Do Organisational-Technological Contingency Factors Influence the Perception of ERP Systems Success?: An Exploratory Study in the Baltic-Nordic Region of Europe

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Abstract
Firms worldwide are adopting enterprise resource planning (ERP) systems. Yet, few studies exist investigating the influence of organisation-technological contingency variables on the success of ERP systems. This study uses existing IS and ERP success evaluation models to investigate the influence of some of such contextual variables in two contrasting, yet similar, countries in Northern Europe. Case studies involving seven similar firms were used in the exploratory study. Findings indicate that the levels of ERP success perceptions appear comparable even though organisational-technological contingency variables differ across board. This would tentatively suggest that such variables are not significant in determining the success of ERP within adopting organisations. The implications of the study are discussed.

1. Introduction
Across the globe, many organisations are adopting enterprise resource planning systems (ERP) [1, 10, 12, 18, 19, 38, 51 - 53]. Klaus et al [35, p 141 write “Usually, called [ERP], these comprehensive, packaged software solutions seek to integrate the complete range of a business’s processes and functions in order to present a holistic view of the business from a single information and IT architecture”. Firms that adopt ERP have been reported to have higher financial performance and higher market valuation than those not adopting ERP [22]. The ERP software market occupies a significant part of the total software package industry [1]. The global diffusion of these systems makes it crucial to study views from differing regions of the world. To that end, this paper presents empirical evidence relating to the evaluation of ERP success in some private organisations from two contrasting Northern European countries. Namely, Finland, which is an advanced country in the Scandinavia and Estonia, a developing Baltic country [8, 11, 59], are chosen for this study.

Since ERP was introduced to the IS field in late 1990’s, a majority of studies on the subject tend to focus mainly on issues relating to its adoption, selection and implementation (see, [18]). However, recently, other studies deliberating the benefits, success, management, amongst others, are beginning to surface (see, for example, Shang and Seddon [51], Willis and Willis-Brown [58], Sammon et al [48], Spathis and Constantinides, [53]). The former signifies the first wave in ERP studies [53] whilst the latter deals with the second wave. We are interested in ERP success in relation to organisation-technological contingency variables. Herein, the term “organisation-technological” is used akin to Chau and Tam’s [9] usage in their research model. Therein, the phrase was used to refer to elements in the organisational IT infrastructure. Examples in these authors’ framework include the following: “satisfaction with existing systems”, “complexity of IT infrastructure”, etc. Here, we extend the phrase to cover other variables such as IS budget size, IS employees skill, etc. See Figure 4 below for detail.

Furthermore, only a small number of studies has been conducted to study the influence of some elements in the organisation-technological context vis-à-vis ERP success. The lack of studies in the area informed this current study. As such, this endeavour may be valuable to the IS literature with its contributions. The few studies researching ERP success tend to focus of the development of measurement models. Particularly, Tan and Pan [55] and Seder et al [50] concerned themselves with developing ERP systems success models whilst Nelson and Somers [46] investigated ERP success from the user’s perspective using perceptual measures alone. This study, to some extent, draws from the work of Seder et al [50] as we use elements in their model in our discourse. The Seder et al [50] ERP success assessment model is validated and comprises both perceptual/subjective and productivity/objective measures (see, Grover et al. [20], Myers et al [44]).

For the purpose of this paper, our definition of ERP success refers to the utilisation of such systems in enhancing organisational efficiency and effectiveness (see, [20, 39, 44, 50, 55]). We contend that both efficiency - relating to the quality and effectiveness, which concerns the impact of ERP systems influence ERP success. Having said that, let us turn our attention to the objectives of this paper. We seek answers to the following questions: What qualities do our ERP-adopting firms associate with such systems? What are the impacts of such systems on the adopting firms? How do these case organisations assess or evaluate such qualities and impacts? Then, we will use revelations from the foregoing questions to answer the core question of this study, which is: Do organisational-technological contingency factors influence the perception of ERP success in the adopting organisations? The rest of the paper is organised as follows: The next section presents the overview of the two countries as well as some insights on ERP issues in each. Next, the review of the literature is provided. The following section describes the research method used. Then, the discussion and conclusions sections are presented.
2. Background information and ERP issues in the Two Countries

Finland and Estonia are both European countries. They are both small countries with a population of 5.5 million and 1.4 million, respectively [11]. Finland is a developed country whilst Estonia a developing/emerging economy. Finland is a technologically advanced country [8, 59], and Estonia leads the rest of Eastern and Central Europe with respect to e-readiness indicators [27, 59]. These facts, amongst others, informed the choice of the two countries in our study. Additionally, both share similar but different cultural values [23, 26, 40]. Myers and Tan [45] had cautioned on the use of static cross-cultural differences typologies in the IS field, we are cognisant of.

