

# BAM 2023 CONFERENCE

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Exploring sustainability in cloud contract for agency relationship

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**Summary:** With the widespread use of cloud computing in modern business, it is more important than ever to ensure that the cloud contracts binding enterprises and cloud providers are balanced and sustainable. However, many inequitable cloud contracts in the market exist and can lead to issues that harm the sustainable partnership between enterprises and cloud providers. There is a scarcity of research examining elements that promote sustainability in cloud contracts. To address this gap, this study offers a comprehensive examination of the relationship between the two parties, and the crucial role that cloud contracts play in ensuring a sustainable partnership. By applying agency theory to evaluate the impact of four key elements on cloud contracts, this study offers unique insights into how to manage this critical aspect of modern business.

Based on a quantitative survey of 685 participants, the results are analysed using confirmatory factor analysis (CFA) and structural equation modelling (SEM), providing a robust and reliable understanding of the factors that promote sustainability in cloud contracts. The findings reveal that investment in information systems and the length of agency relationship are critical to the success of outcome-based cloud contracts, while task programmability has the opposite effect. Moreover, the research sheds light on the possible explanations for each element's impact on cloud contracts. This paper offers valuable insights that can help guide business in managing this critical relationship, making it a must-read for anyone interested in the future of cloud computing.

**Track:** Operations, Logistics and Supply Chain Management Track

## 1. Introduction

Cloud computing is considered one of the top 10 technologies that have transformed the world (Fharney, 2017). It is closely tied to other cutting-edge technologies such as artificial intelligence (AI), big data, blockchain, and the Internet of Things (IoT) (Shashwat, 2020a, Shashwat, 2020b). In recent years, cloud computing has played a significant role in tracking the spread of COVID-19 and reducing its impact (Smidt and Jokonya, 2021). Tech analyst of Gartner (2018) predicted that by 2025, half of all IT spending, including the application software, infrastructure software, business process services, and system infrastructure markets, will have shifted to cloud computing.

Due to its numerous benefits, such as cost savings, mobility, improved collaboration, scalability, and ease of data access (Bayramusta and Nasir, 2016, Wu et al., 2010), many enterprises are quick to sign cloud contracts without fully realizing that these contracts are often prepared by and favour cloud providers (Lundqvist, 2019, Lu et al., 2022). This unbalanced nature of cloud contracts can lead to a number of issues that threaten the sustainability of the agency relationship between enterprises (principals) and cloud providers (agents) (European Commission, 2019). For instance, unbalanced cloud contracts can result in slow service speeds, poor service availability, mandatory updates, and unclear instructions (European Commission, 2019). They can also lead to legal disputes due to unclear terms and conditions for unforeseen events, such as the unclear responsibility for an unplanned outage. These issues can harm the sustainability of the relationship for both parties, putting one side at a disadvantage. Therefore, it is crucial to explore key elements in cloud contracts to maintain a sustainable agency relationship.

Currently, research on cloud contracts focuses on several aspects such as the development of review checklists (Kemp, 2018, Ryan and Loeffler, 2010), the significance of pre-contract evaluations (Gilbert, 2010), and recommendations from multiple perspectives (Lacity and Willcocks, 2012, Lynch and Pryor, 2018, Lansing et al., 2019). However, there is limited research on the elements in cloud contracts that promote sustainability in the agency relationship. To address this gap, this study aims to explore the elements that can maintain a sustainable relationship between the two parties by utilizing agency theory.

Agency theory is a broad theoretical framework that can be applied to examine the relationship between two parties, where one party (agent) acts on behalf of the other party (principal) (Eisenhardt, 1989, Rungtusanatham et al., 2007). It analyzes the principal-agent (client-provider) relationship and addresses the challenges of successful contracting by examining various elements, such as information systems, outcome uncertainty, risk aversion, goal conflict, task programmability, outcome measurability, length of the agency relationship, etc. (Balakrishnan et al., 2008, Wonseok et al., 2006). The theory mainly focuses on the agency problem, which is caused by information asymmetry, moral hazard, and differing goals (perspectives) between the agent and the principal, and could compromise the sustainability of the agency relationship (Eisenhardt, 1989).

The application of agency theory in this study is crucial in understanding the complex dynamics between enterprises and cloud providers in the context of cloud contracts. By incorporating the key elements of agency theory, such as investment in information system, task programmability, outcome measurability and the length of agency relationship, this study aims to shed light on how these elements impact the sustainability of the agency relationship between enterprises and cloud providers. This study adopts agency theory as the theoretical foundation to analyze the cloud contract and its role in maintaining a sustainable relationship between the two parties.

The research questions will be answered through an empirical study.

