Financial Data Integration:
A case study analyzing factors that impact the integration of financial data between systems.

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Abstract

Enterprise systems play a central role in the business processes and management of data within an organization. However it is not uncommon for organizations to possess a multitude of autonomous systems. This thesis examines the way organizations can integrate financial data from different autonomous source systems and examines different factors that can have an impact on data integration processes. The empirical findings were gathered through a case study at Sandvik, a large Swedish industrial firm, making use of qualitative research techniques. The findings contribute to create an in-depth understanding of financial data integration processes. The empirical findings show how an organization can accomplish financial data integration without tight coupling of autonomous systems. Moreover the research contributes by describing various organization and technological factors that impact data integration. The findings indicate that a decentralized organizational structure and singular system architecture play an important role in financial data integration processes. Hereby the research helps to further explore the topic integration within enterprise system research and provides context behind the organizational and technological factors that influence financial data integration processes.

Keywords: financial data integration, system integration, enterprise system, autonomous systems, financial reporting.
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1. Introduction

“Integration can be compared to automotive infrastructure. There are different types of cars, Mercedes, Volkswagens, and Volvos. These cars are based on a singular concept but the way these cars are designed and operate can be vastly different. However this does not matter for their functioning because what these cars need to function is a common road that they can share. This underlying infrastructure is what integration is for an enterprise system.”

Whether this remarkable comparison, made by the first respondent of this research, holds all the way to explain financial data system integration is questionable. Still it serves well to address several important aspects of the topic chosen for this paper. During the last decades organizations have been implementing enterprise systems with the aim to decrease the fragmentation of data within an organization and to link important business processes together (Gartner, 2014). However the standardized nature of the systems makes organizations tempted to implement different autonomous systems throughout the organization (Davenport, 1998). Hereby business units within an organization are better able to meet local requirements and to uphold some sort of independence within an enterprise (Markus, Tanis, & van Fenema, 2000a). However implementing different enterprise systems and finance applications comes with a consequence. The implementation of autonomous systems diminishes the initial reason to implement them: namely to decrease the fragmentation of data between departments. Thus, referring back to the empirical example, this creates a need build a common infrastructure to connect the data between the systems. This can be a problem as research has shown that data integration is a difficult challenge for organizations when data is stored across multiple heterogeneous and autonomous enterprise systems. (Halevy, Rajaraman & Ordille, 2006). This is because autonomous systems often structure data in different ways. Hence to be able to integrate data, firms need to find ways to assemble the data together again (Lenzerini, 2002).

Several authors have addressed the topic of financial data system integration. Chowanetz, Legner & Thiesse (2012) identified that a commonly accepted theory for enterprise system integration was lacking and found that integration can be both a process and an outcome. Furthermore, Kähkönen, Maglyas and Smolander (2014) identified several factors that are deemed to be central to the integration of enterprise systems. Moreover research has shown that system integration includes both organizational- and technological factors. (Barki &
Pinsonneault, 2005; Waring & Wainwright, 2000). Nevertheless little is known about the actual content of the factors that impact integration practices. Prior research has come up with various taxonomies for integration but little is known about the complex interplay between various integration factors (Chowanetz et al., 2012). Moreover focusing specifically on the integration of financial and accountancy data across autonomous systems is often overlooked. Which is odd given that work-tasks like financial reporting and analysis are heavily dependent on integrated information systems (Rom & Rohde, 2007). Moreover Janvrin and Mascha (2014) argue that managers require timely and integrated financial information to help them manage organizations, however still scholars have made little effort to understand the current financial integration practices within organizations. In order to explore this topic a qualitative case study was performed at Sandvik AB, a global industry and technology firm with an abundance of autonomous systems within the borders of the organization. To address the research problem the following research question was created.

(RQ1) *How do technological and organizational factors impact the integration of financial data between autonomous data systems?*

Additionally, a secondary research question was created: *(RQ2) how is financial data integrated between multiple autonomous enterprise systems?* The aim of the second research question is to understand the practices behind financial data integration processes, which in turn will help to build a knowledge foundation for the different factors as discussed in the primary research question.

### 1.1 Purpose & Contribution

The aim of the research is to investigate how an organization consolidates financial data between different autonomous systems and to look at how these integration processes are affected by a variety of technological and organizational factors. By using the insights from financial and accountancy professional this thesis will explore financial consolidation procedures within an organization. Hereby the thesis will aim to contribute to a further understanding of data integration, as integration within enterprise system literature is ill defined (Chowanetz et al., 2012). In addition, the paper aims to gain an insight for financial departments by researching how different factors within an organization can limit and/or enhance financial data integration. Hence managers of financial departments can consider or take action based on these factors in order to improve financial reporting processes.
2. Literature Review

The following chapter will take the reader through a variety of interrelated topics. Enterprise systems will be used as an introductory for the review, in order to provide background information. The literature review continues by focusing on a specific aspect of enterprise systems, namely the integration of autonomous systems. From there the thesis continues by focusing specifically on the integration of financial data between autonomous systems. Data integration thereafter will be further highlighted through discussing organizational and technological factors that in accordance with previous literature can potentially impact data integration processes within organizations. The chapter finishes with a summary of the literature providing guidance for the expectations of the subsequent sections.

2.1 Enterprise Systems

For several decades organizations have been implementing systems in order to automate business processes. Over the years organizations have collected a wide variety of systems in order to match different needs. According to Bennet (1995) initially these systems were not implemented with an aim for overall integration. Hence as every process had its own system, the size of such ‘legacy systems’ became difficult to cope with. The total information system of a firm is likely to remain complex; hence instead of looking how to eliminate complexity, research should instead focus on how to cope with complexity (Ryan, 1999). The total information system is named the enterprise system\(^1\), combining all systems and applications together.

During the last two decades ERP systems (Enterprise Resource and Planning), have started to take over functions and processes previously performed by parts of the legacy system and have established themselves into becoming the backbone of many organizations (Alshawi, Themistocleous & Almadani, 2004). The systems were implemented with a promise of full integration along all business processes. When implemented correctly one ERP system should be able to link all business units including order-intake, production, human resources, and finance on top of that it can link itself to external suppliers and customers (Chen, 2001). Despite this outlook, soon after the introduction of so-called ERP systems, researchers started to express their doubts about the success of such systems. The impression was that many larger organizations would never be able to integrate their processes in merely one system as

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\(^1\) Enterprise systems are used to refer to the complete ecosystem of systems; individual systems are referred to as systems or financial applications.
the design of the systems is to standardized and hence not applicable to specific needs of business units. Furthermore the implementation of ERP systems was often experienced as a troublesome period that organizations had a difficult time recovering from (Davenport, 1998). Additionally organizations did not want to leave certain parts of the legacy systems as the success of certain business units was perceived as to be heavily reliant on these older systems (Bennet, 1995).

Other authors highlighted that the negative attitude towards ERP systems was unjustified as the success of ERP systems is employed several years after the implementation stage (Markus et al., 2000b; Shang & Seddon, 2002). Additionally, the critique of the inflexibility of ERP systems was prompted with new viewpoints on the topic that Gartner (2014) defined as post-modern ERP systems. Within this view organizations can maintain various systems simultaneously through balancing the benefits of full system integration with the flexibility of autonomous systems. Hence, in this view the advice is that organization should use different strategies for different types of applications.

The central role that enterprise systems play in organizations also has an impact on the work of the finance and accountancy department. Enterprise systems are key when it comes to the processing of financial data from various sources. For example an order intake recorded by a salesperson and the cost from the HR department can get processes and consolidated into one database. Hence making it easier for management accountants to produce a total picture of the financial state of organizations (Granlund, 2011). Furthermore, the automation of data processing has made the data more reliable and has left management accountants with more time on their hands for analytical workings tasks (Granlund & Malmi, 2002). On the contrary management accountants often perceive that enterprise systems are non-intuitive and therefore difficult to work with. Therefore a variety of analytical tools (also known as decision support systems) are available to complement the work of management accountants. The tools are stand-alone applications separate from the enterprise systems. However they can often be placed on top of an enterprise system as an empty shell that presents the consolidated data in a manageable format to the management accountants (Rom & Rohde, 2006).

2.2 Integration

Integration is an interdisciplinary term that can be interpreted in various ways depending on which research domain one belongs to. The term is derived from the Latin word *integrame*, which roughly means ‘to make a whole’. (Kähkönen & Smolander, 2013). This thesis
however will only focus on the aspects of integration relevant to enterprise systems in a financial and accountancy data context. This section will also serve as a basis for the subsequent section that will discuss several factors identified that influence integration practices within an organization.

2.2.1 System Integration

As discussed briefly in the previous section enterprise systems named ERP systems were marketed with the idea that it could provide a total integrated solution for organizations. (Davenport, 1998) In reality however when one looks closely at organizations, especially larger sized firms, one can see that they have implemented a variety of autonomous enterprise systems. In order to consolidate data from these systems, e.g. for financial reporting purposes, system integration becomes important (Markus, 2001).

Within the enterprise system domain, integration is approached from different angles. Barki and Pinsonneault (2002) identified that system integration is more than the connection of two or more systems. Instead one can also take the perspective of looking at how business processes are coupled between different departments. Alternatively one can take a strategic perspective by viewing system integration as a coordination enabler between human actors. Likewise, Chowanetz et al. (2012) identified that the domain of enterprise system integration consist out of an organizational and technological level. Moreover the same authors identified that integration can be interpreted in a different way. For example integration as a concept means that one can both look at integration as a process and an outcome. Furthermore integration as a perspective means that integration can be view as a phenomenon and a man-made feature.

Markus (2001) mentions that organizations can have various reasons for not having a fully integrated enterprise system. Organizations might need to hold on to part of a legacy system that handles important business processes, or an organization might opt to implement applications from various vendors that match specific needs from departments instead of purchasing a fully integrated system. Furthermore decision support applications that management accountants use for reporting and analysis are often not included in the enterprise system, which creates a need for integration. Likewise, Markus (2000) mentions that managers in the 1980’s did not see integration of enterprise systems as something necessary. In the article an executive from the telecom industry is quoted that says ‘people in Marketing don’t need to talk to people in Engineering’ when asked why the systems from
different departments were not integrated. The example gives an explanation for why organizations have built up large complex enterprise systems.