On ERP diffusion, a good number of Finnish companies use such systems (see, [19, 21, 24, 35]). Furthermore, insights relating to the first wave of ERP studies have also emerged in Finland. For example, Laukkanen et al [35] wrote about ERP adoption in the country. Reasons as to why Finnish companies adopt ERP systems can be gleaned from the work of Hyvönen [24] and Hallikainen et al [21]. On the other hand, our scan of the literature indicates that no information exists with respect to either first or second wave of ERP studies in Eastern Europe including Estonia. However, ERP vendors are beginning to explore the emerging markets of Eastern Europe for business [10].

3. Literature Review

Over the past three decades, evaluating the value of IS within organisations have been prominent in the IS literature (see, [21, 32, 38, 39, 42, 48 - 53]). A variety of approaches has been used in assessing the impact of IS in organisations. Some have reported IS impact and success on organisations from the end user’s perspective [15, 30]. On the other hand, others have looked solely at IS impacts and success assessment from the economic, financial viewpoints, among others (see, [3, 7, 22, 42]). Perhaps, the plethora of IS success assessment approaches in the IS literature led Keen [32] to ask for clarification of the “dependent variable”. Further, with regard to assessing the benefits of ERP systems, Shang and Seddon [51] developed a five-dimension benefits framework that includes operational, IT infrastructure and so on. Their framework excludes “the affective attitude toward a specific computer application by someone who interacts with the application directly” [15, p. 261]. Grover et al [20] have argued for incorporating both perceptual and objective measures in IS success measurement. The research framework that we intend to use is encompassing as it builds from the model developed by DeLone and McLean [14].

DeLone and Mclean [14] developed an integrated, multi-dimensional and inter-related IS success model. See Figure 1. The DeLone and McLean [14] model has over the last decade emerged to be the most dominant model for IS systems evaluation research. Nevertheless, the DeLone and McLean’s effort are not without criticisms (see, Ballantine et al [2] and Seddon [49], for more detail). In brief, Seddon [49] believes the original model promotes diverse interpretations perhaps not be intended by the authors.

Figure 1: DeLone and Mclean (1992) IS Success Model

Further, Sedera et al [50] developed an ERP success assessment model, see Figure 2 below that draws upon the work of DeLone and McLean [14]. In the Sedera et al’s [50] model, two dimensions - Use and User satisfaction - in the DeLone and McLean [14] original IS success were dropped through statistical analysis. Likewise, our discourse of ERP success will omit these two dimensions as well. Please, see arguments against the dropped dimensions in the work of Srinivasan [54] and Seddon [49]. Thus, the retained dimensions are as follows: System quality, Information quality, Individual Impacts and Organisational Impacts. In particular, Myer at al [43] have argued that any IS model should incorporate the Work-group Impacts in light of the contribution of work teams, groups to organisational productivity, hence the inclusion of that dimension in our model in Figure 3 below.
We define “quality” according to the Oxford Advanced Learner’s Dictionary [56] as “a feature of something, especially one that makes it different from something else”. Similarly, we take the definition of “impact” from the same source as “the powerful [or, simply the] effect that something has on something/somebody.” Importantly, the directions of the arrows in the Sedera et al’s [50] model above are artefacts of statistical analysis beyond the scope of this current study.