Q1: What key elements should be considered in cloud contracts to maintain a sustainable agency relationship between the enterprise and cloud provider?

Q2: How do these elements impact the cloud contract and the relationship between the enterprise and cloud provider?

The structure of this paper is organized as follows. In the next section, we will present a literature review and formulate our hypotheses. This will be followed by a description of the research methods and presentation of our findings. A discussion of the results will then be provided. Finally, we will offer our conclusions and suggest potential avenues for future research.

## 2. Literature Review and Hypotheses

According to Eisenhardt (1989), there are two types of contracts: outcome-based contracts and behaviour-based contracts. Outcome-based contracts are often linked to stock ownership and involve the transfer of some of the risk from the principal to the agent. On the other hand, behaviour-based contracts, such as weekly or monthly salary, typically do not involve the sharing of risk by the agent. In this study, cloud contracts are categorized into two types: outcome-based cloud contracts and behaviour-based cloud contracts.

This study uses the systematic literature review methods for reviewing literatures of cloud computing, business process outsourcing (BPO) and cloud contract. The systematic literature review method could provide robust information about the studied research field (Snyder, 2019). The systematic approach is carried out through a series of steps: comprehensive search, quality assessment, data extraction, synthesis and write up (Tranfield et al., 2003, Jesson, 2011).

The cloud computing literature review:

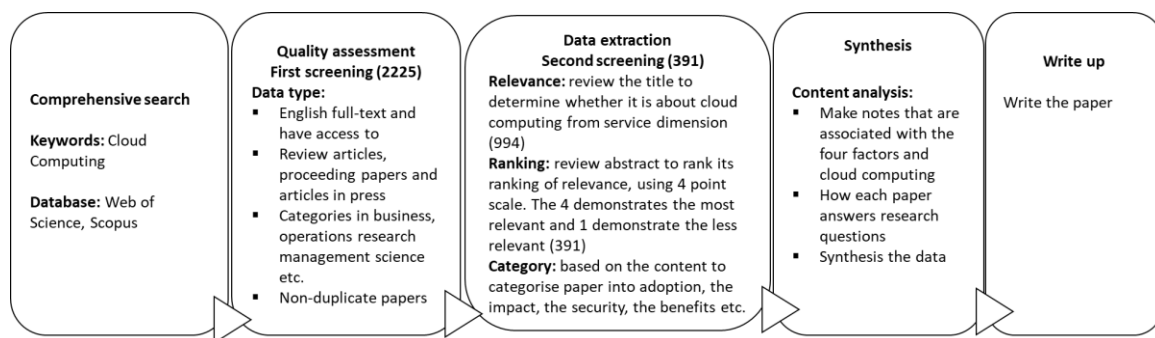


Figure 1: The Cloud Computing Literature Review Process

The BPO literature review:

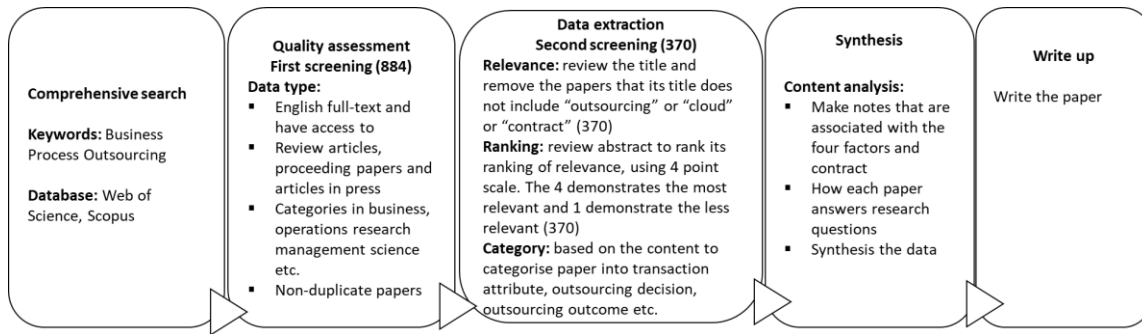


Figure 2: The BPO Literature Review Process

The cloud contract literature review:

