3	2	10	27	25.2
251-500 million	14	10.5	0	0	2	10	12	11.2
501 million-1billion	29	21.8	0	0	4	20	25	23.4
Over 1 billion - 10 billion	32	24.1	2	33.3	8	40	22	20.6
More than 10 billion	18	13.5	2	33.4	4	20	12	11.2
Did not answer	4	3	0	0	0	0	4	3.7

Organizational Industry								
Aerospace and Defense	1	0.8	0	0	0	0	1	1
Engineering / Construction	2	1.5	0	0	0	0	2	1.9
Education	22	16.5	0	0	2	10	20	18.7
Energy, Oil & Gas, and Mining	7	5.2	0	0	0	0	7	6.5
Financial Services / Banking / Insurance	25	18.8	2	33.3	5	25	18	16.8
Gaming	2	1.5	0	0	1	5	1	1
Government	17	12.7	1	16.7	3	15	13	12.2
Healthcare	10	7.5	0	0	1	5	9	8.4
Manufacturing	9	6.7	2	33.3	1	5	6	5.6
Real Estate	1	0.8	0	0	0	0	1	1
Services	5	3.8	1	16.7	2	10	2	1.7
Technology	1	0.8	0	0	1	5	0	0
Transportation	5	3.8	0	0	1	5	4	3.7
Utilities	5	3.8	0	0	2	10	3	2.8
Wholesale / Retail	5	3.8	0	0	0	0	5	4.7
Other	12	9	0	0	1	5	11	10.3
Did not answer	4	3	0	0	0	0	4	3.7

Item	Total		(n=6)		(n=20)		(n=107)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Internal Control Monitoring Software in Use (can choose more than one answer)								
SAP	5		2		3		N/A	
Oracle	8		1		7		N/A	
ACL	7		3		4		N/A	
Approva	3		1		2		N/A	
CaseWare	6		1		5		N/A	
Trintech	1		1				N/A	
Developed Internally	3				3		N/A	
Solarwind	1		1				N/A	
Prelude	1		1				N/A	
Metric Stream	1				1		N/A	
Microsoft Sharepoint	1				1		N/A	
OpenPages	1		1				N/A	
Accelus GRC	1				1		N/A	

Time since Software Adoption

1-2 years	5	0	5	N/A
3-5 years	10	3	7	N/A
6-9 years	6	2	4	N/A
Over 10 years	4	1	3	N/A
Did not answer	1			N/A
Software Access		Actual Access	Preferred Access	
E-mail	22	1	3	18
Dashboard-type Reports	84	4	14	66
Automatically Printed Reports	2	0	0	2
Reports Only Printed as Needed by User	18	1	2	15
Other	2	0	0	2
Did not answer	5	0	1	4

3.7 Common method bias

Prior to data collection it is important to minimize common method bias, which is defined as "systematic error variance shared among variables measured with and introduced as a function of the same method and/or source" (Richardson et al. 2009). Common method bias is a concern because the method of data collection can potentially drive participants' responses. Straub et al. (2004) suggest dealing with common method bias by collecting data during at least two time periods, collecting data using more than one method, and collecting dependent variable data separately from independent variables.

To empirically assess the common method bias, I examined a correlation matrix of the constructs to determine if any of the correlations are greater than 0.9. Overall, the correlations between constructs are below this threshold indicating that the common method bias is low

(Lowry and Gaskin 2014). Further, following Lowry and Gaskin (2014), I include a marker variable that is theoretically dissimilar to the other constructs. I select age as the marker variable and examine the correlations between this construct and the other constructs. The correlation of each construct with the marker variable is less than 0.3 which is the suggested threshold (Lowry and Gaskin 2014). The results of this test once again point to the lack of evidence that the common method bias exists.

3.8 Social desirability bias

Because some of the survey items of this study are perceptual, it is important to address the social desirability bias. Following Arnold et al. (2012) and Podsakoff et al. (2003), effects of social desirability bias have been reduced by assuring respondents that no identifying information is being collected.

3.9 Nonresponse bias and response rates

Following Dowling (2009), I address nonresponse bias by comparing 10 percent of the latest respondents to early respondents. I am only able to conduct nonresponse bias tests among the responses from the FEI and CaseWare because they were the only groups that were contacted with one email. Nonresponse bias does not appear to be a concern for the FEI group ($n=22$, Wilks' Lambda $=0.669$, $p > 0.1$). Similarly, nonresponse bias does not appear to be a concern for the CaseWare group ($n=41$, Wilks' Lambda $= 0.994$, $p > 0.1$).

To encourage higher response rates, the instrument named the sponsoring organization and stated the importance of the responses in informing both practice and research. Moreover, respondents from the FEI were offered an opportunity to be entered in a drawing for a gift certificate valued at $200. All respondents were offered an opportunity to request a copy of the final report outlining the findings of the study.