Attempts to create a structured understanding of how enterprise systems are integrated have been made. Kähkönen et al. (2014) published an article titled ‘what are the factors affecting ERP system integration’. The authors suggest that the factors can be divided into roughly four different sections: domain, organizational landscape, enterprise system development partners and system characteristics. The underlying factors mentioned in the four sections provide an interesting insight in the factors involved in system integration (e.g. system strategy, system characteristics and system architecture). However the article bases the model primarily on the findings from their own study and the factors mentioned are not explained thoroughly, making it difficult to reuse it for other integration studies. Alternatively, Lam (2007) identified that top management support, overall integration strategy and planning are important factors within system integration projects. Moreover the author found that before one can integrate systems that one should first focus on organizational integration.

A commonly mentioned topic within system integration is Enterprise Application Integration (EAI) a technology type that has the ability to integrated autonomous systems (Lam, 2007). Hereby enabling the idea of post-modern ERP systems (Gartner, 2014) to combine full integration with the flexibility of individual systems. On the contrary, total system integration should not be an aim either. Markus (2001) warns for the dangers of excessive integration. A takeaway from this is to not treat full integration as an ultimate goal but instead to view it as a continuum.

2.2.2 Data Integration

For the purpose of this thesis the literature review will continue by focusing on a specific topic within system integration namely data integration. Referring back to Chowantez et al. (2012) one can understand this relation, as that system integration is a process of which data integration is an outcome. This means that through tighter system linkages an organization can obtain data integration. Still data integration on its own can also be seen as a separate process apart from system integration, including its own specifications. For many organizations, the ability to make coordinated, company-wide decision is delimited by a lack of data integration as data elements are dispersed across different enterprise systems (Goodhue, Wybo & Kirsch, 1992).
Lenzerini (2002) describes a data integration framework that is commonly referred to within literature. The framework differs between a global schema and a source schema. In short organizations can achieve a global schema by mapping up data in a similar sense among the source systems. The mapping process is what makes integration difficult as data is structured differently among different systems. Additionally for data integration processes, four main roles can be identified based on the roles described by Wang (1998) regarding the information product creation cycle. For the purpose of this research these roles are instead focused on data integration.

- **Data suppliers** are those employees that work with the collection and creation of data and who report the data into the system.
- **Data manufacturers** work with the design, development and maintenance of the financial system.
- **Data consumers** are employees who use the data for work tasks, e.g. financial reporting, analytics and decision-making processes.
- **Data Product Managers** are the ones that are responsible for data throughout the data lifecycle.

The roles are a supportive identifier to distinguish between different responsibilities within data integration processes.

For the integration of financial data, integration is often referred to as consolidation processes or financial close processes. A detailed description of such processes is given by Janvrin & Mascha (2014). The authors summarize that financial consolidation processes can be benchmarked by looking at costs, data quality and timeliness. Furthermore they differ between a hard close and a soft close of the books. The former relates to regulatory driven consolidation for quarterly and year-end financial statements, while the latter relates to internal reporting such as e.g. a monthly consolidation. The current trend however moves towards a virtual close, indicating that organizations can create an integrated overview on-demand. The shift towards a virtual close, where organizations should be able to integrate financial data within one day on any day of a quarter, was already predicted in 1999 by the Economist (Sutton, 2000).

### 2.3 Data Integration Factors

Several authors have identified the existence of both technological and organizational factors that can both enable or hinder system integration (Chowanetz et. al, 2012; Barki & Pinsonneault, 2005). Moreover Kähkönen et al. (2014) provided a framework with factors
that influence enterprise system integration. With the help of these articles the following theoretical outline was created to analyze factors influencing data integration.

2.3.1 Technological Factors
The first section discusses technological factors; these are factors that relate to the coupling of systems and the optimization of enterprise systems (Warin & Wainright, 2000). The factor is in this research divided into three main topics. System architecture and customization were initially identified by Kähkönen et al. (2014), while system fit builds on the ideas of Strong and Volkoff (2010).

System Architecture
System architecture refers to the build up of the enterprise system and how the systems are connected in-between. Markus (2000) presents three generic enterprise system architectures for organizations with several source systems. The first approach leaves the data source systems alone and instead makes data extracts from these systems on a regular basis. This information is then uploaded into one single database. Likewise Goodhue et al. (1992) also mentions a similar structure that includes a central database that collects essential data while for the rest subunits are left untouched. The structure type can imply difficulties for integration as dissimilar source systems can structure data is different ways. Second, Markus (2000) mentions ERP system as a total architectural solution including all the applications needed to run business processes. Hence hereby all functions use a common database. However, as shown in previous sections, ERP systems are rarely able to function as a complete solution. Similar remarks were also made by Davenport (1998), who argued that firms need to adapt their business processes to the standardized forms that an enterprise system provides. Hence in theory all your competitors could be running on the same business processes.

The last system architecture solution involves placing middleware between all systems. Hereby each system needs to get integrated with the middleware instead of directly from system to system (Markus, 2000). Such a middleware solution resolves a common issue from direct system-to-system integration i.e. when one system makes a change then the integration configuration with the other system does not change with it. However in order for such a middleware solution to succeed, then adapters are needed to connect each system to the middleware. Generally the vendors selling the middleware can provide the adapters needed, however when these adapters are missing that the integration of systems becomes more problematic (Lam, 2007). Hence when one or two systems cannot get integrated with the
middleware then still a firm is left with systems to connect to a central data warehouse. Moreover in a later article Markus (2001) warns about the ease of excessive and mismatched integration. Additionally the systems presented above fail to capture an architecture that is common in today’s organizations, namely the addition of cloud computing. Cloud services provide an on-demand access to a shared pool of data sources and other IT resources. Hence the system is separated from the user and is accessible through the ‘cloud’ (Bharadwaj et al., 2013). In summary the data integration capabilities of a firm can be highly dependent on how the system architecture is build up, each sort implicating different benefits and limitations.

**Customization**

Customization refers to the level of adaptations made to a system. Customization can for example occur when an organization needs to adapt a new enterprise system to be able to integrate it with parts of the legacy system (Markus, 2001).

In literature customizing systems is often seen as something negative. Accordingly the advice is to keep customizations to a minimum and to un-customize systems if possible. Over-customizing a system can over time lead to issues when an essential update from a vendor is released. The reason for this is that vendors provide standardized software packages that are difficult to configure towards firm specifications (Beatty & Williams, 2006). Hence when one has multiple enterprise systems with different configurations to match with your system architecture, then updating these systems can become a time-consuming affair. Furthermore updating customized systems can become an expensive affair, with costs running up to twenty-five percent of the initial implementation cost. (Ng, Gable, & Chan, 2002). On the other side Kähkönen et al. (2014) provide a more positive view on customization practices. They argue that firms gain more control over enterprise systems and its integration capabilities through customizing them. System vendors regularly distribute updates, however with a customized system these updates cannot be implemented without the acceptance and adaptation of the user. Thus customization of systems could both be a necessary evil to be able to integrate data from various sources or it could also have an inhibiting effect since the customization of autonomous systems complicates data integration at top-level.

**System Fit**

System fit discusses the fit between enterprise systems and the rest of an organization. In general enterprise systems are designed to standardize processes and not in order to meet individual requirements of organizations (Davenport, 1998). Hence Strong and Volkoff (2010) argue that the likelihood of a misfit between (1) system capabilities and (2)
organizational requirements is high. The authors continue by identifying different types of misfits that according to them can be divided into functional, data, usability, role, control and organizational culture misfits. The analysis of the research mentions both the deficiencies and imposition of each misfit type, hence showing the sincerity and widespreadness of the misfit issue. Also the paper brings up questions about integration since when a misfit exists between a new system and the current organizational processes and systems, then in turn this also limits the integration possibilities. Integration can also become a misfit when newly integrated systems suddenly cause interdependence between processes that not existed while the systems were more loosely coupled. These findings compare well with those from Markus (2001) in the system architecture section that warned about the dangers of over integrating systems.

Other authors have also identified issues that relate to the misfit between organizations and enterprise systems. Hasselbring (2000) talks about ‘heterogeneity’ and finds that the independent development of systems within a firm can lead to various problems. On a technical level a misfit can exist for example between the source systems of different departments. When departments are individually responsible for their systems, then this can lead to vast technological differences between departments, hence making integration later on difficult. On a conceptual level misfit can exist among different systems since different systems can have different ways of understanding the same real-world concepts. Hence complicating integration possibilities. Furthermore the misfit of one system can leave a gap between the system and real-life business processes (Scott, 2002). The gap requires organizations to take crucial decisions on whether to bridge the gap with integrative software or whether custom-made applications should be added onto the enterprise system. Due to the standardized nature of ERP systems, extending systems with custom-made applications has become common practice. This is done in order to match the unique business processes within a firm. (Alshawi et al., 2004). Thus a misfit between systems is likely to exist between autonomous departments, which can become a disabling factor for data integration practices.

2.3.2 Organizational Factors
Organizational factors relate to organizational forces and decision-making processes (Warin & Wainright, 2000) that can influence data integration. The organizational factor section is grouped into three main topics. All sections were initially inspired by findings from Kähkönen et al. (2014).
Top Management Support

Top management support refers to the actions of senior managers that have the authority or ability to make decisions about the enterprise system. It has been identified as an important factor when it comes to the success of enterprise systems within a firm (Staehr, 2010; Lam 2007). According to Staehr (2010) managerial support is key throughout the system lifecycle both during planning, implementation and post-implementation in order to achieve business benefits. Top management decision-making plays an important role within all stages of the enterprise systems lifecycle consequently top management support also touches upon the data integration capabilities of a system. Likewise Rom and Rohde (2007) argue for the importance of power positions within enterprise systems. According to the authors, a power position, like for example top management, has a moderating impact on the integration of financial data and enterprise systems.

Several enablers are needed for top management to support enterprise system development (Lee et al., 2014). According to the authors, top management needs to receive information from external and internal sources in order to become aware of innovation possibilities. Secondly someone within top management should be able to combine strategic business knowledge with IT knowledge. Moreover there should be an interaction between top management and the information integration team in order for them to consider the benefits of enterprise system development.

Boh and Yellin (2006) argue for managerial roles that can be held accountable for data integration objectives. According to the authors the enterprise system objectives of individual business units are too specific. Hence a top-level decision maker should be in place that can both take into account the specific requirements of the units while simultaneously keeping track of an overall integration strategy. Likewise Tanriverdi (2005) mentions similar findings, as unit managers might adopt incompatible enterprise systems that are not aligned with the goals and objectives of an organization. Moreover the author mentions that organizations that have trouble with data integration between autonomous systems can lack in their understanding of their end-consumer. In summary top management support has an ultimate possibility to influence data integration practices both as a hinder or an enabler.