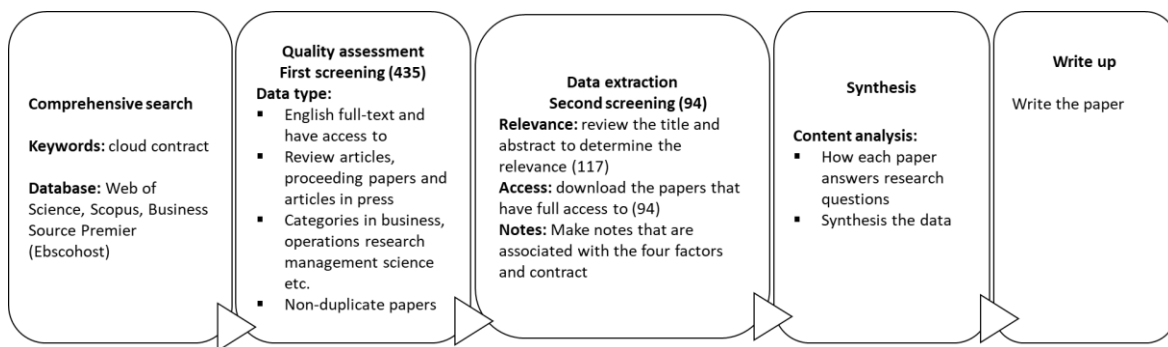


Figure 3: The Cloud Contract Literature Review Process

The literature review in the three areas all start with searching the keywords in database. Then it is followed by two steps of screening. The contents that are related with four factors and contract are extracted, analysed and synthesized in the end.

## 2.1 Impact of investment of Information System on Cloud Contract

Investment in Information Systems (IS) is an effective means of leveraging cutting-edge technology to gain a competitive edge. However, the decision to invest in IS is not solely driven by the desire for advanced technology. There are other compelling reasons that prompt organizations to make such investments.

Firstly, enterprises invest in Information Systems (IS) primarily to address security concerns. Since fully secure systems do not exist (Bojanc and Jerman-Blazic, 2012), enterprises must determine the level of security that best meets their current needs. Investing in IS for security purposes is crucial for all organizations, as the adoption of technology is key to reducing risk (Bojanc and Jerman-Blazic, 2012). Furthermore, through investment in IS, organizations can improve their ability to fend off attacks by increasing their security levels, sharing risks with partners, and receiving guidance from professional experts. According to a study by Kappelman et al. (2019) of 276 European IT executives, investment in cybersecurity was ranked as one of the top five IT budget priorities. The IT executives believed that enterprises should allocate more IT resources towards security. Additionally, research by Cong et al. (2021) found that private investors are more interested in cloud-based start-ups focused on IT security. This investment preference reflects the investors' confidence in and prediction of future market trends. Thus, addressing investment in IS within a cloud contract can not only help balance risk

sharing between parties, but also provide opportunities for future markets. This not only contributes to the sustainability of the cloud contract, but also strengthens the agency relationship.

In addition, enterprises invest in IS to enhance business process quality. Research conducted by Pranicevic et al. (2011) showed that a more mature information system leads to better process quality. Investment in IS has been shown to improve organizational performance (Son et al., 2014, Parameswaran et al., 2011, Moturi and Ngugi, 2015). Mani et al. (2010) argued that investment in IS can improve an organization's information capacity, and Bengtsson and Dabhilkar (2009) further explained that investment in technological capabilities can improve organizational performance. Ramanathan (2009) similarly found that investment in information technology can improve business efficiency. A study of 300 US enterprises by Han and Mithas (2013) confirmed that investment in information and communication technology can improve organizational performance. High business process quality could improve the possibility of sustainable relationship between the two parties (Sarah Carroll, 2021).

Furthermore, enterprises also invest in IS to foster healthy relationships between agents and principals. Research conducted by Pranicevic et al. (2011) also showed that a mature information system has a significant positive impact on the agent-principal relationship, likely due to the improved communication between agents and principals. Kappelman et al. (2019) found that organizations allocate some IT budget to IT training, and Han and Mithas (2013) went on to explain that investment in IT staff can help organizations better monitor provider performance and establish stronger collaborative relationships with providers. A strong, healthy relationship is the foundation of a sustainable one (Parners, 2022).

Finally, enterprises invest in IS to foster innovation. Investing in information systems can significantly reduce the processing time (Mohapatra, 2015) and create more available time for both agents and principals to collaborate and innovate. According to a study conducted by Kappelman et al. (2019), IT executives believe that IT investments should be focused on innovation. Innovation leads to increased participation from both parties, enhances competitiveness and ultimately creates business value (Li et al., 2021).

A strong and secure information system environment, high quality business processes and positive relationships between agents and principals, all contribute to a "win-win" outcome in cloud contracts. However, innovation is often associated with uncertainty and unstable results, and thus, highly innovative enterprises may prefer outcome-based contracts over behaviour-based contracts. This suggests that investment in information systems may have a positive impact on outcome-based cloud contracts and a negative impact on behaviour-based cloud contracts.

H1a: The investment in information system has a positive impact on outcome-based cloud contract.