Chapter 4: Analysis and Results

4.1 Group Comparison

In order to assess whether there are meaningful differences between the three groups of respondents, I performed contrast analyses in SPSS. To begin the contrast analysis, we first refer to the 'contrast coefficients" table. For example, Contrast 1 compares group 1 to group 2, Contrast 2 compares groups 2 and 3, Contrast 3 compares groups 1 and 3, Contrast 4 compares groups 1 and 2 to 3, Contrast 5 compares groups 2 and 3 to 1, and Contrast 6 compares groups 1 and 3 to 2. Of all the contrasts, statistically significant differences appear in the overload construct (4 out of 6 constructs are statistically significant assuming equal variances because the test of homogeneity is not significant for overload). I obtained the direction (higher or lower) from the descriptives table which is too large to include.

A comparison of the average values of the four constructs, as shown in Table 4.1, reveals that there are statistically significant differences in the information overload among the three groups. Specifically, for the average alert overload, statistically significant difference in contrast 1 ($p < 0.05$) suggests that the perception of overload differs among groups one (actual users, n=6) and two (organizational users, n=20) where in group two, information overload is higher than that of group one. Further, significant difference in contrast 3 ($p < 0.01$) suggests that overload of group one is lower than overload of group three (perceptual users, n=107). Significant difference in contrast 4 ($p < 0.01$) suggests that overload of groups one and two combined is lower than the overload reported by group three. Finally, significant difference in contrast 5 ($p < 0.01$) points to overload differences among group one and groups two and three combined. As a result of the significant differences in alert overload reported by respondents in the three groups, each group will be analyzed separately. Moreover, the current study will focus the analysis on group three because the sample size of group one and two is too small for any meaningful conclusions.

Table 4.1: Contrast Tests

Contrast Coefficients

Contrast	Group 1	Group 2	Group 3
1	1	-1	0
2	0	1	-1
3	1	0	-1
4	1	1	-2
5	-2	1	1
6	1	-2	1

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Average Frequency	1.043	2	130	.355
Average Overload	.076	2	130	.927
Average Resources	5.827	2	130	.004
Average TTF	3.770	2	130	.026

Contrast Tests

		Contrast	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
Average Frequency	Assume equal variances	1	-.0714	.62328	-.115	130	.909
		2	-.0841	.32620	-.258	130	.797
		3	-.1555	.56177	-.277	130	.782
		4	-.2397	.67492	-.355	130	.723
		5	.2270	1.14094	.199	130	.843
		6	.0127	.82109	.015	130	.988
	Does not assume equal variances	1	-.0714	.62335	-.115	9.344	.911
		2	-.0841	.35513	-.237	24.885	.815
		3	-.1555	.54286	-.287	5.595	.785
		4	-.2397	.67311	-.356	12.674	.728

		5	.2270	1.11373	.204	6.180	.845
		6	.0127	.85712	.015	20.992	.988
Average Overload	Assume equal variances	1	-1.4056	.62961	-2.232	130	.027
		2	-.5059	.32951	-1.535	130	.127
		3	-1.9115	.56748	-3.368	130	.001
		4	-2.4174	.68177	-3.546	130	.001
		5	3.3170	1.15252	2.878	130	.005
		6	-.8996	.82942	-1.085	130	.280
	Does not assume equal variances	1	-1.4056	.64817	-2.168	7.538	.064
		2	-.5059	.31280	-1.617	27.859	.117
		3	-1.9115	.59753	-3.199	5.524	.021
		4	-2.4174	.69974	-3.455	10.219	.006
		5	3.3170	1.20685	2.749	5.741	.035
		6	-.8996	.82396	-1.092	16.156	.291
Average Resources	Assume equal variances	1	-.3722	.59454	-.626	130	.532
		2	-.1475	.31116	-.474	130	.636
		3	-.5197	.53587	-.970	130	.334
		4	-.6672	.64379	-1.036	130	.302
		5	.8920	1.08833	.820	130	.414
		6	-.2247	.78323	-.287	130	.775
	Does not assume equal variances	1	-.3722	.98004	-.380	5.627	.718
		2	-.1475	.26455	-.558	29.807	.581
		3	-.5197	.95884	-.542	5.161	.610
		4	-.6672	1.00909	-.661	6.323	.532
		5	.8920	1.92087	.464	5.195	.661
		6	-.2247	1.06843	-.210	7.832	.839
Average TTF	Assume equal variances	1	-.5167	.40774	-1.267	130	.207
		2	-.2565	.21339	-1.202	130	.231
		3	-.7732	.36750	-2.104	130	.037
		4	-1.0298	.44151	-2.332	130	.021
		5	1.2899	.74637	1.728	130	.086
		6	-.2601	.53713	-.484	130	.629
	Does not assume equal variances	1	-.5167	.63406	-.815	6.243	.445
		2	-.2565	.22210	-1.155	24.996	.259
		3	-.7732	.60458	-1.279	5.180	.255
		4	-1.0298	.65396	-1.575	7.063	.159
		5	1.2899	1.21892	1.058	5.348	.335