Enterprise System Strategy

Strategy is an ambiguous term, which makes it difficult to pinpoint out an exact meaning. Within enterprise system research strategy is used in order to describe the reasons behind implementing, maintaining and changing systems. Furthermore merely having a clear vision
is not sufficient; instead one also needs quantifiable objectives that are achievable and deliverable (Holland & Light, 1999). The link between strategy and integration can be understood as the aim of an organization to integrate systems in-between or the opposite (Lam, 2005). When there is no willingness to integrate systems or improve data integration possibilities then it is likely that no resources will be reserved for such practices and vice versa.

Enterprise system strategy is described by Kähkönen et al. (2014) as having a global system strategy in place. The case subject in their research has a global strategy in place that aims to implement the integrated system in each entity globally. Moreover continuous road mapping of the system is part of the strategy to maintain an overview of the system landscape. On top of that Ryan (1999) mentions the need for a clear vision when it comes to the development of large complex systems. For example a vision can articulate essential capabilities of a final integration project. Thus for the development or improvement of data integration processes, it is vital that there is a common goal or strategy within the firm that describes a concrete plan of future development steps to improve the enterprise system.

**Enterprise Architecture**

Enterprise architecture is a discipline that turns strategy and business vision into structural changes by improving key principles, models and decision-making structures of an enterprise (Gartner, n.d.). Organizations can design themselves alongside a combination of architecture streams such as commonly mentioned centralized and decentralized structures. In reality, especially for medium- and large sized organizations, enterprise architecture is often defined by a combination of different structures.

Enterprise architecture is according to Kähkönen et al. (2014) a factor that affects enterprise system integration, however as discussed before the article gives little background information regarding why these factors have been selected. The authors mention that global organizations tend to have a complicated architecture with many different business units. The diversity of business units makes having only one integrated enterprise systems difficult, since it is difficult to find a functional system for all. In an article written by Boh and Yellin (2006) the role of enterprise architecture within enterprise system integration becomes clarified. According to the authors, enterprise architecture standards are key in integration. Standards are set of policies rules and guidelines to unify principles and practices across a firm without dictating exactly how business units handle their data processing activities. The authors conclude that standards can have a significant effect on enterprise system integration.
however for data integration between systems standards are not sufficient. Instead a centralized IT development team is needed in order to coordinate data integration. Such teams need sufficient power to overrule the decision-making of business units.

Hasselbring (2000) discussed autonomy related problems within an enterprise architecture, indicating the potential issues of a decentralized structure. According to the author, the autonomy of systems and departments can have implications for integration practices. The author mentions two different types of autonomy. First, the development of systems can be autonomous meaning that departments are responsible for their own system design. Hence the differences in design can make integration difficult. Second, the systems can also be autonomous with respect to communication. This means that departments can independently decide how to handle the communication with the outside world, which in turn can lead to discrepancies in financial reporting. Furthermore, the author identified that problems caused by autonomous systems can usually only be resolved through organizational changes. An illustration and consequence of this are given by a manager from IBM who told that: “[organizations] saying they are running SAP across the globe – but when you look closely you often discover that in the 100 countries there are 100 different installations ... this of course drives tremendous costs on for instance process efficiency, and ultimately on business efficiency” (Caesarius & Hohenthal, 2013). Thus, enterprise architecture standards can positively influence integration practices while a decentralized architecture with autonomous decision-making can hinder data integration.

2.4 Literature Summary

The literature review has brought up several findings from previous research about integration and enterprise systems. In the first Section 2.1, background information was given about enterprise systems. The section also briefly showed how financial reporting practices are expected to benefit from enterprise systems as it improves data processing capabilities and data quality (Granlund & Malmi, 2002).

Regarding Section 2.2, the expectation that through the case analysis different data integration aspects will come forwards both as an outcome of system integration and through data integration as a process Chowantez et al. (2012). Data integration as an outcome will likely to be determined by the way organizations couple autonomous system and try to bridge heterogeneous structures (Hasselbring, 2000) while data integration as a process will look into how the practice of consolidating financial data together works.
Regarding Section 2.3 expectation is that overall organizational factors have a more dominant effect on data integration than technological factors. This is motivated because organizational factors have an overruling effect not only on data integration but also on technological aspects of an enterprise system. For example if a person within top management is responsible to improve data integration as presented by Boh and Yellin (2006), then it is likely that these decisions also impact the development of the system architecture. A similar reasoning was given by Lam (2007) who argued that organizational changes should be made prior to altering the enterprise system.

Regarding section 2.3.1 the first anticipation is that system architecture influences data integration. Organizations can have different ways of designing a system structure and these different structures have different outcomes for the possibilities to integrate data (Markus, 2000). Second, customization is projected to influence data integration as systems are often adapted to fit specific needs but when these systems then need to get integrated with other systems then this can become a troublesome task (Markus, 2001). Third, the research will also look into the relation between system fit and data integration. As it showed that misfit between autonomous enterprise systems can lead to integration issues (Strong & Volkoff, 2010). Thus the relation between integration and the misfits between systems and organizational processes are further studied in this paper.

Moreover for the organizational factors from section 2.3.2 the expectation is that first top management support has an enabling effect on data integration as top level management can overrule the individual interests of business units (Tanriverdi, 2005). Second, for enterprise system strategy the anticipation is that a clear enterprise system strategy with quantifiable objectives should be present (Ryan, 1999) in order to improve or change financial data integration practices within a firm. Third, enterprise architecture can impact data integration foremost through a decentralized structure as this leads through heterogeneous systems that are difficult to consolidate (Hasselbring, 2000).

3. Method

The research was initiated after the identification of both technological and organizational factors influencing integration that were described in literature (Chowanetz et al., 2012; Barki & Pinsonneault, 2005). However within the literature a clear framework could not be identified that gives insight into the content of these factors. Hence, in order to research the topic an exploratory approach was chosen to contribute to a greater understanding of how data
integration comes to place and to describe the factors involved in data integration. Furthermore the research strategy used for this paper is a case study, more specifically a singular case study with Sandvik as a case study object. The case study approach allowed the author to analyze the research question in a real life context using a multitude of evidence (Yin, 2003) and provides an opportunity to study the complexity and particular nature of the study object (Stake, 1995). Further details about the data selection, data collection and data analysis are described below.

3.1 Data Selection

Case Selection Sandvik

The author selected Sandvik as a case study object since it provided an excellent learning opportunity to gain more knowledge about the topic. Also since Sandvik provided the author with access, the case study object could be used to gain an in-depth understanding of the research topic (Bryman & Bell p 482. 2011). The connection between the author and Sandvik was made during an internship at the group business control department, which provided the author with a unique insight into the financial reporting processes of the organization. The selection of one firm indicates a single case study design. A rationale for choosing a single case design can be to analyze a typical or representative case (Yin, 2003). Sandvik can be seen as a representative case as it is a global firm consisting out of a variety of business areas with different product specifications (Sandvik AB, 2015). Hence the nature of the firm provides optimal conditions for the existence of a variety of enterprise systems, thus creating a need to integrate financial data between the systems. (Davenport, 1998; Markus et al., 2000a). Accordingly the nature of Sandvik’s operations provides an interesting study object.

After the case selection process a decision was made to use two data sources for the research, interviews and documents. This is in line with the idea that case study research benefits from using multiple qualitative methods (Knights & McCabe, 1997), as it improves the validity of the research (Yin, 2003).

Interviewee Selection

Interviews were selected as one data collection method. The interviews provided the researcher with the possibly to collect real-life interpretations from interviewees (Kvale, 1983), hence helping to gain an in-depth understand of the topic chosen. A total of eight individuals were selected to interview (nine including the meetings and insights received from the contact person). The individuals and details regarding the interviews are summarized in table 1. Within the table a definition of their roles is given based upon the information
product roles defined by Wang (1998). These roles are used further during the analysis in order for the reader to understand the work tasks within the enterprise system of the respondents. Interviewees were selected with the help from a contact person at Sandvik. Prior to starting the thesis, contact was made with a contact person who plays a central role in the finance information system at Sandvik. The contact person provided the author with an initial selection of interviewees. Using the contact person as a way to approach potential interviewees created an opportunity to reach out to employees that normally would have been hard to reach. The benefit from greater access was set against a potential bias created by involving the contact person within the selection process to such an extent (Kvale & Brinkmann, 2009). The way participants were selected is best explained as a convenience sampling technique. Convenience sampling techniques give a reduced representation of a total population, which limits the generalization possibilities of its findings (Saunders, Lewis & Thornhill, 2009, p272). However for a case study the aim of the research is not generalization instead case studies are intended to describe and understand a particular case in detail (Stake, 1995) thus making the chosen selection process more suitable for the aim of this case study research.

Table 1 – Interview Participants

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Work Title</th>
<th>Data Role</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manager Financial System (Contact)</td>
<td>Data Mechanic</td>
<td>102 min</td>
</tr>
<tr>
<td>2</td>
<td>Business Controller</td>
<td>Data Consumer</td>
<td>50 min</td>
</tr>
<tr>
<td>3</td>
<td>Business Controller</td>
<td>Data Consumer</td>
<td>55 min</td>
</tr>
<tr>
<td>4</td>
<td>Finance System and Process Developer</td>
<td>Data Mechanic</td>
<td>51 min</td>
</tr>
<tr>
<td>5</td>
<td>Finance System and Process Developer</td>
<td>Data Mechanic</td>
<td>57 min</td>
</tr>
<tr>
<td>6</td>
<td>Financial Controller</td>
<td>Data Supplier</td>
<td>62 min</td>
</tr>
<tr>
<td>7</td>
<td>Financial Controller</td>
<td>Data Supplier</td>
<td>50 min</td>
</tr>
<tr>
<td>8</td>
<td>Financial Controller</td>
<td>Data Supplier</td>
<td>55 min</td>
</tr>
<tr>
<td>9</td>
<td>Financial Controller</td>
<td>Data Supplier</td>
<td>38 min</td>
</tr>
</tbody>
</table>

**Document Selection**

A document analysis, a secondary research method, was used as a data collection method for the thesis. According to Saunders et al. (p258, 2009) secondary research is commonly used alongside primary research to gain a deeper understanding of the research topic. Benefits from using documents are that they are not created for the case study per se, which can help to
emphasize new and relevant topics (Yin, 2003). Hereby the author was able to obtain data about an inventorisation of all enterprise systems used for financial reporting and an overview of all reporting entities, among others. Furthermore for a case study it can be relevant to analyze written material specific to the research object on top of general academic literature.