4. The Contingency Variables
We present the selected contingencies in this paper. According to Donaldson [16, p5]: “At the abstract level, the contingency approach says that the effect of one variable on another depends upon some third variable…” The approach has its roots in the contingency theory [5, 36]. The contingency theory asserts, “it depends”. Despite its popularity with researchers, the theory has been criticized for its limitations (see, [57]). The shortcomings of the theory, in many instances relates to how researchers verbalise their variables [4]. In this study, we are interested in finding out if organisational-technological contingency variables such as IS function size, position, etc. influence or “moderate” the interactions of the impacts and qualities on ERP systems success as discussed earlier.
Essentially, we are interested in investigating the views of our ERP-adopting firms in both countries regarding ERP qualities/impacts vis-à-vis their ERP system success. Please, see Figure 4 above for illustration. Importantly, there are other contingencies that could be explored, but the ones chosen are selected for simplicity sake and because some of them have been widely reported in the IS literature dealing with ERP issues. Thus, we succinctly discuss each of the contingency variables as follows:

**Size of the IS function:** The size of the IS function within an organisation may have a relationship with the size of that organisation. For example, larger organisations may have the need for larger IS function due to the fact that have more resources, IS needs, etc. Laukkanen et al [35] findings suggest that small companies experience more knowledge constraints than their larger counterparts in ERP adoption. Similarly, Mabert et al [38] find ERP benefits to differ by size. Following the observations in the studies above, it may expected that differing views on ERP success perceptions may arise contingent upon the size of the IS function within the organisation.

**IS position within organisation:** The position or value placed on IS within an organisation is a crucial factor in determining the success of any IS system within that organisation [31]. Lee and Pai [37] found that the higher the relationship between top managers and the IS executives, the more successful the IS system planning and alignment are.

**IS leader's position within hierarchy:** Researchers have shown that when IS leadership is high in any organisation, such IS managers or leaders are in better position to understand and communicate business strategy and thus communicate IS goals, and opportunities more effectively within their organisations [31, 37].

**IS budget size:** In the same vein, organisations with scarce resources tend not to fully realise the full benefits of their IS investments. Smaller organisations have been noted to be lagging behind in this respect (see, Iacovou et al [25]) as a consequence, they tend to incur problems arising from understaffing, inadequate resources for upgrades, amongst others.

**Satisfaction with existing systems:** Chau and Tam [9] comment that the primary aim of adopting a new system is to improve the efficiency and cost-effectiveness of the existing IT infrastructure. In addition, they asserted that, "such a motivation always relates to a lower level of satisfaction with existing computing systems”.

**IS sophistication of the organisation:** Raymond [47] found positive relationship between the IS sophistication and IS success. We define IS sophistication as the degree to which the IS department possesses the necessary technical expertise and skills to do their tasks in the organisation.

**IS skills of employees:** A vital factor in the success of IT infrastructure within organisations is how skilled the employees of such organisations are with general IS knowledge and skills. Igbaria [29] showed that there is a relationship between computer anxiety, experience and training. Computer anxiety is “the tendency of individuals to be uneasy, apprehensive, or fearful about current or future use of computers” [28, p. 375]. In particular, ERP use demands that employees possess some basic computer skills. Organisations that want to use ERP systems to change their business processes must have employees that are not fearful about computers and their uses. Such organisations must be prepared to expose their employees to comprehensive ERP training [6].

5. Research Method

The current study is part of an ongoing research project concerning ERP success in private organisations in Estonia and Finland. We restricted our investigation to private organisations because of the likelihood of ERP pervasiveness in such entities. We decided to use structured interviews in this first phase in order to gain first-hand information about the discourse in the research contexts. This is in line with Yin’s [60] suggestions. Furthermore, existing theories have informed our own research framework. Case studies are used for various research aims including describing a phenomenon, testing hypotheses, etc. [60]. Here, we are using it for exploratory purposes. In addition, case studies have been used in similar cross-national ERP studies (see, [52]).

The firms were identified through contacts in the two countries. The firms participated voluntarily, though they requested anonymity, which we obliged. Thus, the organisations are referred to with pseudonyms. Please see the Appendix. Multiple cases in each country were employed to increase comparability and generality [60]. The research used structured interview to ensure that similar questions are being asked in all the sites. The participants were instructed to speak on the behalf of their organisations on the various issues. We had sixteen (16) participants. Notably, we presented them with definitions of the terms as shown above. The interviewees were encouraged to respond in a manner that distinguishing between their ERP systems and non-ERP ones. For example, when speaking of quality and impact, the best way to present a view would be to have comparisons to a non-ERP system. This clarification is instructive and is advocated in the IS success literature – see, "referent” issues (see, Myers et al [44], Grover et al [20]).