6	-.2601	.73294	-.355	10.554	.730

4.2 Measurement Model

I use SmartPLS 2.0 (Ringle et al. 2005) Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the measurement model. I use PLS-SEM as opposed to covariance based SEM (CB-SEM) such as LISREL because PLS-SEM can analyze measurement models containing both reflective and formative constructs. Also, PLS-SEM is able to efficiently analyze small sample sizes and does not have restrictions with respect to assumptions such as data normality (Hair et al. 2013, Chin et al. 2003). Moreover, this study's model includes formative constructs, and Kline (2006) states that modeling formative constructs in CB-SEM can result in unidentified model. PLS-SEM does not have restrictions with respect to model identification because PLS performs ordinary least squares regression that are not simultaneous (Roberts and Thatcher 2009; Lee et al. 2011). PLS-SEM has been used extensively in information systems research (Pavlou and Gefen 2005; Lin and Huang 2008) and accounting information systems research (Hall 2008; Chapman and Kihn 2009; Dowling 2009; Elbashir et al. 2011).

4.3 Convergent Validity, Internal Consistency Reliability – Reflective Measurement Models

Convergent validity is "the extent to which a measure correlates positively with alternative measures of the same construct" (Hair et al. 2014). Convergent validity is achieved when "the measures for each construct belong together" (Petter et al. 2007, 640). Convergent validity is assessed by examining the outer loadings of the indicators and the average variance extracted (AVE). In order to establish indicator reliability, Hair et al. (2014) state that outer loadings of all indicators should be statistically significant at a minimum, and they also should be 0.708 or higher to establish the communality of an item. The internal consistency reliability is assessed using a measure of composite reliability which varies between 0 and 1, with scores between 0.7 and 0.9 regarded as acceptable. Also, the AVE value of 0.50 or higher establishes convergent validity which means that more than half of the indicator variance is explained by the construct.

There are two reflective constructs in the current study: Task-Technology Fit (Alert Currency) and Information Overload. Table 4.2 below summarizes the individual item loadings, composite reliability, and average variance extracted (AVE). All six items of the alert overload construct have statistically significant loadings and are higher than 0.708 (OV1 = 0.8282, t = 15.2302; OV2 = 0.8514, t = 19.2128; OV3 = 0.8938, t = 26.0806; OV4 = 0.8528, t = 22.6280; OV5 = 0.8507, t = 23.0843; and OV6 = 0.8613, t = 24.1493). Also, the composite reliability value is 0.9429 and the AVE score is 0.7338 which are both acceptable. However, only two loadings of the TTF construct are greater than 0.708: TTF3 = 0.748 and TTF4 = 0.723, while others (TTF1 = 0.138, TTF2 = 0.596, and TTF5 = 0.324) are lower than 0.708. Moreover, the composite reliability value is 0.6901 which is acceptable, and the AVE value is 0.3121 which is below the requirement of 0.50. Hair et al. (2014) recommend removing indicators with outer loadings below 0.40. Therefore, I removed TTF1 because it has the lowest loading and reran the model. After the removal of TTF1, the loadings of TTF2, TTF3, TTF4, and TTF5 are 0.8878, 0.8909, 0.8428, and 0.6971 respectively. The deletion of TTF1 was beneficial because the loading of TTF2 is above the threshold of 0.708 and the loading of TTF5 has increased to 0.6971. Further, the composite reliability value is 0.9001, and the AVE is 0.6945, which are now acceptable.

Table 4.2: Individual Item Loadings, Composite Reliability, Average Variance Extracted (AVE) Statistics (Group 3, n=107)

Panel A: Alert Overload: (Composite Reliability = 0.9429; AVE = 0.7338)

Item Code	Loading	Standard Error	t-statistics
OV1	0.8282	0.0544	15.2302
OV2	0.8514	0.0443	19.2128
OV3	0.8938	0.0343	26.0806
OV4	0.8528	0.0377	22.6280
OV5	0.8507	0.0369	23.0843
OV6	0.8613	0.0357	24.1493

Panel B: Task-Technology Fit (Alert Currency): (Composite Reliability = 0.9001; AVE = 0.6945)

	Loading	Standard Error	t-statistics
TTF2	0.8878	0.1896	4.6834
TTF3	0.8909	0.1956	4.5560
TTF4	0.8428	0.1845	4.5674
TTF5	0.6971	0.2066	3.3739

Panel C: Frequency of Computerized Alerts: Formative Construct

	Indicator Weight	VIF	Standard Error	t-statistics
FR1	-0.7950	2.364	0.4387	1.8110
FR4	-1.1680	3.080	0.4828	2.4200
FR5	0.9350	3.482	0.5096	1.8350
FR7	1.4779	2.736	0.4437	2.4920