The documents received were created for a variety of reasons, which is something important to realize when using documented resources (Atkinson & Coffey, 2004). During the last five years financial reporting has changed significantly within Sandvik and most documents were created to support such change projects. For example the finance department started for some years ago with a monthly consolidation of some important financial indicators, and the company has outsourced parts of the financial organizations. Hence different reports were created both by internal personnel and by consultancy firms. These documents provided an excellent insight into the financial data integration practices at Sandvik. However something that needs to be considered is that most corporate documents are confidential and can therefore not be published externally (Yin, 2003), which imposes limitations for repetition possibilities of the research. Still to conclude the documents usage within this study has provided the author with various valuable insights different from those collected through interviews.

The next section will discuss data collection but will exclude documents here as secondary research types are different compare to the primary research types (Atkinson & Coffey, 2004). The documents used for the research were created for a different purpose hence the author was not an active participant in the data collection process. Instead the author ‘merely’ selected the documents.

3.2 Data Collection

The following section describes the process of data collection. The first sub-section discusses the impact of the authors’ internship on data collection. Thereafter the collection process of the interviews is discussed including information on how the literature was operationalized for the interview question.

3.2.1 Work Shadowing

In research having physically been active in an organization can be seen as an insightful complementary research technique. As explained prior, the researcher had to possibility to work as an intern at the group business control department. Hereby one could argue that the author was able to gain an insight into the ways of working more then a typical desktop
research would be able to. Through work shadowing, a researcher can become a part of the social and organizational environment, which helps researchers that seek a great deal of detail (McDonald, 2005). Hence considering that the thesis is a singular case research focusing on in-depth understanding, the work shadowing aspects contributes to generating an additional level of insight into the empirical results. For example the researcher has been a part of the financial consolidation process multiple times, working at the data consumption side. It was also during this period that the researcher found out how Sandvik made use of a multitude of financial data applications and that this by some was seen as an issue. The usefulness of shadowing is further supported by findings from Brannick and Coghlan (2007), who claim that ‘going-native’ enhances the possibilities of access, increase the topic pre-understanding and creates a role duality. This role-duality in turn also can be seen as a negative as switching between an organizational and a researcher role can become puzzling. Still the author perceives that the length of the internship (six months) is not sufficient to become completely native. Moreover through researching units away from group business control, such as data suppliers within product units, part of the potential native behavior could be suppressed.

3.2.2 Interviews

Interview Guide Operationalization

In order to conduct a qualitative research, the researcher had to find a way to activate the theoretical definitions into a practical setting. Hence prior to starting the data collection process an interview guide (Appendix I) was created that aimed at incorporating the theoretical ideas as presented in the literature review in the questions asked. The interview guide starts with several introduction questions as to get to know the work of the interviewee and to gain insight about how their work relates to the usage of financial applications. Thereafter the questions continue in the same structure as the literature review.

The first section integration can be seen as a further elaboration to understand how data integration practices work. It focused on aspects to identify how the multitude of autonomous system played a role in the work of the respondents, as organizations can have different reasons to maintain multiple systems. Moreover inspired by research upon the usage of enterprise systems by management accountants such as Granlund & Malmi (2002) question where asked regarding the respondents usage of systems for their work tasks. Thereafter the questions specialize further by dividing them into questions aimed at identifying the importance of the various organizational and technological factors as predicted by Chowanetz et al. (2012). As explained previously the factors are partly based upon a
A difficulty during the operationalization process was to find a balance between developing questions that reflected the literature while simultaneously remaining relevant to the work context of the respondents. Furthermore the work context of the different respondents varied, which gave limitations to their knowledge on data integration practices as a whole. Hence some concepts were measured mostly through questions that naturally evolved from the interview. To cope with all these specification, the author decided to use a semi-structured interview approach. Hereby the author was able to leave room for alterations during the interview and to promote the natural evolvement of the conversation. This is in line with the ideas from Kvale and Brinkmann (p130, 2009) that the interview guide should be seen as an outline that covers the most important topics instead of a bounded script.

**The Interview Process**

Prior to the interviews a brief verbal presentation was given to the respondents to explain the topic of the research. All interviews, except for the initial meeting with the contact person, where recorded and transcribed. After each interview a list of notes was created to summarize the most important findings and to grasp the overall feelings regarding the interview. The interviews were recorded and transcribed in order to allow for more thorough examination in the analysis and to help to overcome the limitation of the human memory. Furthermore since a single author wrote the thesis, combining extensive note taking and simultaneously remaining highly alert during the interview can become a difficult task (Bryman & Bell, p
Hence by audio taping the interviews, the author was able to fully concentrate on interviewing and being present in the moment. Some interviewees took the initiative to show in practice how they worked with e.g. reporting which the interviewer agreed upon in order to create a full understanding of how the interviewees worked with data integration.

All interviews were conducted in Swedish since the native language of all respondents was Swedish. Although all respondents were able to speak English one can argue that letting respondents communicate in their native language allows them to feel more comfortable expressing themselves (Tsang, p. 511, 1998). Continuing, the interviews where all conducted face-to-face, this indicates a synchronized communication in time and place between the interviewer and the respondent. Face-to-face techniques are preferable over non-synchronized interviews because it allows for social cues to persist throughout the interview, which in turn promotes a natural flow through the conversation (Opdenakker, 2006). On top of that the face-to-face interviews made it also possible for the interviewees to show the author their work tasks in practice, which would not have been possible through non-direct communication techniques.

3.3 Data Analysis

The last step in the research involved the analysis of the data collected within the previous steps taken. This last step can be roughly divided into three stages, namely: sortation, reduction and argumentation (Rennstam & Wästerfors, 2015). The first two stages are not directly visible to the reader. First the author printed out all empirical data to gain a better overview. According to the three stage model the first step should help to get to know the data, which in this case at times was confusing because the interviews played out differently making it difficult to make direct comparisons between the interviews. By printing out the material the author was able to manually mark sections that would be of interest. Following thereafter the author focused on reducing the empirical data by identifying common themes. During this stage the summarized results from the literature review came in handy as they provided guidance to see which expectations were conformed and which ones contradicted.

The analysis section in this thesis combines empirical evidence in combination with analytical sections and theoretical reflections. This is done in order to enhance the argumentation for the findings that are presented in the section (Rennstam & Wästerfors, 2015) and to create a chain of evidence throughout the research that links the findings from the literature review with the empirical findings and the research question (Yin, 2003). Also within the analysis sections one can find a variety of quotes from the interviews. These quotes are translated from
Swedish into English, since Swedish was chosen as the language to interview the respondents. The translations are performed with ultimate precision still it cannot be avoided to lose some character and interpretation through such actions.

4. Case Context
The following section introduces Sandvik as a case study object. It provides some brief background information and describes the enterprise system context at Sandvik. The information in this section will help the reader understand assumptions and comments made in the analysis section that follows thereafter.

Sandvik is a global industrial and engineering group from Sweden. In 2015 the group had approximately 46 000 employees and a revenue of about 91 000 million SEK from operations in over 150 countries. The group conducts operations in four different business areas that have large responsibly over their own operations such as sales, production and R&D. The four business areas are: Machining Solutions, Mining and Rock Technology, Materials Technology and Venture (recently renamed Other). Machining Solutions produces a variety of tools and tooling systems for industrial metal cutting. Mining and Rock Technology is a supplier of various equipment and tools for the mining and construction industry. Materials Technology focuses on the development and manufacturing of advanced metal alloys and stainless steel solutions. Venture, is a gathering of business ventures not directly related to one of the other business areas. (Sandvik Annual Report, 2015) Hence, the business diversity among the four business areas makes that the organization can have a practical reason to own a variety of system (Markus et al., 2000b).

The four business areas consist out of a selection of smaller companies (Figure 1). For example, the largest business area Machining Solutions consists out of different product units such as Coromant, Walter, Seco Tools and Dormer Pramet. Sandvik refers to these product units as product areas. Under the product areas one can also find different sales offices and representation offices and it is in this lowest structural layer one can find the various reporting entities. These entities can represent various activities. For example, there are entities that represent one business or product area within a country, such as Coromant UK and Sandvik Mining Argentina. There are also reporting entities that represent multiple business areas, e.g. Sandvik Mexico. In total there are roughly around 400 reporting entities within the group.
The last inventarisation of enterprise systems was performed in 2012 as a part of an outsourcing project for finance functions. The report includes only systems with a finance application, all other systems are excluded. For example, the human resource department works foremost with a separate application from a vendor named Peoplesoft, however this application, among dozens of others, is left out of scope. The report gives the enterprise system at Sandvik the name ‘system landscape’, which suits the collection of around 30-40 applications well.

The most prominent system within Sandvik is SAP SAT. SAP SAT is a version of SAP that was specifically customized for Sandvik and according to one respondent, the initial idea was that SAP SAT would become the system for all entities to use, however this vision turned out different in reality. Still, this system is both the most common version of SAP within Sandvik and the most common system within the group. However, as of now there is no regulation or policy within the group that forces entities to implement SAP SAT. In more recent years, this intention has changed into a wish to go towards three main systems: SAP SAT, S21 and Movex (S21 and Movex are other ERP system vendors).

Throughout the interviews, the author received mixed perceptions on the current state of reducing the amount of enterprise systems. A part of the organization seems to understand

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2 SAP is one of the largest global vendors of enterprise systems (SAP, n.d.) because of its dominance, many respondents often refer to SAP when they talk about their financial application.
that having 30-40 applications is not practical, which has led to the removal of many minor financial applications during the last couple of years. However, another respondent discussed that currently the organization can implement new systems at a pace of maximum five entities per year. Hence, since there are several hundred reporting entities within the group, it will take decades at this pace before a noticeable difference can be seen.

A main reason given for the increase of the number of systems is the acquisition activities of Sandvik. Over the years, Sandvik has acquired various organizations. During an acquisition process, the main objective is not to find a target with a matching enterprise system. Instead Sandvik most often looks at firms that have an interesting clientele or that possess innovative technologies. Over the years various organizations have been acquired that have had vastly different systems compared to those at Sandvik. These organizations normally maintain their local system after the acquisition. On top of that, the author learned during an interview that not all local managers are concerned with reducing the amount of financial applications. One newly started entity within Mining and Rock Technology had recently been added to the reporting list, however as a new unit they had opted to start using a new version of SAP (not SAP SAT), which is strange since Mining and Rock Technology entities are foremost working with S21 systems. Such an example reinforces the impression that no central group seems to drive the question of the multitude of systems forward, even though all respondents mentioned that personnel perceived the ‘landscape’ as being an issue.

