Applications Integration: Is it Always Desirable?

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Abstract

This paper describes a qualitative research study that surfaced practitioner interpretations (assumptions, knowledge, and expectations) of applications integration downsides. Although integration is the primary benefit of enterprise systems, like most things, integration also has a downside. However, most people agree that integration is still desirable. The challenge is to understand and manage the negative aspects of integration to minimize the adverse effects. Doing this requires an awareness of the potential problems. This paper augments past research on this subject with the results from a recent investigation of integration of applications for enterprise systems. Fifty-one people representing three stakeholder groups from four organizations were interviewed. The data revealed thirty-one unique integration downsides representing at least five dimensions. It now appears that integration is not always desirable or practical for a number of legitimate reasons. Collectively, organizations spend billions of dollars to achieve integration so it seems reasonable that understanding applications integration downsides is important to success. Yet, little is known about practitioners' perceptions of integration that influence their decisions and actions.

1. Introduction

Integration has been a major objective of MIS for decades [1], [2], [3], [4]. Integration of separate and isolated "islands" of systems and data began with projects involving a few applications [5]. Less than two decades ago, the floodgates of applications integration burst open with ERP implementations gaining considerable momentum in the mid 1990s as Y2K approached. Integration objectives encompassed enterprise-wide initiatives such as enterprise resource planning (ERP) systems and enterprise data warehouses [6]. Organizations have pursued several different approaches to integration including ERP, EAI, Middleware, and Componentware. Today, integration among organizations is an increasing trend. This new breed of integration, known as B2B and interorganizational systems (IOSs), transcend legal enterprise boundaries [7], [8].

The research presented in this paper reveals practitioner perceptions (assumptions, knowledge, and expectations) of applications integration downsides. Integrated enterprise systems are defined as artificial mechanisms created by organizations to compete in the marketplace and to perform routine operations. Understanding and studying these monolithic creations has been and continues to be difficult. One approach is to investigate practitioner perceptions of enterprise systems since people, representing a variety of stakeholder groups create, implement, manage, and operate integrated systems. The work on social construction of technology [9] and technological frames [10], [11] suggests approaches than can be used to study complex IT technologies. This paper adopts the position that interpretations of applications integration by practitioners are socially constructed and shape organizational outcomes.

The findings of an exploratory study are described that surfaced perceptions of downsides to applications integration by three stakeholder groups – managers, IT professionals and end-users. Although data was collected on different stakeholder groups, analysis of stakeholder differences is not the primary purpose of this paper, but will be the topic of a future paper. However, some differences in groups are reported in the results.

The research objective was to investigate attributes and benefits of applications integration. Reality required using enterprise systems (ES) as the lens to study this phenomenon. ES are a legitimate implementation of applications integration and are the only example of applications integration for many practitioners.

While it is generally assumed that integration is a positive thing, the results of this study indicate many practitioners believe there are numerous disadvantages associated with applications integration even though most of these same people still prefer integrated solutions. The research reveals legitimate reasons to avoid or limit integration although some "downsides" or objections appear arbitrary or biased personal preferences.

The remainder of this paper describes the motivation for the research and a brief description of the history of IT integration. Then, the relevant literature is reviewed and the purpose of this research, its importance, and the need for continued research on this topic are discussed. Next, the research methodology, data collection, and data analysis procedures are described. This is followed with a description of the results and supporting evidence. The appendix contains a quantitative summary of the results. The paper concludes with a discussion of implications and future research directions.

2. Research Motivation

Although organizations, collectively, spend billions of dollars to achieve IT integration, little research has been conducted to understand practitioner perceptions of problems associated with integration. The one major exception has been studies that investigated ERP success factors. Because practitioner perceptions – including assumptions about the characteristics, benefits, and downsides of integration – influence decisions and actions, this represents a critical knowledge gap. For many practical situations "perception is reality." The purpose of this research is to begin to address this gap by surfacing the shared frames of reference (assumptions, knowledge, and expectations) [12] of three stakeholder groups - managers, IT professionals and end-users.

3. The Literature

The virtues and advantages of applications integrations for enterprise systems, especially ERPs, have been widely reported in the literature [13], [14], [15], [16], [17], [18]. Therefore, the literature reviewed for this paper was restricted to framing integration in general and the downsides of applications integration in particular.