Panel D: User Resources to Modify Alert Frequency: Formative Construct

	Indicator Weight	VIF	Standard Error	t-statistics
RES1	0.2336	2.290	0.2173	1.0750
RES2	0.1071	3.745	0.3035	0.3530
RES3	0.6365	2.626	0.3159	2.0150
RES4	-0.1695	2.497	0.2680	0.6324
RES5	-0.6806	3.146	0.3818	1.7826
RES6	0.8666	2.400	0.3420	2.5338

4.4 Discriminant Validity – Reflective Measurement Models

Discriminant validity examines whether the construct is different from other constructs by capturing values that are unique to that construct and not assessed by other constructs. Discriminant validity is attained when items are "distinguishable from measures of other constructs" (Petter et al. 2007, 640). To examine discriminant validity, indicator cross-loadings of reflective constructs are assessed (Hair et al. 2014). To establish discriminant validity, the outer loadings of the indicator on the respective construct should be higher than that indicator's loadings on any other constructs. Panel A of Table 4.3 below presents the item loadings and crossloadings for reflective constructs. All of the items of the information overload construct load higher on the overload construct than any other construct (all loadings are greater than 0.8). Also, all the items of the TTF construct load higher on their respective construct than any other construct (all loadings are greater than 0.69). Furthermore, Hair et al. (2014) suggest calculating the Fornell-Larcker criterion for a more conservative assessment of discriminant validity. To establish discriminant validity using this criterion the square root of the AVE of each construct should be higher than that construct's correlation with any other construct. Table 4.4 presents inter-construct correlations and the Fornell-Larcker criteria for reflective constructs. The Fornell-Larcker criteria of alert overload and TTF are 0.8591 and 0.8334 respectively. For both constructs, the square root of their AVE is greater than that construct's correlation with any other construct.

Table 4.3: Item Loadings and Crossloadings

Panel A	**Constructs Measured Using Reflective Items**	
Items	**Alert Overload**	**Task-Technology Fit (Alert Currency)**
OV1	0.8282	-0.1198
OV2	0.8514	-0.0936
OV3	0.8938	-0.1286
OV4	0.8528	-0.1208
OV5	0.8507	0.0214
OV6	0.8613	-0.0255
TTF2	-0.1122	0.8878
TTF3	-0.0792	0.8909
TTF4	-0.0617	0.8428
TTF5	-0.0373	0.6971

Panel B	**Constructs Measured Using Formative Items**	
Items	**Frequency of Computerized Alerts**	**User Resources to Modify Alert Frequency**
FR1	-0.1719	0.0531
FR4	-0.2413	-0.0325
FR5	0.2627	-0.0560
FR7	0.4085	-0.1211
RES1	0.0542	0.5481
RES2	-0.0781	0.7648
RES3	-0.1140	0.7106
RES4	-0.0630	0.4461
RES5	-0.0651	0.4094
RES6	-0.2045	0.7985

Table 4.4: Inter-Construct Correlations and Square Root of Average Variance Extracted Statistics (n=107)[4]

	Constructs Measured Using Reflective Items[5]		**Constructs Measured Using Formative Items**	
	(1)	(2)	(3)	(4)
(1) Alert Overload	0.8591			
(2) Task-Technology Fit (Alert Currency)	-0.0920	0.8334		
(3) Frequency of Computerized Alerts	0.2446	-0.0690	1.000	
(4) User Resources to Modify Alert Frequency	-0.3732	0.2268	-0.1904	1.000

4.5 Content Validity - Formative Measurement Models

Content validity "is concerned with whether we are measuring what we want to measure" (Kwok and Sharp 1998). Despite the fact that constructs are drawn from theory, the evaluation of content validity is based on judgment and is highly subjective (Straub et al. 2004). In the context of survey questionnaires, content validity means appropriately selecting items to assess all the facets of each construct. It is especially crucial for the current study because the survey is specific to automated alerts and many of the items have not been used and validated in prior studies. Petter et al. (2007) state: "while content validity of reflective measures does not have such a powerful downstream influence on instrument validation (Straub et al. 2004), content validity does for formative constructs and so should be a *mandatory* practice for researchers using formative constructs" (639). Following Petter et al. (2007), this study will establish content validity for formative constructs to ensure that they are not misspecified by omission of important aspects.

[4] Diagonal figures are the Fornell-Larcker criteria or the square roots of the average variance extracted statistics. Off-diagonal elements are the correlations between the latent variables extracted from PLS.
[5] AVE is appropriate when the construct is measured using reflective indicators (i.e., alert overload and task-technology fit).