5. Analysis

The analysis will obtain a similar structure as the literature review. The first section 5.1, guides the reader into the world of financial data integration practices at Sandvik, in line with RQ2. Thereafter this knowledge will be used to address RQ1 by looking at how technological and organizational factors influence financial data integration practices within Sandvik.

5.1 Financial Data Integration Processes

The section started with the initial idea to research how Sandvik integrates financial data between autonomous systems. Through the literature review it became clear how system integration was expected to be a driving factor for data integration possibilities (Chowanetz et al., 2012, as data needs to be bridged between different systems (Hasselbring, 2000). The case context further showed how the multitude of systems at Sandvik could potentially create a need for integration, e.g. in order to meet financial reporting requirements. However within
Sandvik data integration is not achieved through the direct integration of systems. Instead the integration is centered around one system referred to as BPC\textsuperscript{3}. The basic idea is that all reporting entities are required to fill in a variety of reports on a monthly basis in order to create a consolidated picture of the firm. Each financial quarter the reporting requirements increase. This is in line with the difference made by Janvrin & Mascha (2014) regarding a monthly soft-close and a quarterly hard-close of the books. The data within BPC can thereafter be used to create reports both for internal use and to create external financial statements. A simplified visualization of the system setup is presented below in Figure 2.

*Figure 2 – Finance & Accounting Information System Structure*

The data is imported into BPC through reports in standardized formats to create an integrated insight in the financial performance of the firm. The reports are not adapted to the source systems from the reporting entities; instead the reporting entities need to adapt themselves to the standards of BPC. The reporting entities can choose between three different upload types: system-to-system uploads, web uploads and manual uploads. System-to-system uploads is the most automated upload technique. Data suppliers can use the data from their local system and send over data without a need to make any manual adjustments. This way of uploading is only available for SAP SAT users. The second upload technique is named web-upload and is a semi-automated technique created for non-SAP SAT users. Data suppliers need to extract files from their local system in a specific BPC format and upload these files through a web-application. Entities can receive assistance from the IT department to map these extraction files accordingly with the required structure for BPC. One respondent mentioned that web:

\textsuperscript{3} BPC (Business Planning & Consolidation) was originally named Outlooksoft but was revamped as BPC after its acquisition by SAP. It is an application specifically designed for financial consolidation, budgeting and forecasting tasks (SAP, n.d.)
uploads are becoming increasingly popular. Approximately half of all reporting entities make use of web-uploads in some way. Hence showing an interest from users for automated data integration. The third option is manual uploads, which indicates that the data suppliers have to manually fill in the reports.

Not all reports are available through system-to-system uploads and web-uploads. Moreover there are more reports available for web uploads than for system-to-system uploads. This makes that, for example, a SAP SAT user uploads some reports fully automated, some through web-uploads and some manually. At the moment foremost generic reports have been accessible through these automatic upload techniques, while more specific reports are generally filled in manually.

Data reported into BPC undergoes various quality checks. The first check starts when a report is uploaded into BPC that scans to see whether the structure of the upload is in line with the BPC structure. Otherwise the file cannot be uploaded. When this is done successfully the data suppliers can go into a web-based application named MyUploads to see if the values in their reports are found to be valid according to the system. These validity checks are performed automatically. If not then the system requires the data suppliers to make alternations. Thereafter, when the data is processed into BPC it can occur that data consumers do manual data checks to ensure the quality. When large deviations occur in the data, e.g. compared to last period, then data consumer can choose to directly contact the responsible data supplier to ask for an explanation.

The user base (data consumers) of BPC consists out of around 100 users. The BPC team (data mechanics) is responsible for providing the correct access level to each user. For example, a business controller at group-level can have access to a fully consolidated report, while a business controller at the business area SMT only has access to the consolidated data regarding SMT. The data consumers use BPC mainly for financial reporting and analysis. For example, the data from BPC is used to create the externally communicated quarterly financial statement and is also used to create presentations for management teams and the board of directors.

The financial data integration processes include little integration between the 30-40 source systems. The existence of BPC resolves many reasons to create a fully integrated data information system. Still, the variety of source systems previously led to issues with internal sales. When one entity recorded an internal sale in one period, while the buying party recorded the same sale within another period then a difference in the total result occurred. To
reduce such issues Sandvik decided to implement a new system named *Sandvik Invoicing Hub* where all entities are obliged to register internal sales. Hereby Sandvik managed to overcome the problem without any extensive system integration. Furthermore, another respondent mentioned that internal costs recorded between different entities are often sent manually as an invoice. Only when entities use the same source system then entities can send the recorded cost automatically from one account to another.

The finance department has undergone many changes during the last years through a project named GFSS (Global Finance Shared Service). The project has moved many financial reporting responsibilities away from the product areas onto a shared service function and an outsourcing partner. The outsourcing partner takes care of most manual reporting tasks, while the shared service center gathers the financial controller functions retained by Sandvik. Thus while previously financial controllers where dispersed over the different product areas and other reporting entities, now instead they are placed together within the shared service. These changes have had an enormous impact on the way the organizations works with financial data and reporting. For example, some respondents mentioned that placing the financial controllers from product areas together within a shared service function has helped to improve the quality of reporting and it creates a shared understanding of how to interpret reporting requirements. Thus, the findings show that Sandvik integrates financial data without extensive integration between the systems. This is different from the initial expectation that data integration would be an outcome of system integration, or at least not through the direct coupling of systems through integration technologies. The idea was based on the conclusion from (Chowantez et al., 2012) that integration can be both a process and an outcome. Moreover, data integration between autonomous systems is often made difficult since systems can have different ways of structuring data (Lenzerini, 2002). However this example shows that Sandvik can avoid this since BPC sets the standards for what is reporting in. Hereby the system leaves the data suppliers with the responsibility to find a way to report these figures. Lastly, the findings touch upon several topics relevant to understand the factors that will be further explained in section 5.2.

### 5.2 Factors Influencing Data Integration

The following section will address the findings related to the main research question (RQ1) that aimed at researching how technological and organizational factors influenced the integration of financial data between autonomous systems.
5.2.1 Technological Factors

System Architecture

Prior to starting the research the author expected that system integration between the different source systems would be more common. On the contrary, the previous section outlined how Sandvik can integrate data without tight system integration. In the literature section the expectancy was that different system architectures would incorporate different pros and cons (Markus, 2000). The system referred to as data warehousing in this article from Markus (2000) shows remarkable resemblances with the structure of BPC (figure 2, p 27). A prominent pro of this solution is that one can achieve data integration without having to make changes to the source systems, while a disadvantage is that the system cannot compensate for the limitations of the source systems. The following empirical chapters will illustrate some of these effects.

A central aspect of BPC is that data suppliers are required to report their results on a monthly basis. For many data suppliers, BPC is not more than a system where they report into each month. While for data consumers the system is their foremost source of financial data. The amount of information they receive is limited to what is reported into the system and thus has a limited granularity level compared to a source system. The following empirical example explains this further.

“A lot of times, both in BPC and in other systems, then you want, if they have the time and possibility, then you want that things are reported in on the lowest granular level as possible. That is always a trade-off, because it also takes time to report it at that level. But if you have the possibility then you should, because then when you analyze the data you can cut the data and make cubes on the lowest level. Otherwise the risk is that the more aggregated the data is the more limited are the possibilities for your analysis. Therefore you need to report so many details as possible.”

Within organizations the person analyzing the data is separated from the one supplying the data (Wang, 1998). Data consumers might want to receive data as detailed as possible, but the more detailed the data the more work it takes for data suppliers to report results into BPC. On top of that, data from different systems is often mapped in different ways (Lenzerini, 2002), hence when reports introduce extra levels of granularity then data suppliers need to be warned long in advance in order to ensure that their source systems can cover the renewed data granularity. Another interviewee added to the topic of data granularity by explaining that several manual reports in BPC require not only figures but also a written explanation.
“... what they (data consumers) want is comments on the reports. When there is a capital expenditure then they want to have both the number and a comment. I assume that they could automate the upload of the number if they wanted to, but a partial reason for not automating this is that they want to have that comment, they want us to fill it in manually. It can be depreciations, capital increases or that we have sold or bought an entity and then they want to have a comment that we directly report into BPC with the report.”

Whether there is a clear lack of data granularity is difficult to tell. When interviewing two data consumers, both perceived that the data available within BPC was sufficient for their work tasks. Still one of the data consumers also had access to SAP SAT to check upon certain data that is not available in BPC. Moreover one data mechanic perceived that currently too many change requests are received each month to change reports, indicating that data consumers are requesting more granularity on reports then currently available. The way data consumers at Sandvik work with finance is vastly different from the articles written by other authors that describe how management controllers work with enterprise systems (Rom & Rohde, 2006; Granlund & Malmi, 2002). In these articles, data consumers are found to often directly work in the enterprise systems or in an analytical system directly attached to it. Because all data is gathered in the same place in these examples, systems vastly improve data processing capabilities and data quality. While with the solution provided by BPC these benefits evaporate, as they are heavily dependent on what is reported in. The following empirical example illustrates this further.

“Yes problems [with data integration] do occur for example to have similar ways of working and to build up reports in similar ways, that is definitely something we strive for. And it is a big change that we are going towards, but it takes some time with such a large organization ... a major change made here at country finance is that we are all placed under the same roof. Before everyone was spread out over the different product areas where we worked with finance and reporting independently. Back then you did not get the same affinity that you get here where we can work together with routines and such. Put simply, working with how we can work in a similar way. It is a large, large project that lies here, to do everything the same.”

“Because everyone has to report, causes that we have the same monthly deadlines globally for all the entities. The result goes into BPC on a certain date and things like that ... Most of them have the same deadline for the overall result while some other deadlines exist for some specification reports. And as soon as the deadline has passed, then we at group business
control start our work, doing quality checks and looking for figures that are missing. And then there are also some entities that do not respect deadlines, some entities are always late.”

The first example refers back to the country finance offices as discussed in section 5.1 regarding finance shared service. Several respondents expressed their thoughts about the interpretation of reports. The concern here is that as the data suppliers, as they work dispersed from each other, that they interpret the meaning of the reports differently. For example, one respondent talked about order intake and said that different data suppliers and source systems can have different ways of interpreting at what point an order intake is ready to be reported in. The shared service should help to increase the shared interpretation of reports as data suppliers are placed together. The second empirical example shows that after the reporting deadline has finished that the data consumers before they can use the data often first have to do a quality check. As explained in section 5.1 BPC already automatically checks the quality of the data. Still data consumers need to spend time on checking for larger variations compared to last period. Also when one respondent began working as a data consumer, several suppliers made mistakes such as filling in a plus instead of a minus. Such practices have improved as the data consumer started to directly send feedback and questions to the entities making mistakes.