3.1. Integration Approaches and Importance of IS Research on Integration

Integration is a widely applied concept in science, engineering, computer science, and economics as well as IT [19], [20], [21], [22], [13]. A review of the topic of integration in the IS research literature shows that the pursuit of IT-enabled integration dates back to the dawn of the computer age – the idea for enterprise-wide integration was considered as early as the 1950s and 1960s [1].

During the last five decades, experts have sought to integrate the various functions of the enterprise using computers [23]. The initial concept was to create a single, totally integrated system for an enterprise [24], [25]. The next major school of thought that followed sought to achieve enterprise integration by having all programs "feed" off a single, centralized database for the entire organization [23]. Integration efforts has evolved during the last half century from interfacing modules of a computer program to the electronic coupling of different organizations with one another (known as B2B). Successive generations of integration technologies have become increasingly complex, as the scope of integration has continuously expanded.

Historically, the research emphasis in information systems and computer science domains mirrors a similar pattern, moving from 'small scope' to 'large scope' integration topics. The emergence of enterprise systems, in particular, has prompted calls for intensive IS research in this area. As Markus and Tanis (1999) comment, "Integrated enterprise systems deserve serious research because of their great potential for financial, technical, managerial, human, and strategic benefits, costs, and risks" [14, p. 173].

3.2. Questioning Integration Objectives

Increasingly, a few IS researchers have begun to question assumptions about the benefits of integration and the degree of integration that is desirable or practical [26], [27].

> "The value of [an ERP system] is that it is totally integrated; and the downside of [an ERP system] is that it is totally integrated" [15] cited in [28, p. 1049].

While IS researchers are questioning assumptions and raising concerns related to applications integration, no empirical research has been conducted to understand practitioner perspectives on applications integration downsides.

Contrary to popular belief, integration may not always be desirable or deemed practical for a variety of reasons discussed throughout this paper. Consequently, it appears reasonable that we need to know more about the specific nature of applications integration downsides in order to intelligently evaluate various integration strategies and arrive at prudent decisions. Most practitioners and academic researchers seem to value integration. However, the practicality of 100% integration is questionable.

> "The notion that a company can and ought to have an expert (or group of experts) create for it a single, completely integrated supersystem—an "MIS"—to help it govern every aspect of its activity is absurd" [29] cited in [14, p. 173].

Others also echo Dearden's sentiment that the demands imposed by integration might be too great in some circumstances [27], [30]. Prompting these concerns are issues related to complexity, turbulent business

environments, short application lifecycles, and rapid technological changes. These and other issues are discussed next.

3.3. Integration Downsides and Concerns

Eight integration concerns were found in the literature. These concerns are briefly discussed below.

Loss of Control Issues – "Does…dependence [on vendors] have negative effects on organizations" [14]? If an organization creates a system then their IT staff understands the system and are able to perform maintenance and add functionality. This situation changes when software packages are purchased from a vendor. Typically from a third party, consultants are hired to help with configuration, training, and implementations. Even when the organization's staff is deeply involved with learning the purchased software package, the organization must still rely on the vendor for new functionality and routine maintenance.

Design Issues – "Rather than designing a system to meet the organization's idiosyncratic ways of working, enterprise systems adopters often adjust the organization's ways of working to fit the package (because modifying packages has numerous negative consequences)" [14]. So, the advantages traditionally associated with requirements analysis are eliminated.

Enterprise systems are typically designed to be tightly coupled. This means the components (applications) were designed to work together and to use a common database. On the surface this sounds good. The problem is that it reduces flexibility and can have unintended negative side effects [31]. For instance, "The tight integration of all processes in an EWS [enterprise wide systems] package reminds one of the butterfly effect as discussed in relation to Chaos theory" [32][1].

Costs and Risks – Acquiring and implementing ERP systems can be both costly and risky. Risks include picking the wrong vendor, disruption to operations, huge financial investments, and at the extreme, even bankruptcy [33]. Ross (1999) found that ERP implementations could be very disruptive and have adverse effects on employees including management [34]. "…there is general consensus that business process change adds considerably to the expense and risk of an enterprise systems implementation. The principal reason is the difficulty of managing large-scale human and organizational change" [14].