Averagely, each interview lasted for an hour and half. Prior to each interview, the protocol questions were sent to the interviewees in order to prepare them for the interview. In all cases, we met with at
least two interviewees. The use of multiple informants enhances the reliability and validity of this study. During the interview sessions, notes were taken, which were transcribed as soon as possible (usually within two-three days). The reports were then sent to the interviewees to peruse, a few changes were made as a result. Also, telephones calls and email exchanges were used to clarify unclear issues. The collection of organisations’ documents and reports also assisted the research effort.

As the unit of analysis is the organisation, we ensured that key informants such as functional managers were contacted. Their job titles include the following: Chief Accountant, General Sales Manager, Logistics Manager, ERP Manager, IT Manager, to mention but a few. All of them are college graduates. They have worked several years in their various organisations. On the selected college graduates, we only chose firms that have more than one ERP module and had completed their ERP acquisition for at least three years earlier. This is done to reduce response bias not distinguishing between ERP implementation successes (see, [18] from ERP system success as defined above. Table 1 and the Appendix summarize the participating organisations and their responses to our inquiry. We used the Miles and Huberman’s [41] tabular method to guide our data analysis. The data were categorised [17] using terms from the literature, in this instance those of DeLone and McLean [14], Myers et al [43] and Sedera et al [50].

6. Findings and Discussions
To start with, the different companies across the two countries have differing methods or procedures for assessing the success of their ERP software. Some don’t even have any procedure for such an activity, or simply don’t know of any in their organisations. This may is not a novelty as Kumar [34] had discussed. Further, it appears smaller organisations in both countries seem to be the ones not paying attention to the issue of evaluations. This, again may be attributable to issues relating to differences between larger and smaller enterprises (see, [35, 38]).

With regard to ERP quality issues, companies in both countries indicated a number of those. Some of which have been widely reported in the literature. In some instances, for both countries, some of the quality issues elicited were negative. For example, the report format of their ERP systems is one singled out as a problem. However, this observation is not limited to organisations in our chosen countries alone. Davidson [13] had noted: “ERP systems are typically not geared to produce user-specific reports,….” Similarly, Willis and Willis-Brown [58] write, “A major complaint has been the lack of user-friendly systems”. Nonetheless, our case organisations seem to be satisfied with the quality of their ERP system. Correspondingly, the overall levels of ERP success perceptions in the organisations seem to be high (See, Table 1). Notably, high ERP qualities and equally high levels of ERP success perceptions are seen. Of note, we suggest no causality.

Regarding the impact of ERP, the selected organisations in the two countries do believe their ERP software gives them remarkable advantages. These benefits – see the Appendix - roughly compares with some of those seen in the Shang and Seddon’s [51] framework. For example, a majority of the participants reported that their ERP systems enhance individual, departmental (work-group) and organisational productivities. They also noted such systems as enablers of e-business. Once again, our case firms seem to be satisfied with the overall impact of their ERP systems. With the exceptions of Co-G and Co-F, all the participating firms have high perceptions of the success of their ERP systems. The overall levels of ERP success perception in these organisations seem to be high (See, Table 1).

We found that regardless of the economic climate - developed and developing - organisations in both countries appear to be enthused with the quality and impact of their ERP systems, which they rated highly. However, we noticed that bigger companies tend to acquire top ERP brands like SAP and Oracle as would be expected (see, [19, 24]). There seems not to be any marked differences in how ERP quality and impact issues are presented in the two countries; the respondents enumerated similar items.