Thus, the findings regarding the system architecture impact of financial data integration differ. Initially the author had expected to identify a push towards complicated IT solutions such as Enterprise Application Integration software (Lam, 2007; Markus 2000), which drive towards total integration. Instead Sandvik has chosen for an indirect approach to the integration of finance data, using BPC that is not directly linked to the source systems. Hereby one could say that Sandvik Finance effectively found a way to avoid problematic extensive integration as warned for by Marcus (2001). In a sense over-extensive system integration is far away from being an issue within the system architecture. However BPC also comes with a set of cons that limit data integration possibilities. The system will be sufficient as long as monthly results are enough for analytical and reporting practices. This contradicts with the idea of a virtual close where organizations can quickly consolidate all financial data on any given moment (Janvrin & Mascha, 2014). Instead at Sandvik monthly reporting tasks from data supplier to data consumer takes over a week to finish. Moreover monthly reporting in BPC was only introduced a few years ago. Furthermore there is tension between the granularity required by the consumers and the ability of the data suppliers to provide the requested granularity. Comparing BPC to financial applications as described in literature, it
can be questioned if data integration through BPC can lead to the same processing and data quality capabilities as a fully integrated enterprise systems would (Rom & Rohde, 2006; Granlund & Malmi, 2002). As a result, the chosen system architecture for financial data enables Sandvik to leave source systems untouched. Still the findings also show how the architecture incorporates several limitations for data integration, i.e. data granularity possibilities and the speed of financial consolidation.

**Customization**

Initially the expectation was that organizations, in general, find themselves with a need to customize their systems in order to adapt to specific organizational needs. However a problem with customization is that it complicates integration (Beatty & Williams, 2006). The findings in this case however show that customization does not play a considerable role within the system structure of Sandvik. Product areas can decide themselves how they want to customize their system without having to worry about integrating financial applications directly to a central database. Thus the empirical findings contradict the initial expectations. Which can be partly explained by that the system architecture allows for data integration practices to act out without integrating systems directly with each other. Still several findings could be identified showing that customization of systems does play a role in data integration practices, although in another way as previously expected. BPC as a system is highly customizable both for the data mechanics and for the data consumers. The previous section mentioned that changes can be made to the reports to increase granularity. One data mechanic mentioned the problem with changing reports.

“A lot of changes are made to the system, too much I would say. Again a small effect from the independence of the business areas which causes that they can come with viewpoints about for example: we want to change this report slightly so that you even include these parameters ... We try to get them to think about only requesting changes one or two times per year. Now instead we implement changes 10 times a year.”

Making actual changes to reports is straightforward; the data mechanics can easily access the reports and restructure them. What takes up most time is the communication aspects as the data mechanics need to communicate the changes to the affected data suppliers in order for them to prepare their systems for the coming changes. Moreover the interviewee expressed concerns about the amount of changes being made, something also another respondent had noticed.
"The team that works with BPC puts a lot of effort into managing and maintaining the system, however I feel like if we could make time and resources free there to develop the system further ... if we could make resources available there to look at things from an analytical perspective. We have so much data in the system accessible for analysis. But can we get this data out of the system for even more advanced analysis to include in our decision-making?"

The example shows that data mechanics are perceived to spend too much time on adapting the system, which inhibits them to some extent from developing the capabilities of the system on the data consumer side. According to the respondent an adequate amount of data is collected into BPC that it hence would be interesting to look at even more advanced analysis techniques to use for decision-making. For data consumers, BPC also provides the ability to customize the way the data is presented, a feature highly appreciated by one of the respondents who proclaimed that it added a creative aspect to reporting tasks.

Thus the findings initially showed how customization does not inhibit data integration practices. This contradicts findings from others such as Beatty & Williams (2006), which can be explained by the financial system set-up. According to Markus (2000) the main benefit from such indirect coupled solutions is that source systems are left separate from the integration system. If another, more directly integrated architecture for the financial information system was chosen then it would have been more likely that customization would have a negative impact on data integration processes. The findings also contribute by providing another perspective on customization showing that BPC provides various opportunities to alter the way it collects and presents data adding a flexibility element to data integration.

System Fit

Before starting the analysis the expectations of the study focused mainly on potential misfits between enterprise systems, which could inhibit data integration possibilities (Strong & Volkoff, 2010; Scott, 2002). These expectations proved initially to be flawed for similar reasons as with customization, because for BPC the fit of a source system should become irrelevant. Still several empirical findings hinted towards a possible influence from system fit on data integration practices. As mentioned in segment 4, Sandvik developed a customized SAP solution that was intended to become the system for general system within the group. Over the years Sandvik has been able to role this system out to various entities in Sweden, France, China, England and the United States, foremost to entities with a close relation to the group entity. Because SAP SAT is the system that the group advocates makes that the system
also has the best fit with BPC. The following empirical example tells the story of a data supplier that uses the SAP SAT.

“... Exactly, and in there we have a specific tool made for SAP that uploads figures automatically with only one push of a button. So that is very very useful. And it works great if I compare to those colleagues that do not have this. And to be clear not everyone that uses SAP has this instead this is something that they produce for each entity individually. I had luck that somebody already had done that before I started. However I still need to make sure that it works each time that we make changes in the setup of SAP, because then we also need to make adjustments to the upload data so that the upload in BPC is still reported correct ... But a lot of my work has been automated ”

Although there are some difficulties left with data integration from the SAP SAT platform to BPC, still this is nothing compared to other users. Something the respondent was also aware of. Moreover an additional finding was that the respondent using SAP SAT was able to be the sole financial controller (in combination with the outsourcing partner) for the largest product area within the group plus having a similar position for two other reporting entities. Compared to other (smaller) product areas that not use SAP SAT, they often require a full-time financial controller for reporting tasks for a single entity. This gives an indication for the savings on personnel and outsourcing fees that could be made by increasing system fit between source system and BPC.

The next empirical example further shows how important source system fit with BPC is for data integration practices. Another respondent worked with a different system and had experienced major changes in ways of working in recent history. The product area has a long history of using Movex as their enterprise systems and prior the finance team had developed a way to use an Excel Query to import data from Movex in a structure that could be uploaded into BPC. However after the outsourcing project, this solution was not viable anymore as it gave external partners access to sensitive information. Hence the outsourcing partner had to change back to manual reporting tasks, while the respondent is responsible to oversee these activities. This has led to that the interviewee described current reporting tasks as following:

“Waiting is what takes up most of my time during times that I could also work with other things but I need to be available. And communication, time to answer questions basically. I tell them [Interviewee plays out a scene with the outsourcing partner] Me: ‘you have not reported correctly please redo’. [Second message] Me: You reported wrong again, could you be so kind to redo it. It is not my responsibility to report, that is your task’. Outsourcing
Partner: ‘I don’t know how, please tell me how’ Me: ‘I am not supposed to tell you, you should have a detailed work manual that tells you how’. Such processes take away so much of my time”

The experience from the Movex user shows us how a hand-made data integration solution became useless after structural changes were made to the finance department. This has led to a fall back to manual uploads into BPC which has become extra complicated now that these tasks have been outsourced.

Another aspect of system fit identified in the literature was that misfit of systems can leave a gap between systems and organizational needs, causing organizations to adopt additional systems to fill the gap (Scott, 2002). Similar findings were noticed at Sandvik. In section 5.1 the Sandvik Invoicing Hub was discussed, which essentially is a system to fill the gap left by having autonomous systems that are not integrated, as it makes sure that internal sales between units are recorded within the same period. Additionally, another system exists alongside BPC that is less intensively used. This system is named Aaro⁴. The system is directly linked to BPC and thus data can get transferred automatically into Aaro to perform the necessary calculations (Figure 3).

Figure 3 – Extended Finance & Accounting System Structure

![Diagram of Finance & Accounting System Structure](image-url)

Essentially the data within these systems is the same although Aaro has the ability to slice and combine the data in a different way. The following empirical episode gives more explanation for the reasons why Aaro was implemented.

“On top of that we have yet another system, unfortunately I have to say, that we have to maintain and that system is named Aaro. BPC gives us the answer to most questions that we have aside from specifications on the profitability of a specific group, product or market ...”

⁴ Aaro Systems AB is a Swedish producer of reporting and consolidation systems. According to their website twenty percent of OMX Stockholm large cap is an Aaro user (Aaro, n.d.)
Therefore we went out on the market and found a vendor named Aaro Systems which is a system that various Swedish firms use in similar ways as we use BPC. But Sandvik only uses it only for financial statements ... entities report as usual in BPC and then we import numbers from BPC into Aaro for more advanced analytical calculations, quarterly. ’’

Filling the ‘gaps’ between requirements and system capabilities does not directly impact data integration. Instead they help to increase the complexity of the ‘enterprise landscape’ as two more systems are added to the landscape. Additionally the findings show that the systems are implemented to overcome the shortcomings of the original system, this in line with findings from Alshawi et al. (2004).

Thus the findings show both a direct and indirect influence from system fit on data integration. First a fit between a source system and BPC positively influences data integration, as in that it makes it easier to fulfill reporting duties. While source systems that are different from the organization norm are more likely to be overlooked when it comes to data integration and automatic upload capabilities. These findings add on to the initial findings from Strong & Volkoff (2010) regarding organizational-system fit. Moreover indirectly misfit can also influence data integration, as the shortcomings of one system leads to the adoption of additional systems, hence adding another step to the integration process.

5.2.2 Organizational Factors

Top Management Support

The literature section outlined how top management support is likely to have a decisive effect on how an organization deals with data integration and enterprise systems. For an organization to succeed with integration questions then a central organization is needed that can be hold accountable for integration goals. This is further enforced by the drive from local entities to strive after goals that benefit their specific aims rather than focusing on integration projects that might benefit the overall organization (Boh & Yellin, 2006). Thus a centralized unit with decision-making power is needed in order to improve data integration between systems.