[1] Sor was referring to Gleick: "…a butterfly stirring the air in Peking today can transform (into) storm systems next month in New York" (1987, p 8).

Organization Fit – Integration may not be appropriate for some organizational structures and business models [13]. Slater (1999) reported that Dell discontinued the implementation of an ERP system because of a lack of fit between the software package and Dell's management style [35]. The volatile business environment requires agile companies that can constantly adapt. However, organizations that change their organizational structures too often may find ERPs unsuitable [36].

Cost and Competitive Advantage – It is widely known that ERP systems are costly to acquire and implement. For example, Bailey (1999) reported that Allied Waste discontinued a $130 million computer system because it was considered too expensive and complicated to operate [37]. Fear of losing competitive advantages has been given as a reason by some firms for not implementing enterprise software [13].

Complexity – Enterprise systems are challenging both technically and managerially. ERP systems can contain over 10,000 tables and 1,000 plus business processes. "Enterprise systems projects are managerially challenging, since they may involve parties from many different organizations and cut across the political structures of the organization" [14].

Disintegration – The focus of enterprise systems has been on integration. However, disintegration can be equally important and even more complex for multidivisional organization. Reasons for disintegration include divestures and outsourcing [27]. Davenport (2000) believes it is unlikely that firms will devote much attention to the disaggregation [disintegration] issues [6].

Best Practices – In theory, best practices represent the best way to conduct business. However, the benefits derived depend on how the best practices are operationalized. According to Sasovova et al. (2001), "The major constraint to the successful transfer of best practices is the nature of the innovation" [27]. Others, including Robey and Boudreau (1999), have argued that technology does not guarantee success [16]. Even if best practices did consistently improve operations, this would level the playing field thereby likely causing negative competitive advantage problems.

4. Methodology

4.1. Data Collection

The data collected for this study was from semi-structured interviews. Fifty-one participants were interviewed from four organizations ranging from the public sector of higher education to large and mid-size private sector petro-chemical firms. Each organization

included members of three stakeholder groups – senior/mid-level managers, IT professionals and end-users. Group interviews of three to five individuals from the same stakeholder group were conducted. An interview guide was used, consisting of twelve semi-structured, open-ended questions designed to surface practitioner perspectives related to the topics shown in Table 1. This paper is only concerned with three of the twelve questions which dealt with downsides of applications integration. Specifically, the questions were:

1. Do you feel applications integration is desirable or undesirable? Please explain why.
2. Should all applications and data be integrated? Please explain.
3. What are the disadvantages of applications integration (if any)?

The above questions are part of a broader study that investigated the very essence of applications integration for enterprise systems [4].

Interviews were approximately one hour in length and were tape-recorded. Each interview session was opened by reading a brief statement about the research and the purpose of the interviews. During the interviews, care was taken to avoid asking additional questions that might bias the responses. Additional unscripted questions were asked if it became necessary to ensure that the interviewer understood a person's input or to help get the discussion started after a period of silence.

4.2. Data Analysis

Content analysis was used to surface themes in the interview data that reflected practitioner understandings of applications integration. The approach suggested by Weber (1990) was followed to code the interview data [38]. A set of codes used to classify the data was developed based on concepts from the research literature. The codes were later augmented with additional emergent ideas discovered by the researchers during the coding.

Using a content analysis form developed for the study, each sentence from the interview transcripts was assigned one or more codes. Each data element (sentence) was coded by two different people, the primary researcher and an IS doctoral student. The coders then met to assess the level of agreement in code assignments. Discussion resulted in refinement of the initial set of codes. The data was then recoded, again independently, by the two different coders. Average overall inter-coder agreement was 67%. However, the inter-coder agreement for the last two organizations coded was 74% reflecting much learning by the coders. Krippendorf (1980) recommends that inter-rater reliabilities be greater than 70% [39]. Considering this is the first known study that uses content analysis to investigate perceptions of integration downsides, 67% is considered acceptable.

The final step in the analysis was to review all transcripts, results of the coding, and notes made by the researchers during the data collection/analysis process. Nine major themes, described in the next section were identified.