There are two formative constructs in the current study: alert frequency and user resources to modify alert frequency. Content validity for the alert frequency construct was established by conducting a thorough literature review as well as interviewing experts in the area, both faculty and professionals. Content validity for the user resources construct was already established because it was adapted from Mathieson et al. (2001).

4.6 Multicollinearity – Formative Measurement Models

High levels of collinearity between items in formative models are problematic because they affect both the weight estimates and their statistical significance (Hair et al. 2014). To assess the levels of collinearity, I obtain the variance inflation factors (VIF) by performing a regression analysis in SPSS. Multicollinearity becomes problematic for VIF values of 5 and above. The regression analyses reveal that for the resources construct the levels of collinearity are below the critical levels. The VIF for Res1, Res2, Res3, Res4, Res5, and Res6 equal to 2.290, 3.745, 2.626, 2.497, 3.146, and 2.400 respectively. The collinearity levels between some of the items in the frequency construct, however, are above the critical levels. The VIF for Fr1, Fr2, Fr3, Fr4, Fr5, Fr6, and Fr7 are 7.273, 9.366, 6.690, 3.723, 6.794, 8.612, and 3.177 respectively. Hair et al. (2014) suggest removing an indicator and reassessing the collinearity levels. After the removal of Fr2, the item with the highest level of collinearity, the VIF values for Fr1, Fr3, Fr4, Fr5, Fr6, and Fr7 are 2.485, 6.659, 3.711, 6.787, 7.567, and 2.992 respectively. Further, after the removal of Fr6, the VIF values for Fr1, Fr3, Fr4, Fr5, and Fr7 are 2.445, 5.808, 3.709, 4.207, and 2.992 respectively. Finally, after the removal of Fr3, the VIF values for Fr1, Fr4, Fr5, and Fr7 are 2.364, 3.080, 3.482, and 2.736 respectively. With four out of the seven initial indicators as part of the construct, the collinearity values are at acceptable levels which makes it possible to further interpret the significance of outer weights and analyze the formative measurement models' contribution. The remaining four indicators in the frequency construct represent areas such as quotation and order management (Fr1), receiving payments and collections (Fr4), purchasing/procurement (Fr5), and accounts payable and payment processing (Fr7). The four areas combined provide a diverse representation of the overall accounting cycle with its revenue and expense components.

4.6 Significance and Relevance of Formative Indicators

To assess the relevance of formative indicators, it is necessary to test whether its outer weights are significantly different from zero. This is achieved by performing a bootstrapping procedure in SmartPLS. The outer weights of the frequency construct are statistically significant: Fr1 $t = 1.781$, $p < 0.1$; Fr4 $t = 2.419$, $p < 0.05$; Fr5 $t = 1.911$, $p < 0.1$; Fr7 $t = 2.499$, $p < 0.05$. The outer weights of the resources construct are statistically significant for the following items: Res3 $t = 2.029$, $p < 0.05$; Res5 $t = 1.882$, $p < 0.1$; and Res6 $t = 2.591$, $p < 0.01$. The remaining weights are not significant: Res1 $t = 1.035$; Res2 $t = 0.336$; Res4 $t = 0.617$. When the outer weights of the formative indicators are not significant, Hair et al. (2014) suggest examining the formative indicators' outer loadings. The outer loadings of Res1, Res2, and Res4 are 0.5477, 0.7638, and 0.4450. If the outer loading is equal or greater than 0.5, Hair et al. (2014) suggest keeping those indicators even though they are not statistically significant. Therefore, Res1 and Res2 will remain in the model. For Res4, I assess the significance of the outer loading to determine whether the indicator should remain in the model. The t value of the outer loading for Res4 equals to 2.1429, which is statistically significant at $p < 0.05$. Therefore, Res4 will not be removed from the model.

4.7 HYPOTHESES TESTING

I use SmartPLS 2.0 which uses bootstrapping as a resampling technique. Following Hair et al. (2014) I select 5,000 random samples to estimate the structural model and determine the statistical significance of the paths. Table 4.5 outlines the results of the PLS analysis. The path analysis provides empirical support for Hypotheses 2 and 5. Hypothesis 2 predicts that the frequency of computerized alerts is positively associated with perceived information overload. The results presented in Table 7 support this hypothesis with a relationship that is statistically significant (0.170, $p < 0.1$). This finding indicates that greater frequency of automated alerts increases user perceptions of feeling frustrated and overwhelmed as well as user perceptions of making errors while evaluating internal controls.

Hypothesis 5 predicts that perceived user resources to modify alert frequency will reduce information overload. The results shown in Table 7 support the hypothesized relationship (-0.351, $p < 0.01$). This finding indicates that greater availability of resources reduces the negative impact of information overload.