During interviews when respondents were asked about whom within the group had the responsibility over integration questions, answers varied. When one looks at data integration then the BPC team (data manufacturers) has an ultimate responsibility over the consolidation of all financial data required for reporting and analysis. However they do not have the control over where that data comes from, that responsibility instead lies with the reporting entities
and the product areas that these entities belongs to. The lack of central coordination of systems development is more clearly illustrated through the following empirical findings. When one of the interviewees was asked who within the firm would be responsible for driving integration projects, the following answer came forward:

“That would be, [pauses] That is a difficult question because Sandvik is a very decentralized organization when it comes to making decisions. The business areas and even the product areas have been very independent to manage their business in a way that they believe is best to serve their customers best. So therefore there has not been anyone at group level that has been able to drive an initiative at group level. And it is difficult because, at least I believe, that it would not be able for the CFO to say ‘now everybody will start using SAP’. Instead we should establish a mutual understanding or something between the business areas and reserve resources to work with this. But that is not prioritized at the moment”

Another interviewee responded similarly when asked why Sandvik made use of so many different enterprise systems. Simultaneously the respondent reasoned that making actual adaptations would cost a tremendous amount of resources, which Sandvik currently is not willing to spend.

“Throughout the years we have been very decentralized in the way we handle enterprise systems and the entities within the group. When entities perceived that an enterprise system fits their specific needs, then they have had the possibility to make a decision themselves about purchasing the system and implementing it. And that has perhaps been good for the business of theses entities. However after so many years now when you look at the total picture then you can see that it has become this enormous landscape ... And now we are sitting here and it would cost a lot of resources, labor, money and time to do something about it. And at the moment I believe we have a focus on other things.”

The examples show that the responsibility over enterprise systems lies foremost with the product areas. Additionally the respondents do not believe that top management in the current governance setup could enforce an integrated solution on the product areas. This in turn leads to a variety of data source systems as unit managers are inclined to make decisions based on the needs of the unit instead of integration. This is in line with findings from other researchers, such as Tanriverdi (2005), that describe the consequences of autonomous system governance. The findings contradict the initial beliefs of the author that top management at Sandvik would actively work on integrating the ‘system landscape’ or at least work towards reducing the amount of systems. This was further enforced by the idea that a lack of data
integration could prohibit coordinated decision-making for top management (Goodhue et al. 1992); hence this could motivate top management to increase coordination among systems. Still, if one considers Sandvik Group as top management, then they seem to be able to manage the organization without tight integration among systems, this holds as long as the monthly reporting that BPC provides is sufficient to coordinate the firm.

Thus it becomes difficult to say whether top management support is decisive as an enabling factor for data integration because decision making it decentralized and thus no central organization exist that can be held responsible for data integration projects, as proposed by Boh and Yellin (2006). Instead one could say that the lack of top management involvement is a contributing factor why the system landscape is so diverse, in turn making automated data integration techniques difficult to implement.

**Enterprise System Strategy**

The expectation prior to the data collection was that having a clear strategy in place regarding enterprise system development would have an enabling effect on data integration practices (Kähkönen et al., 2014). Moreover the strategy should incorporate quantifiable objectives in order to be effective (Holland & Light, 1999). During the case research it became clear that the BPC team has a vision on how they would like to go forward with the usage of data systems, namely in the ideal situation all reporting entities should be limited to the usage of three different possible system: SAP SAT, S21 and Movex. From this point on automated upload applications can be built for each of these systems. However any clear objectives are missing within this vision. The existence of such a vision is more clearly illustrated in the following empirical section:

“*No formal decision has been made about what we are going to do, if you take the perspective of the total group. Now I do not have an up-to-date figure but if we go back four to five years ago then I think we had a total of 60-70 different systems here. Back then the ambition was we are going to have one, entities will need to have one of the three major systems SAP, Movex or System 21. But we have not managed to enforce momentum, because it would occupy resources and it will cost money. At least our ambition is to go towards one of those three systems and from there build an [automated] interface to BPC.*”

The example shows the existence of a vision but there is currently none within the organization that follows up on the vision. Also again it shows that Sandvik is currently not willing to spend resources on reducing the amount of systems. Additionally a common mentioned factor for the existence of the ‘landscape’ is that it came about due too acquisition
activities. After the acquisition, the entities acquired can generally retain their own system. One respondent perceived that this was related the current lack of an integration strategy.

“There are other firms that have other strategies when it comes to this. Maybe when a firm consolidates its systems to such an extent that the majority of all entities within a group work with the same system, that then the value of replacing the systems of the acquired firm becomes liable. But when we at Sandvik, where we already have a multitude of systems ... it will take a long time before we start seeing the value of an integrated system solution.”

A clear enterprise system strategy seemed to be missing within the organization, similar to top management involvement. Prior to the analysis the expectation was that having a clear strategy in place including quantifiable objectives (Holland & Light, 1999) would enable data integration. A clear vision to reduce the number of financial systems to a total of three does exist however no concrete plan exists to obtain these results. Nor does an eagerness to allocate resources to this vision exist. The author also questioned whether such a decision can be made in a firm that is so deeply rooted in a decentralization strategy, a strategy that can be seen as one of the main success factors of the firm. Only recently the current CEO said the following in a Sandvik publication ’’As you already know, I am a strong believer in decentralization and in moving accountability further down in our operations to make sure our decisions add value to our customers’’ (Meet Sandvik, 2016). Still the intensive decentralization strategy has also brought with it an enormous abundance of enterprise systems and currently there is no clear pathway away from this ‘system landscape’.

Thus, the findings match with the premise that merely a vision is not sufficient but that a strategy also needs clear objectives (Holland & Light, 1999; Kähkönen et al., 2014). Something that is clearly lacking in Sandvik’s vision. Thus this also provides why there are no resources reserved to improve data integration and system reduction. A new insight is that research like Kähkönen et al. (2014) focus on examples where there is a strategy in place. This research however shows how an organization is able to integrate financial data, through BPC, with various autonomous systems that are not managed by a common system strategy.

**Enterprise Architecture**

From the previous sections we learned that the organizational structure of Sandvik is primarily based upon decentralization, leaving many decisions with the management of business and product areas. The initial premise of this section was that an enterprise architecture that favored autonomous units would be likely to have heterogeneous systems (Hasselbring, 2000), which is correct looking at Sandvik that manages around 30-40 financial
applications alone. And at group level the only way to integrate all the required data for financial reporting is through BPC.

During the interviews it became clear how the structure of the firm inhibits integration practices in other ways than the lack of a strategy and top management involvement. When a product area would like to implement a new system, e.g. a system such as SAP SAT, then they need to pay for these costs themselves. In the following empirical example a respondent tells why this could possibly be a hinder for entities that would like to change their system.

''As soon as somebody puts up his/her hand to say that they want to start using SAP then this costs money, and then there is the IT entity that debits these companies for resources to work with this, and I wonder whether this should not be the other way around where there is a central unit that takes these costs and not to let a local unit take these kinds of costs. Because these are measured on their results so they do not want to have these kinds of cost that stress their financial result, because the entities are measured on their results ... it is no piece of cake for those companies out there to take that extra cost especially when their current (non-integrated) system works fine.’’

The idea from the respondents to centralize the cost goes right against the decentralized structure of Sandvik and can be compared to the advice given by Boh and Yellin (2006). In a sense one could say that the reality within Sandvik is the direct opposite against guidelines set by the literature. The example shows that the product areas, because of their independence, are responsible themselves for carrying the cost of changing their system. Leaving little incentive to change the system when there already is a fully working system in place. The respondent afterwards continues by explaining where the idea of a centralized rollout of systems comes from. Apparently a firm that was acquired by Sandvik did the opposite by centrally rolling out an enterprise system, sharing the cost with the whole organization and not leaving the decision with local units. This product area now has a fully integrated enterprise system, although different from the rest of the Sandvik.

Two other respondents continued to give explanations for why the product areas themselves will not be prone to follow the vision of Sandvik Group to reduce the amount of systems.

‘‘... And it has also been part of the culture within the business area. It is not finance and economics that we focus upon, instead we focus on production. There is a whole group of engineers here which makes it easier to say that 'we want to invest in a new machine’ then to
say ‘we need to slim down our accountancy system’ or ‘we need to spend money on SAP to be able to work more efficient’. It is not something we prioritize’

“I believe that the actual businesses within the group do not really see the differences in systems as an issue. Instead it is we that sit a little higher in the structure where the problems start, because we need to create a final report [to report into BPC]. So the businesses do not really see the problem here. So we that are stuck in the middle should find ways to change it so that it becomes easier.”

The examples give further insight into the organizational structure of Sandvik and why it impacts data integration. The entities within the group are in a sense truly independent firms that have little to do with Sandvik Group, more than their reporting duties each month. Furthermore the core focus of these product areas is not finance and accountancy, which may sound straightforward, but this could be interpreted as a reason for the persistence of the system landscape.

Another aspect of the organizational architecture that was found relevant for its relation to integration is the legal structure of the firm. During the interviews it became clear that the legal structure of the firm has a different mockup compared to the formal organizational structure (figure 1). A considerable group of the entities is part of a legal structure referred to in Swedish as ‘kommissionärsbolag’, which means an organization whose operations are carried out on behalf of another organization on the basis of a formal agreement. For example, the product area Coromant is one ‘kommissionärsbolag’ for the parent company Sandvik AB and likewise so is Coromant’s business area Machining Solutions one. This legal structure causes that the entities connected to the parent company are legally bounded to report their quarterly results into the parent company’s enterprise system, on top of their reporting obligations in BPC. It is important to understand that the finance department from the parent company is separated from the group finance department, as not all entities within the group are part of the parent company structure and thus the parent company finance team is also placed at the data supplier side of the BPC system. The parent company uses SAP SAT as their enterprise system. One respondent working for the parent company mentioned that the data integration into SAP SAT is often troublesome, while another respondent that worked at one of the ‘kommissionärsbolag’ explained how they integrated the data into SAP

“Many of the 17 businesses that we consolidate together have different systems, they have Movex, Aurora and much more. And then they get to report their figures into SAP, because when we consolidate the parent company then it is SAP that counts, not BPC. So then the day
after the reporting deadline, we need to control to see if what has been reported into BPC by these 17 businesses is the same as what they have reported into SAP. And that can be a problem, because then BPC says one thing while SAP says something else. Then these businesses think that SAP is very tricky because they are so used to Movex. And believe that Movex is better. But they have to try to translate their Movex data to make it fit SAP."

“What we do for each quarterly closing of the books is that we report our balance sheet and income statement into SAP because we are a part of the parent company Sandvik AB together with the other kommissionärsbolag. But that work is done manually. It is a transaction that Cap Gemini [the outsourcing partner] ticks in into SAP on a quarterly basis ... we take everything out from Excel through a query and then have to sort everything so that it matches with the mapping accounts in SAP. Because that is not a one-to-one relation ... One could transport each transaction from our system directly into SAP, but there is just no reason for doing that.”