5. Results

It is important to keep in mind that most discussions of applications integration are based on packaged software and the experiences that people have had with these packages. Thus, most of the following comments are in the context of commercial ERP software packages.

This section describes the analysis of the interview data. Practitioners identified 31 unique downsides. These items have been organized into five dimensions. For discussion purposes, the results have been organized into major themes. These themes paint an initial picture of the attitudes that practitioners have about the downsides of applications integration. A number of specific downsides to integration were documented. Some perceptions appeared invalid (at least on the surface) while others appeared factual. Yet, most people preferred integration even while acknowledging the shortcomings. The significance of this was that while integration was beneficial for many applications, 100% integration does not appear practical or desirable in most instances.

Downsides of integration could be viewed as negative by pro-integration advocates. However, there are some seemingly legitimate reasons not to seek integration or to avoid it. At this point, it appears

Table 1. Interview Topics

1. From an enterprise systems perspective, what constitutes integration of applications — what are the attributes?
2. What are the benefits of applications integration?
3. What are the downsides or disadvantages of applications integration?
4. What are the alternatives to applications integration?
5. How should applications integration be measured? How do you determine the extent of the integration?

Table 2. Five Most Frequently Cited Integration Concerns

Item	Freq	%
Complexity: Higher employee skill level required	16	9.1
Data Mgt: Data needed by one area or for one purpose	15	8.6
Complexity: Software maintenance is more difficult; prevents quick fixes	14	8.0
Risks: Complexity may adversely affect competition	14	8.0
Risks: Security of access to sensitive data	12	6.9
Total response for ALL 31 items	**175**	

appropriate to comment on the term downside. "Downside" has a negative connotation and does not always convey the correct or intended meaning. Sometimes "concern" is a better choice while at other times "challenge" is perhaps the better choice. Therefore, references to downsides include both concerns and challenges as well as the more negative meaning.

Table 2 lists five of the 31 most frequently cited concerns which account for about 42% of all concerns. Frequencies can be an indicator of the relative importance of the ideas related to applications integration for each of the stakeholder groups. A more detailed summary showing category/dimension frequencies for each stakeholder group is shown in the appendix.

Table 3 provides a summary of integration concerns by dimension. From the table, we see that two of the five dimensions (Complexity and Risks) account for 55% of all downsides. So it is not surprising that four of the top five most frequently cited concerns are from these two dimensions. Most of the downsides seem consistent with prior research [14], [27].

5.1. Themes That Surfaced

The following is a detail description of the nine themes that surfaced during the analysis.

Employee Requirements Greater – Practitioners believe that you must have personnel with a higher skill level to adapt to an integrated system. One person put it this way. "You look at the personnel and you have people who have been able to perform jobs and functions before. And now all of a sudden, they can't because they simply don't have the skill level, the ability to understand the implication of what their job does and what happens [when they perform given actions] and it is so crucial that they understand that."

Clearly, it seems plausible that complex enterprise systems require a more knowledgeable staff. For instance, another participant commented, "[Integration] requires people to have a global view of things." Some felt a reduced skill set was required of employees although the employee had to be more talented/capable. They argued that an integrated system created a problem for hiring and retaining qualified staff.

Risks – A variety of risk were identified that included security concerns, data quality, dependence on a single vendor. The following are examples of practitioner concerns.

> "[If] your end-users don't have a very clear understanding of what their transaction is going to cause to happen in the system, you create a nightmare because they don't realize the impact of every transaction that they do."

> "If someone puts garbage in, it just ricochets through the system as garbage."

> "If the end-user doesn't really know what they are doing and what the impact of their little piece of the pie is, it can be really bad."

A recurring theme was data security in terms of access. A few participants were concerned to the point that they felt security was so important for certain data that it required data to be separate from other data. Other security related concerns voiced were:

> "There is a risk that vendors don't respond timely to marketplace changes."

> "[An enterprise system means] having all of your eggs in one basket."

> "If the system fails, there is absolutely nothing you can do. All the systems stay up together. If you have one system and something happens, then everything stands still."

Maintenance More Difficult – Practitioners believe "There is more work involved when you change a process or adapt a new procedure when you change how your system works because you have to go all the way through and change all of the modules." Another person commented, "If the system is too big then it becomes almost impossible to do an upgrade."