Next, we focus on the influence of the organisational-technological contextual factors. Table 1 below summarizes the contingencies and the corresponding levels of success associated to the adopted ERP software in each organisation. The evidence below, concisely, seems to indicate that despite varying degrees in the organisational-technological contingencies seen, our case organisations in the context of the Baltic-Nordic region seem to hold similar views with respect to our inquiry.
Table 1: Organisation-technological variables and ERP success perception

<table>
<thead>
<tr>
<th>Country</th>
<th>Estonia</th>
<th>Finland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies</td>
<td>Co-A</td>
<td>Co-B</td>
</tr>
<tr>
<td>Size of the IS function</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>IS position within organisation</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>IS leader’s position in hierarchy</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>IS budget size</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Satisfaction with existing systems</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>IS sophistication of the organisation</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>IS skills of employees</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>ERP Success (perception)</td>
<td>Largely successful</td>
<td>90% successful</td>
</tr>
</tbody>
</table>

Legend:  H = High,  M = Medium (moderate, average),  L = Low

Our investigation revealed that despite these varying responses and observations on the contingencies, their perceptions of ERP success do not seem to differ markedly. For example, our findings indicate that regardless of “the size of the IS function” within an organisation the level of ERP success remains at comparable levels. The same can be said for “the position of IS within the organisation” or the level of skills or knowledge possessed by both the technical (IS) staff and ordinary employees in the organisations. Our discussions with the informants did not reveal any pattern of responses to suggest an overbearing influence or lack thereof of the contingencies on the perceived levels of ERP success. Specifically, our case firms seem to be satisfied with their existing legacy systems, and such systems are used to complement acquired ERP system. This is contrary to the assertions made by Chau and Tam [9] that lower satisfaction would be associated with such old systems in organisations adopting new innovative systems. The replacement of such legacy systems has been drummed up as being one of the main reasons why ERP are adopted. Discussions with participants in this study seem to suggest a contrary view. For example, one IS Manager in a courier company comments: “We are satisfied with our “X” system [A legacy systems built in the 1970’s] because it does some functions for us that our ERP does not”.

In brief, the respondents were asked to give a perception of the levels of success resulting from their ERP systems. This exercise, though subjectively presented gives us some picture in the case studies. In relation to the efficiency and effectiveness of the ERP systems in these organisations, all the case companies excepting Co-F and Co-G seem to be satisfied with their systems. Our informants based their responses on our conceptual framework of ERP quality and impact dimensions as discussed above. Thus, the perceived levels of satisfaction by the users of the systems and the financial performance, business growth and net worth resulting from the acquired systems informed their subjective quantification. However, a look at companies’ objective data sources could be a more reliable approach in interpreting such issues.

### 7. Conclusion

The study investigates the qualities and impacts associated with ERP systems in comparable private organisations across the two differing countries in Northern Europe. These qualities and impacts were used in describing the success of the ERP system. Some of the qualities and impacts compare with findings in the literature. In our discourse, we made use of relevant frameworks in the IS literature, which were modified to suit our own study. The study revealed some useful facts. For example, some organisations in the two countries have means of assessing the success of their ERP systems whilst others do not, or simply do not know how to. This is surprising considering the huge investments in ERP systems. Evaluations of such systems, are thought, ought to be vitally important to adopting organisations.
Furthermore, the influence of contingencies factors was investigated. The selected contingencies or contextual factors include IS function size, satisfaction with existing systems, IS skill of employees etc. The findings seem to suggest that such contextual factors may not be moderating or influencing the perception of ERP success in our case companies. Particularly, the findings indicate that the levels of ERP success perceptions appear comparable even though organisational-technological contingency variables differ across board. This would tentatively suggest that such variables are not significant in determining the success of ERP within adopting organisations. For example, ERP success could still be realized regardless of the size of the IS department/function or the value placed on IS, or the skills possessed by employees of the firm. Though, this findings need to be interpreted with caution in view of the research objectives. Importantly, this study is part of a larger research project to which this current effort will complement.

A case study approach is used, which does not allow for generalisability even though it allows the researcher to understand his research contexts. In this instance, a picture of ERP issues with respect to organisational-technological contingency variables in the two countries has emerged. We can say that the case companies across both countries seem to be expressing similar levels of perception with respect to the effectiveness (impacts) and efficiency (qualities) of their ERP systems. A note of caution must be sounded off, though. The respondents in this study presented views that could be described as subjective. Other limitations of the study are as follows: The study examines only seven companies in certain industries, the influence of firm-specific characteristics were not taken into consideration. Moreover, interviewee bias cannot be ruled out as respondents may or may not present favourable responses depending on companies’ standpoints. Further, only a few ERP systems were considered in the study, other ERP systems might facilitate differing results.