The examples show that although the entity could have a clear incentive to increase the level of integration between the systems that still no effort is being made to do so. The same respondent namely also proclaimed that the product unit had to hire a Movex consultant for more than a year in order to create a data mapping bridge between Movex and SAP SAT. This empirical finding relates to organization structure because it shows again the independence of the businesses within the group, as the only real connection between the entity and the parent company is a legal restriction that makes them report their data into SAP.

Thus the findings show the impact that the organizational structure has on data integration. The decentralized decision-making has left product areas with the ability to make their own decisions on enterprise system usage. On top of that several respondents mentioned that these product areas themselves do not experience the difficulty of data integration processes and that within product areas a culture exists where finance is not considered being central. This finding provides a conflict of interest if the management of a product area is responsible for the cost of implementing a new ‘group-friendly’ system, although not encountering any difficulty from the system landscape and rather spends it on other projects then the likelihood of any changes happening is small. These findings are a worthy note of addition to the findings from other researchers such as Kähkönen et al. (2014) and Hasselbring (2000) who argue that autonomy of departments can lead to integration and coordination difficulties, but do not go further into detail about what further consequences autonomy can entail.
6. Discussion

The research aimed at finding out how technological and organizational factors influenced financial data integration practices between autonomous systems. In order to do so, the research initially set out to discover how Sandvik integrated financial data between autonomous systems. Within this case research, the integration of financial data is concentrated primarily around one system. The expectation was that system integration would be a cornerstone to data integration, however in practice the overall level of integration among the autonomous enterprise system has proved to be limited. The independent financial applications can remain autonomous, but are obliged to report parts of their data into BPC on a monthly basis. In theory, using different source systems should lead to various integration problems such as heterogeneous data structures (Lenzerini, 2002; Hasselbring, 2000). This research however contributes with new insights to this as BPC dictates the reporting standards, hereby minimizing such problems. The different outcomes from this study regarding system integration could be explained by the purpose of financial data integration. Enterprise systems initially were designed to help with the coordination of business processes through integrating data from different departments. (Gartner, 2014) Thus when one for that reason wants to integrate data then tight integration between autonomous systems becomes necessary. However for financial reporting purposes this tight coupling is not essential as the aim of financial reporting and analysis is to create a consolidated report rather than trying to coordinate processes in real-time.

The initial findings heavily influenced the findings regarding organizational and technological factors, as financial data integration within Sandvik can be said to be synonymous with BPC. In a sense the case organization uses a single system to integrate financial data from an otherwise dispersed ‘system landscape’. The key findings from this research can be divided into three sections. First, the decentralized structure at Sandvik showed to have a key influence on the existence of the system landscape; complicating data integration possibilities is various instances. Complicated structures are generally found to cause difficulties for data integration (Halevy et al., 2006). The decentralized structure interlinks the three organizational factors as the structure of an organization can be seen as a vital reason for the lack of top management involvement in data integration practices and therefore also why a group-level enterprise system strategy is missing. This adds on to findings from Lam (2007) that advises on making organizational changes prior to changing systems. In this case it showed that changes in favor of integration would not be likely to happen without making
changes to the decentralized organizational structure. Second, the product areas have little incentive to comply with improved data integration as they have a focus on other objectives. This makes data integration more difficult because in the current governance model they would be responsible for carrying the cost of creating a more harmonious system landscape. The lack of support among middle-management levels further adds on to findings from authors such as Boh and Yellin (2006) who describe the effect of autonomous decision-making on enterprise systems without central guidance. Additionally the findings showed a contradiction because most respondents acknowledged that the system landscape was an issue however few saw reasons to allocate resources to resolve some of these issues to improve data integration. Third, within the technological factors the dominant position of the system architecture made its presence felt having a dominant effect over the other technological factors and to some extent top management support as the system limits their insight in the business to a monthly occasion. Thus, a limitation of the system architecture solution is that the capability of one system dictates the overall financial data integration possibilities. As discussed previously, the current system provides sufficient data to manage the organization effectively. Still comparing the findings to the benchmarks set out by Janfrin and Mascha (2014), several bottlenecks of the system can be identified related to timeliness and data granularity. Thus the current system structure will be likely to endure as long as the benefits from an autonomous set-up outweigh a potential push towards improved financial insights.

6.1 Theoretical Implications

The theoretical contribution made by the study is two-folded. First, the research adds on the knowledge about enterprise system integration, through looking specifically at the data integration aspects within this field. Moreover the contribution is in line with other research within this field (Chowanetz et al., 2012; Barki & Pinsonneault, 2005) that projected integration to be influenced by both technological and organizational factors. The author has expanded the insights about technological and organizational factors apparent within enterprise system integration and has tried to expand these ideas to data integration practices with mixed results. This means that the factors often showed to influence data integration, although different from initial expectations. Second, through researching the integration of financial data, this research has also described how a financial consolidation processes come into place within an organization. This is a field of research that according to Janfrin and Mascha (2014) is often overlooked. Hence this following research adds on to the understanding of financial reporting processes.
6.2 Practical Implications.
The practical implication of the research can be foremost contributed to financial departments within organizations. A financial management team can use the research to assess whether the technological and organizational factors within their specific firms also can oppose a hinder to effective data integration practices. Additionally the research provides an insight for managers at organizations where the success of the organization is dependent on decentralized decision-making. This research has shown a side effect of decentralized decision-making, which has led to a full ‘landscape of systems’ that draws many resources to maintain and uphold. In order to overcome these side effects, this research recommends finding a balance between decentralized decision-making and a central organization with formal decisive power to overcome the side effects. For example in this case a central organization at group level could work with the creation and execution of a company-wide financial information system policy.

6.3 Limitations of Study
The selection of the respondents was effective as it identified data suppliers, data mechanics and data consumers to participate, following Wang (1998). Only data product managers are missing, which can be explained by the finding that a central organization was missing to guide system and data integration projects. Still looking back at the research the author believes that it would be beneficial to include IT personnel within similar future research as financial data integration research is closely related to IT (Rom & Rohde, 2007). Secondly, during the research process the author perceived that it was difficult to find suitable literature that covered the research topic, i.e. recently published literature that combined system integration research with financial reporting tasks or a theoretically grounded research framework regarding factors influencing integration. This limitation is specifically relevant to enterprise system research, as Gartner (2014) noted the move towards ‘post-modern’ enterprise systems indicating a change in system usage thus effecting findings from previous authors.

6.4 Directions for Future Research
A direction for future research could be to further address the finding that organizations can achieve data integration without extensive system integration. The finding challenges the initial expectation that data integration could be seen as an outcome of system integration processes. Hence, as this research focuses solely on data integration for the purpose of financial reporting, one could further explore whether this also holds for other organizational
data streams. This could be achieved e.g. by including IT personnel as respondents or through looking at vastly different data streams such as production or logistics. Second, research could further address the experienced limitation of a clear framework to address data integration or the processes that influence financial data integration. The current research has contributed to an in-depth understanding of these factors however, as previously identified by Kähkönen and Smolander (2013), quantitative research upon this topic is lacking. Thus future research could expand integration research by researching the possibilities of a quantitative measurable framework to understand what drives data integration practices.

7. Conclusion

The research started with the motivation to explore how an organization manages to integrate financial data together from autonomous enterprise systems in order to create a consolidated end-result, hereby being influenced by various organizational and technological factors. Therefore an explorative case study was initiated. The study suggests that organizational factors such as decentralized decision-making structures promote the existence of a multitude of systems. The multitude of systems in turn makes it difficult to automate financial data integration processes because data is dispersed between different systems. The findings regarding technological factors suggested that the architecture of an enterprise system has an ultimate influence over the data integration possibilities of an organization. Within the study, the case organization had opted to implement a set-up that leaves the source systems free from direct system integration. However if changes were to be made to the set-up, then yet again the importance of decision-making structures comes forwards, as autonomous entities are not likely to work on integration without central governance. Thus, the multitude of systems is not something that is likely to be resolved without top management involvement.

Data integration practices will continue to be present and required as long as organizations retain autonomous systems, something that is not easily taken away. Hence organizations should find a way to effectively deal with the factors influencing data integration. Referring back to the introduction, organizations should not only focus on the maintenance of the individual cars/source systems but also on improving the infrastructure. Hereby an organization can unlock the financial analysis prospects that an enterprise system can provide.
Bibliography


Appendix

Appendix I - Interview Guide

Introduction:

- [1] Could you tell me something regarding your position?
- [2] How are enterprise systems used for your work?
  - [2a] What are the differences?
  - [2b] Are the systems linked in-between?

Data & System Integration

- [3] How do you make use of enterprise systems in your daily work?
- [4] How do you report in your results?
  - [4a] Do you receive support to integrate/automate reporting, what kind?
- [5] Do you recognize in your daily work that you make use of a variety of systems?
  - [5a] Does this lead to issues?
  - [5b] How do you work to overcome these?
- [6] Does the multitude of systems leads to issues for Sandvik as a whole?
- [7] How much time do you spent on analytic work and how much on manual tasks?

Organizational Factors

I Top Management Support

- [8] Who is able or has the responsibility about making decisions regarding enterprise system implementation?
- [9] How does the upper management works with this topic?
  - [9a] Who is responsible to drive such questions?

II Enterprise System Strategy

- [10] How will enterprise systems at Sandvik develop in the future?
  - [10a] Is there a focus on integration, either systems integration or data integration?
  - [10b] Are there any concrete targets that Sandvik has decided to achieve?
- [11] How is the Sandvik Group strategy aligned with the development of enterprise systems?
- [12] How would you like to see the system is improved in the future?
III Enterprise Architecture

- [13] Could you tell me in short about the structure of Sandvik
  
  [13a] How the structure aligned with the enterprise system structure?

- [14] How independent/dependent is your department within the group?

Technological Factors

I System Architecture

- [15] Do you have to bridge data from one system to another?
  
  [15a] How do you bridge the data between systems?

- [16] What kind of support do you receive to integrate/automate reporting?

II Customization

- [18] How much are systems customized towards the needs of the entities?
  
  [18a] Is data integration a consideration for the implementation of new systems?

  [18b] In case systems are customized, does this lead to issues for your work activities?

III System Fit

- [19] Are all your work needs covered by your enterprise system?
  
  [19a] What kind of improvements of the system would make your work easier?