Table 3. Summary of Integration Concerns by Dimension

Category, Dimension, Item	Management			IT Professional			End User			Total	
	Freq	Percent of		Freq	Percent of		Freq	Percent of		Sub Tot	% of Cat Tot
		Sub	Cat Tot		Sub	Cat Tot		Sub	Cat Tot		
Data Management	3.0	11.1	4.5	7.0	25.9	12.3	17.0	63.0	32.7	27.0	15.4
Complexity	17.0	36.2	25.8	19.0	40.4	33.3	11.0	23.4	21.2	47.0	26.9
Risk	19.0	38.8	28.8	15.0	30.6	26.3	15.0	30.6	28.8	49.0	28.0
Economic	14.0	46.7	21.2	11.0	36.7	19.3	5.0	16.7	9.6	30.0	17.1
Functionality and Operational	13.0	59.1	19.7	5.0	22.7	8.8	4.0	18.2	7.7	22.0	12.6
Total	66.0	37.7		57.0	32.6		52.0	29.7		175.0	

Complexity – Complexity was one of the two dimensions that accounted for over 55% of all concerns. Practitioners recognized the monolithic nature and hence the complexity of modern enterprise systems. This seems to be reason for the following comments:

> "If you have a problem at the end of the process, in order to reverse that problem, you have to back up across all processes and possibly across all functions. It becomes more complicated because it is integrated."

> "Complexity and cost double."

> "As you get more and more integrated, it gets so complex, you almost can't deal with it."

> "A disadvantage is it makes it more difficult to identify the problem. If everything is all integrated with one another and you are out of balance, how do you figure out where you are out of balance?"

Flexibility – Flexibility was attacked on two fronts. First, people were concerned about the rigidity of integration in terms of functionality. This led to the second concern that applications integration can adversely affect competition in some cases. Some comments were:

> "Limits you when you are integrated, you are only allowed to go along the path of the integrated product."

> "Lack of flexibility or slowness to adapt ERPs adversely affects speed to market for new products and services."

Functionality – Of course the heart of an enterprise system is the data. However, we usually think of the functionality as representative of the system since functionality defines the systems capability. Functionality may therefore be the most debated aspect of enterprise systems and distinguishes one vendor from another. Some typical complaints heard about functionality were:

> "You may sacrifice critical functionality."

> "Functionality doesn't fully meet business requirements."

> "I will use maintenance as an example. Our maintenance department will tell you that they prefer to use a system outside of SAP to manage their maintenance task because it is a key to customized maintenance whereas within SAP you have your limitations."

Cost/Benefits – The cost/benefits of integrated enterprise systems has long been a subject of interest to researchers. Clearly, organizations that implement these extremely expensive systems must believe the benefits justify the costs especially in view of the risks involved. Comments related to benefits and costs were:

> "Cost of change can be too high."

> "It is very hard for us to imagine the benefits of integration up streaming and down streaming by using one integrated system."

> "The additional efficiency that is actually gained from the system may not be enough to compensate how much it bogs down the system."

Rationale for Integration – In general, most practitioners interviewed felt that integration was a good thing. Yet, for some, it seems they had a nagging doubt about integration for many situations. In other words, integration is not always desirable and depends on the particular circumstances. These concerns are reflected in the following remarks.

> "If your business is [not] integrated, why would you want your systems to be integrated."

> "You can get led into integration for the sake of integration."

> "Unless you are vigilant, you can start to integrate things that don't really need to be integrated. In turn what you get is a very complex and difficult modified structure."

Data Issues – As mentioned earlier, data is the heart of any system. Thus, concerns about data management seem perfectly natural. Example comments were:

> "Something we always come across is, it seems like in an integrated environment the level of data quality needs to be a lot higher than you would have to have in an interfacing environment because you can sort of make compensating moves in an interfacing environment; whereas, you are dead alone with everyone else being dead if someone fouls up one piece of information."

> "When you share information between offices and someone not in your office is looking at your information that information may not be properly interpreted."

> "Some data just doesn't fit together."