Nonetheless, the study has both impactions for practice and research. First, the conceptualised ERP success model, which we suggest as comprising both subjective and objective measures may guide management, in evaluating their ERP success especially for those who do not have any methods for assessing the success of their acquired ERP. Second, management especially those in the region could find the knowledge that ERP issues are in fact similar in the region useful, as resources may not be required or allotted for investigating similar issues. In fact, business ventures between the two regions are on the increase [11], in which IT systems in organisations in both regions have been integrated [26, 27]. Third, the research community benefits from information about one region of Europe - Eastern and Central Europe - with little or no research studies on ERP issues. Fourth, the study shows that regardless of varying organisational-technological contingency variables, firms do have comparable levels of ERP success perceptions, which in this paper, is built from perceived qualities and impacts. Thus, management may find the information valuable as prevailing conditions, e.g. size of IS function, available skills, etc. in their organisations may not seen be as constraints with respect to realizing success from IS investments. Here, we found out that a small IS function or budget could be influential but may be not sufficient in lessening the success levels of acquired IS systems, in this instance, ERP software.

There are implications for research as well. Notably, our study seem to suggest that ERP systems could be viewed as software that may lend itself for the development of universal theories that could be applicable in differing regions of the globe. We have presented such a view from the perspective of ERP success evaluations. Further, the influence of contextual variables investigated herein, which were seen to be of little or no significance could inform further investigations vis-à-vis ERP success assessments. In the same vein, our conceptualised framework used could be validated as our model extends other previous work in the IS literature. Further, the accepted notion that ERP are often adopted to replace legacy systems may in fact be misleading, as revelations from our case companies seem to suggest the contrary. Both systems (ERP and legacy systems) may in fact exist in one organisation, simultaneously where each system is capable of satisfying the diverse needs of the organisation. This knowledge could be useful for both practitioners and academics that have not been critical about the “marketing hype” of ERP vendors (see, Sammon et al [48]).

Finally, this study is exploratory in nature, and uses a qualitative research paradigm. To be able to improve upon this current endeavour, the use of quantitative data may be necessary. The framework provided may also lend itself to useful hypotheses formulations and testing. Thus, such approaches will enable the findings made in this study to be open for verification and replication. Moreover, studies using contingency-based approaches, ideally, are better understood with quantitative data analysis. To this end, we hope to entice research to explore similar issues in other locations in the region or elsewhere.
8. References


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### Appendix: Company Profiles and their Responses

<table>
<thead>
<tr>
<th>Country</th>
<th>Estonia</th>
<th>Finland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies</td>
<td>Co-A</td>
<td>Co-B</td>
</tr>
<tr>
<td>Type of Company</td>
<td>Independent</td>
<td>Associate</td>
</tr>
<tr>
<td>Industry</td>
<td>Electrical goods Manufacturing</td>
<td>Courier Services</td>
</tr>
<tr>
<td>Location</td>
<td>Tallinn</td>
<td>Tallinn</td>
</tr>
<tr>
<td>Size</td>
<td>200 employees</td>
<td>75 employees</td>
</tr>
<tr>
<td>Turnover [million (m) euro]</td>
<td>8.6 m</td>
<td>7.2 m</td>
</tr>
<tr>
<td>ERP software</td>
<td>Hansa</td>
<td>Scala</td>
</tr>
<tr>
<td>Time after implementation</td>
<td>3 years</td>
<td>7 years</td>
</tr>
<tr>
<td>What qualities do our ERP-adopting firms associate with such systems</td>
<td>- Easy to use - Timeliness - Good features - Conciseness - Accuracy</td>
<td>- Easy to use - Not flexible - Reliable - Not User-friendly - Data resource Integration - Poor format</td>
</tr>
<tr>
<td>What impacts are derived?</td>
<td>- Productivity is enhanced - Better Decision-making - Organisational data resource use</td>
<td>- Productivity is enhanced - Better data flow - Better cooperation in the department - Automation</td>
</tr>
<tr>
<td>How are the qualities and impacts assessed?</td>
<td>None</td>
<td>Internal audit and controls</td>
</tr>
</tbody>
</table>