Table 4.5: Path Coefficients: Test and Control Variables

Path	**Path Coefficient**	**t-statistic**
Alert Frequency – Alert Overload	0.170	1.784*
Alert Frequency – Task-Technology Fit	0.130	1.152
Alert Overload – Task-Technology Fit	-0.122	1.453
Resources – Alert Overload	-0.351	4.109***
Frequency*Resources – Alert Overload	-0.021	0.3068

*t-statistic > 1.65 is significant at p <0.10
**t-statistic > 1.96 is significant at p <0.05
***t-statistic > 2.57 is significant at p <0.01

4.4 Moderator Effect

In order to assess whether the relationship between the frequency of alerts and alert overload is moderated by user resources, I create an interaction term as the product of the two constructs: frequency and resources. Because both frequency and resources are formative constructs, I use the two-stage approach as suggested by Hair et al. (2014). In the first stage, I estimate the main model without the interaction term in order to obtain the latent variable scores. Subsequently, the latent variable scores are added to the dataset, and the model is updated so that each latent variable is represented by one item—its latent variable score. As part of the second stage, I create a moderating effect with frequency as predictor and resources as moderator. The path coefficient between the moderator and the alert overload is not significant (t=0.3068).

Chapter 5: Discussion

The goal of this study is to investigate how the expected frequency of alerts generated by computerized Internal Control Monitoring System influence user perceptions of information overload and Goodhue and Thompson's (1995) Task-Technology Fit. The findings suggest that users of ICMS should be cognizant of the negative effects of information overload associated with more frequent automated alerts. Also, the findings strongly suggest user perception of resource availability reduces overload that results from large quantities of automated alerts. Overall, the findings could serve as guidelines for organizations to evaluate whether their internal control monitoring systems meet the needs of its users. Understanding the fit that exists between the ICMS and the information needs of its users by identifying the functional and dysfunctional effects will help ensure that the systems are used in an optimal way.

It is important to note that the responses analyzed in the current study were almost entirely received from professionals who do not currently receive automated alerts. The results of the study may have been different if the sample only consisted of current recipients (not potential recipients) of alerts. Nevertheless, the findings of the current study provide valuable insight for organizations and regulators prior to widespread adoption of the ICMS.

Chapter 6: Limitations and Future Research

The results of this study should be interpreted with caution as the number of participants is fairly small, and the sample almost entirely consists of respondents who are not current users of the ICMS.

Another limitation of this study is that it does not address alert quality and the impact of alert quality on user perceptions of Task-Technology Fit. Future studies could examine this quality dimension. Also, future research could examine individual and organizational performance impacts associated with the use of computerized Internal Control Monitoring Systems. Moreover, future research could examine the impacts of internal control monitoring technology as it relates to managerial decision-making (Masli et al. 2010).

Following Kuhn and Sutton (2010), future research could examine the influence of information overload on user decision-making and information processing, including the heuristics that users adopt in the process. Future research could also address the role of artificial intelligence in the process of coping with information overload. Masli et al. (2010) call for research on how internal control monitoring technology influences areas outside of internal controls over financial reporting. They emphasize the importance of examining impacts of monitoring technology on managerial decision-making. Another direction for future research would be to study the potentially differential impact on simple and complex alerts on information overload and subsequently on user decision-making.

Further, the sample analyzed in the current study represented users from a limited number of industries. In the future, it would be beneficial to expand the study to a broader cross-section of organizations from a more diverse pool of industries.

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Appendix

Constructs, Items, Item Codes, and Descriptive Statistics

Panel A: Constructs Measured using Reflective Items

Item Code	Item	Min. (n=6)	Max. (n=6)	Mean (Std. Dev.) (n=6)
Group 1: Respondents who selected "My organization USES software to monitor internal controls, and I RECEIVE the alerts generated by the software that monitors internal controls."				
Alert Overload				
Please indicate the frequency with which your company's internal controls monitoring software generates alerts in the following areas. Please select the answers that represent the greatest frequency with which you normally receive the alerts.				
OV1	I sometimes feel frustrated because of the large volume of alerts that I receive.	1	5	3.17 (1.602)
OV2	The large amount of information that I have to know in order to analyze alerts effectively makes me feel overloaded.	1	5	2.83 (1.472)
OV3	The large volume of alerts that I must deal with is frustrating.	1	5	2.67 (1.633)
OV4	The large number of alerts that I receive causes me to omit investigating some potentially important alerts.	1	3	2.17 (0.983)
OV5	The large number of alerts that I receive makes it challenging to distinguish which alerts should be investigated further.	1	5	2.67 (1.633)
OV6	I have had to overlook some alerts because of the large number of alerts I receive.	1	5	2.67 (1.633)
Perceived Task-Technology Fit (Alert Currency)				
Please indicate the extent to which you agree or disagree with the following statements. These statements refer to whether internal controls monitoring alerts are current enough to meet your needs:				
	"Our internal controls monitoring alerts…"			
TTF1	Fit my preferences for the up-to-date status of internal controls.	3	6	4.67 (1.366)
TTF2	Fit my needs for the current status of internal controls.	3	6	4.67 (1.366)
TTF3	Are sufficiently frequent for my evaluation of internal controls.	3	6	4.83 (1.472)
TTF4	Are generated as often as I would like.	3	6	4.83 (1.472)
TTF5	Are produced at the rate necessary for my purposes.	2	6	4.67 (1.751)