6. Discussion

Many of the findings from this study appear to support prior research as discussed earlier in the literature section. Chief among these are (1) loss of control, (2) costs and risks, (3) organizational fit, (4) complexity.

Interestingly, one practitioner commented that, "I think you gain by integration but you also lose by

integration." Such comments are consistent with Filipczak's view (1997) discussed earlier [28]. The comment also seems to summarize the commonly held view of the practitioners interviewed. Integrated enterprise systems are thought to offer tremendous benefits but not for all situations. ES implementation failures have been blamed on many things such as lack of upper management commitment. Much research has been undertaken to identify critical success factors. From this study, it seems some reasons for lack of success may be related to unavoidable downsides. This is reminiscent of the comments from the movie, *Oh, God!* when God asks: "How do you make an 'up without a down' or a 'front without back'?" Understanding the downsides of integration allows us to address legitimate concerns and avoid costly mistakes.

There seems to be a relationship between knowledge of enterprise systems and views of integration downsides. People with the most enterprise experience tended to be the most pragmatic. They understand and readily admit the downsides and limits of integration. For the most part, people with commercial enterprise systems felt that integration was still desirable even though they fully understood and acknowledged the numerous problems and challenges involved. Therefore, it seems that knowledgeable practitioners understand that compromises must be made between cost, benefits, and risks.

Integration downsides appeared to be exaggerated in some cases. While many of the downsides are legitimate concerns, many are not. Integration merely for the sake of integration is not desirable because it clearly implies expenditure of resources for no good reason. On the other hand, objecting to others using your data because they might misinterpret the data does not appear legitimate. For instance, one end-user remarked that, "If you mess up, everybody knows about it immediately." Although the user viewed this as negative, this could be interpreted as positive from the organization's viewpoint because such problems are more readily identified and therefore can be corrected more quickly.

This study suggests that applications integration is a "fuzzy notion" for many practitioners. Some practitioners may have pursued, and continue to pursue, applications integration without having a precise or deep understanding of exactly what it is they are seeking to achieve. This is interesting since an understanding of what integration is seems to be a prerequisite to identifying integration downsides. Nonetheless, practitioners seem to have a better grasp of the integration downsides than they do of what integration "is."

The major contribution of this study is that it has surfaced 31 practitioner perceptions of applications integration downsides. Additionally, five downside dimensions have been identified. These findings should be important to future IS research since such perceptions influence actions and decisions as organizations seek to leverage enterprise systems investments.

7. Summary and Conclusions

This paper reports the findings from the analysis of in-depth interviews of 51 practitioners from four different organizations that represent three stakeholder groups regarding downsides to applications integration. Thirty-one downsides representing five dimensions were revealed. In spite of these downsides, virtually everyone interviewed believed that integration is desirable although not for all situations.

Numerous opportunities are available for additional research and include:

- Creating an instrument to measure applications integration downsides
- Replicating this study
- Investigating the implications of applications integration downsides

8. References

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Appendix - Coding Summary

Frequency by Downside Dimension and Stakeholder Group

Dimension and Item	Management			IT Professional			End User			Total	
	Freq	Percent of		Freq	Percent of		Freq	Percent of		Sub Tot	% of Cat Tot
		Sub	Cat Tot		Sub	Cat Tot		Sub	Cat Tot		
Data Management											
Data needed by only one area or purpose	3.0	20.0	4.5	5.0	33.3	8.8	7.0	46.7	13.5	15.0	8.6
Misuse & misunderstanding of data by others	0.0	0.0	0.0	0.0	0.0	0.0	6.0	100.0	11.5	6.0	3.4
Information overload	0.0	0.0	0.0	0.0	0.0	0.0	1.0	100.0	1.9	1.0	0.6
Data quality requirements too restrictive	0.0	0.0	0.0	0.0	0.0	0.0	1.0	100.0	1.9	1.0	0.6
Data errors difficult & time consuming to Fix	0.0	0.0	0.0	2.0	50.0	3.5	2.0	50.0	3.8	4.0	2.3
Dimension Total	3.0	11.1	4.5	7.0	25.9	12.3	17.0	63.0	32.7	27.0	15.4
Complexity											
Complexity to implement/operate	4.0	40.0	6.1	6.0	60.0	10.5	0.0	0.0	0.0	10.0	5.7
Geog. location separation makes it impractical	1.0	33.3	1.5	2.0	66.7	3.5	0.0	0.0	0.0	3.0	1.7
Skill level higher–More difficult to hire & train	6.0	37.5	9.1	4.0	25.0	7.0	6.0	37.5	11.5	16.0	9.1
Database size requires too much processing	0.0	0.0	0.0	3.0	100.0	5.3	0.0	0.0	0.0	3.0	1.7
Software maint difficult & longer–no quick fix	6.0	42.9	9.1	3.0	21.4	5.3	5.0	35.7	9.6	14.0	8.0
Problems source difficult & time consuming to find	0.0	0.0	0.0	1.0	100.0	1.8	0.0	0.0	0.0	1.0	0.6
Dimension Total	17.0	36.2	25.8	19.0	40.4	33.3	11.0	23.4	21.2	47.0	26.9
Risk											
Single failure points has greater impact	2.0	22.2	3.0	4.0	44.4	7.0	3.0	33.3	5.8	9.0	5.1
Proprietary solutions cause loss of control	4.0	57.1	6.1	2.0	28.6	3.5	1.0	14.3	1.9	7.0	4.0
Competition adversely by complexity	0.0	0.0	0.0	0.0	0.0	0.0	1.0	100.0	1.9	1.0	0.6
Inflexible; cannot adapt to business changes	6.0	42.9	9.1	4.0	28.6	7.0	4.0	28.6	7.7	14.0	8.0
Maintenance control; who makes changes	1.0	100.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.6
Lack of local support	2.0	50.0	3.0	1.0	25.0	1.8	1.0	25.0	1.9	4.0	2.3
Disaster recovery complex/time consuming	0.0	0.0	0.0	1.0	100.0	1.8	0.0	0.0	0.0	1.0	0.6
Security–control data access	4.0	33.3	6.1	3.0	25.0	5.3	5.0	41.7	9.6	12.0	6.9
Dimension Total	19.0	38.8	28.8	15.0	30.6	26.3	15.0	30.6	28.8	49.0	28.0
Economic											
High costs; diminishing returns	4.0	36.4	6.1	7.0	63.6	12.3	0.0	0.0	0.0	11.0	6.3
Full integration not practical, needed, or desired	6.0	60.0	9.1	2.0	20.0	3.5	2.0	20.0	3.8	10.0	5.7
Constant change–new versions/upgrades	2.0	66.7	3.0	0.0	0.0	0.0	1.0	33.3	1.9	3.0	1.7
Workload increased for employees	1.0	50.0	1.5	0.0	0.0	0.0	1.0	50.0	1.9	2.0	1.1
Too time consuming/effort to operate/maintain	0.0	0.0	0.0	1.0	100.0	1.8	0.0	0.0	0.0	1.0	0.6
App life expectancy too short to be worthwhile	0.0	0.0	0.0	1.0	100.0	1.8	0.0	0.0	0.0	1.0	0.6
Business must change to fit software	1.0	50.0	1.5	0.0	0.0	0.0	1.0	50.0	1.9	2.0	1.1
Dimension Total	14.0	46.7	21.2	11.0	36.7	19.3	5.0	16.7	9.6	30.0	17.1
Functionality and Operational											
Functionality not available in system	3.0	75.0	4.5	0.0	0.0	0.0	1.0	25.0	1.9	4.0	2.3
Not best of breed–software/processes	2.0	50.0	3.0	1.0	25.0	1.8	1.0	25.0	1.9	4.0	2.3
Forced to use undesirable software; process	0.0	0.0	0.0	3.0	100.0	5.3	0.0	0.0	0.0	3.0	1.7
Some features & functions do not fit integration	5.0	71.4	7.6	1.0	14.3	1.8	1.0	14.3	1.9	7.0	4.0
Turmoil/chaos created for employees/organ	3.0	75.0	4.5	0.0	0.0	0.0	1.0	25.0	1.9	4.0	2.3
Dimension Total	13.0	59.1	19.7	5.0	22.7	8.8	4.0	18.2	7.7	22.0	12.6
Category Total	66.0	37.7			32.6		52.0	29.7		175.0	