Item Code	Item	Min. (n=20)	Max. (n=20)	Mean (Std. Dev.) (n=20)
Group 2: Respondents who selected "My organization USES software to monitor internal controls, but I DO NOT receive the alerts generated by the software that monitors internal controls."				
Alert Overload *Previously, you stated that you do not receive the alerts generated by software that monitors internal controls. For a moment, please put yourself in the position of someone who does receive such alerts and answer the following questions by indicating the extent to which you agree or disagree with the following statements referring to alerts:*				
OV1	I would sometimes feel frustrated because of the large volume of alerts that I would receive.	1	6	4.25 (1.293)
OV2	The large amount of information that I would have to know in order to analyze alerts effectively would make me feel overloaded.	2	6	3.95 (1.395)
OV3	The large volume of alerts that I would have to deal with would be frustrating.	2	6	4.30 (1.418)
OV4	The large amount of alerts that I would receive would cause me to omit investigating some potentially important alerts.	1	6	3.80 (1.642)
OV5	The large amount of alerts that I would receive would make it challenging to distinguish which alerts should be investigated further.	2	6	4.55 (1.317)
OV6	I would have to overlook some alerts because of the large amount of alerts I would receive.	1	6	3.75 (1.713)
Perceived Task-Technology Fit (Alert Currency) *Finally, if you were receiving the internal controls monitoring software alerts, please indicate the extent to which you agree or disagree with the following statements referring to whether alerts would be current enough to meet your needs:*				
	"Our internal controls monitoring alerts…"			
TTF1	Would fit my preferences for the up-to-date status of internal controls.	2	7	5.35 (1.040)
TTF2	Would fit my needs for the current status of internal controls.	2	7	5.25 (1.209)
TTF3	Would be sufficiently frequent for my evaluation of internal controls.	2	6	5.00 (1.170)
TTF4	Would be generated as often as I would like.	2	7	5.25 (1.070)
TTF5	Would be produced at the rate necessary for my purposes.	2	7	5.40 (1.046)

Item Code	Item	Min. (n=107)	Max. (n=107)	Mean (Std. Dev.) (n=107)

Group 3: Respondents who selected "My organization DOES NOT use software to monitor internal controls, and I DO NOT receive the alerts generated by the software that monitors internal controls."

Alert Overload

Again, please put yourself in the position of someone who receives such alerts and answer the following questions by indicating the extent to which you agree or disagree with the following statements referring to alerts:

Item Code	Item	Min. (n=107)	Max. (n=107)	Mean (Std. Dev.) (n=107)
OV1	I would sometimes feel frustrated because of the large volume of alerts that I would receive.	1	**7**	4.90 (1.440)
OV2	The large amount of information that I would have to know in order to analyze alerts effectively would make me feel overloaded.	1	7	4.57 (1.448)
OV3	The large volume of alerts that I would have to deal with would be frustrating.	1	7	4.68 (1.477)
OV4	The large amount of alerts that I would receive would cause me to omit investigating some potentially important alerts.	1	7	4.17 (1.756)
OV5	The large amount of alerts that I would receive would make it challenging to distinguish which alerts should be investigated further.	1	7	4.81 (1.700)
OV6	I would have to overlook some alerts because of the large amount of alerts I would receive.	1	7	4.50 (1.723)

Perceived Task-Technology Fit (Alert Currency)

Finally, if you were receiving the internal controls monitoring software alerts, please indicate the extent to which you agree or disagree with the following statements referring to whether alerts would be current enough to meet your needs:

"Our internal controls monitoring alerts…"

Item Code	Item	Min. (n=107)	Max. (n=107)	Mean (Std. Dev.) (n=107)
TTF1	Would fit my preferences for the up-to-date status of internal controls.	2	7	5.50 (0.905)
TTF2	Would fit my needs for the current status of internal controls.	3	7	5.43 (0.943)
TTF3	Would be sufficiently frequent for my evaluation of internal controls.	2	7	5.36 (1.094)
TTF4	Would be generated as often as I would like.	3	7	5.63 (0.995)
TTF5	Would be produced at the rate necessary for my purposes.	3	7	5.61 (0.949)

Panel B: Constructs Measured using Formative Indicators

Item Code	Item	Min. (n=6)	Max. (n=6)	Mean (Std. Dev.) (n=6)

Group 1: Respondents who selected “My organization USES software to monitor internal controls, and I RECEIVE the alerts generated by the software that monitors internal controls.”

Frequency of Computerized Alerts

Please indicate the frequency with which your company’s internal controls monitoring software generates alerts in the following areas. Please select the answers that represent the greatest frequency with which you normally receive the alerts.

Item Code	Item	Min. (n=6)	Max. (n=6)	Mean (Std. Dev.) (n=6)
FR1	Quotation and order management	1	4	2.67 (1.506)
FR2	Order fulfillment and delivery	1	4	2.50 (1.643)
FR3	Billing and invoicing	1	4	2.83 (1.472)
FR4	Receiving payments and collections	1	4	2.83 (1.472)
FR5	Purchasing/Procurement	1	4	3.33 (1.211)
FR6	Receiving	1	4	2.83 (1.472)
FR7	Accounts payable payment processing	1	4	3.50 (1.225)

User Resources to Modify Alert Frequency

Please indicate the extent to which you agree or disagree with the following statements. These statements refer to resources available to you to modify the frequency of the internal controls monitoring software alerts:

"I have the following resources necessary to modify the frequency of alerts..."

Item Code	Item	Min. (n=6)	Max. (n=6)	Mean (Std. Dev.) (n=6)
RES1	Authorization	1	7	4.50 (2.739)
RES2	Necessary knowledge	1	7	4.67 (2.503)
RES3	Time	1	7	3.50 (2.258)
RES4	Financial resources	1	7	4.17 (2.317)
RES5	Available assistance	1	7	4.33 (2.338)
RES6	Documentation (e.g., manuals, books)	1	7	4.50 (2.429)

Item Code	Item	Min. (n=20	Max. (n=20)	Mean (Std. Dev.) (n=20)

Group 2: Respondents who selected "My organization USES software to monitor internal controls, but I DO NOT receive the alerts generated by the software that monitors internal controls."

Frequency of Computerized Alerts
To the best of your knowledge, please indicate the frequency with which your organization's internal controls monitoring software generates alerts in the following areas. Please select the answers that represent the greatest frequency with which those alerts are normally generated.

FR1	Quotation and order management	1	7	3.05 (2.064)
FR2	Order fulfillment and delivery	1	7	2.90 (2.125)
FR3	Billing and invoicing	1	6	3.00 (1.777)
FR4	Receiving payments and collections	1	7	2.80 (1.795)
FR5	Purchasing/Procurement	1	6	3.00 (1.589)
FR6	Receiving	1	7	3.05 (1.731)
FR7	Accounts payable payment processing	1	7	3.20 (1.642)

User Resources to Modify Alert Frequency
Again, please put yourself in the position of someone who receives such alerts and answer the following questions by indicating the extent to which you agree or disagree with the following statements referring to resources that would be available to you to modify the frequency of the alerts:

"I would have the following resources necessary to modify the frequency of alerts..."

RES1	Authorization	1	6	4.65 (1.631)
RES2	Necessary knowledge	2	7	5.30 (1.031)
RES3	Time	2	6	4.50 (1.318)
RES4	Financial resources	2	6	4.40 (1.392)
RES5	Available assistance	1	7	4.30 (1.559)
RES6	Documentation (e.g., manuals, books)	1	7	4.75 (1.482)

Item Code	Item	Min. (n=107)	Max. (n=107)	Mean (Std. Dev.) (n=107)

Group 3: Respondents who selected "My organization DOES NOT use software to monitor internal controls, and I DO NOT receive the alerts generated by the software that monitors internal controls."

Frequency of Computerized Alerts

Previously, you stated that your organization does not use software to monitor internal controls and that you do not receive the alerts generated by that software. For a moment, please put yourself in the position of someone who does receive such alerts and indicate the frequency with which you would prefer that it generate alerts in the following areas:

FR1	Quotation and order management	1	7	2.98 (1.590)
FR2	Order fulfillment and delivery	1	7	3.04 (1.541)
FR3	Billing and invoicing	1	7	3.13 (1.381)
FR4	Receiving payments and collections	1	7	3.19 (1.480)
FR5	Purchasing/Procurement	1	7	3.01 (1.424)
FR6	Receiving	1	7	2.96 (1.359)
FR7	Accounts payable payment processing	1	7	3.28 (1.596)

User Resources to Modify Alert Frequency

Again, please put yourself in the position of someone who receives such alerts and answer the following questions by indicating the extent to which you agree or disagree with the following statements referring to resources that would be available to you to modify the frequency of the alerts:

"I would have the following resources necessary to modify the frequency of alerts..."

RES1	Authorization	1	7	5.05 (1.507)
RES2	Necessary knowledge	1	7	5.23 (1.371)
RES3	Time	1	7	4.74 (1.562)
RES4	Financial resources	1	7	4.53 (1.443)
RES5	Available assistance	1	7	4.55 (1.650)
RES6	Documentation (e.g., manuals, books)	1	7	4.68 (1.552)

Vita

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