H1b: The investment in information system has a negative impact on behaviour-based cloud contract.

## 2.2 Impact of task Programmability on Cloud Contract

Task programmability refers to the extent to which a task can be separated into clear, distinct steps (Eisenhardt, 1989). This concept is similar to business process modularity in business process outsourcing (BPO) and IT detachability in cloud computing. Business process modularity describes the standardization of a process and its ability to be decomposed and rearranged into another process without losing its functionality (Wang and Hou, 2011). On the other hand, IT detachability measures the extent to which a business process can be separated

from its IT infrastructure and operated on another system (Tanriverdi et al., 2007). When a business process has a high level of modularity and detachable IT, it requires little interaction between the enterprise and provider, leading to low coordination costs (Ge et al., 2021). It has been established that improving business process modularity enhances the sustainability of an enterprise's payoff (Wang and Hou, 2011), which is associated with behaviour-based contracts (Eisenhardt, 1989).

Additionally, process codifiability is a factor that contributes to the sustainability of the agency relationship. Process codifiability is the extent of process reassemble into modules (Ying and Aron, 2015). The ability to reassemble processes into modules makes the implementation of business outsourcing to cloud easier and more precise (Mani et al., 2012). A high level of process codifiability reduces communication between the enterprise and the provider (Srikanth and Puranam, 2011) and improves the quality of the output (Ying and Aron, 2015). As a result, the actions and behaviours become more clear, as all activities can be carried out according to a set of written instructions (Ying and Aron, 2015). This clarity improves the sustainability of the agency relationship.

Furthermore, the objective of Business Process Management (BPM) is to enhance the efficiency of business operations by transforming functional management into process-based management (Zairi, 1997). BPM is the essential task that should be included in cloud contract. According to Zairi (1997), BPM aims to map and document business activities in a clear and organized manner by linking activities horizontally. If business tasks are programmable, it becomes easier to manage the business process, as programmable tasks are more specific (Cheng and McKinley, 1983, Ouchi and Maguire, 1975, Turcotte, 1974) and standardized (Brass, 1981, Cheng and McKinley, 1983).

The programmability of tasks brings two main benefits to organizations: improved control and better monitoring. Programmable tasks make it easier for managers to oversee the business process and drive improvements (Wai Ming and Tat Wai Yu, 2008). Additionally, when tasks can be precisely defined, it becomes much easier to monitor performance, as the entire process is clearer (Eisenhardt, 1989). The programmability of tasks is considered an ability for organizations to monitor behavior (Stroh et al., 1996), and it has a positive impact on behaviour-based contracts (Wai Ming and Tat Wai Yu, 2008, Goodale et al., 2008, Stroh et al., 1996).

In the context of cloud contract, most of them are standard (Dhar, 2012), and the process has a high level of programmability (Pietrabissa et al., 2017). As a result, it is anticipated that the programmability of tasks will have a positive impact on behaviour-based cloud contracts and a negative impact on outcome-based cloud contracts.

H2a: The task programmability has a negative impact on outcome-based cloud contract.

H2b: The task programmability has a positive impact on behaviour-based cloud contract.

### 2.3 Impact of outcome Measurability on Cloud Contract

Outcome measurability refers to the extent to which the outcome of a process can be quantified and assessed (Eisenhardt, 1989). Kouatli (2020) believed that outcome measurability can enhance the performance of a process, align it with industry standards, and improve overall business effectiveness. To this end, he proposed a benchmark operation for measuring the performance of cloud computing providers.

Akkermans et al. (2019) also believed that outcome measurability contributes to improved collaboration between parties involved in the process, as it increases transparency and

accountability. They argued that outcome measurability drives a shift from a focus on cost reduction in outsourcing to an emphasis on quality improvement and enhanced collaboration. As a result, they believed that outcome-based contracts are more effective than performance-based contracts, which focus on outcome rather than process behavior.

In addition, the increased transparency makes decision-making easier (Akkermans et al., 2019), as businesses have a clearer understanding of the outcome which help to keep a sustainable relationship. This clarity provides greater confidence and establishes trust in the relationship, which can result in improved outcome (Akkermans et al., 2019). Therefore, outcome measurability is positively associated with outcome-based contracts.

Moreover, the outcome measurability complements task programmability in enhancing business process efficiency. When the outcome of a process is quantifiable, it becomes easier to control and monitor the process (Laurie et al., 2002). A higher degree of outcome measurability leads to improved process visibility (Li and Mao, 2012, Lovelock, 1983), making it easier to control and increase efficiency (Goodale et al., 2008). As a result, the level of outcome control and measurability has a positive impact on the process performance (outcome) (Wang and Liu, 2014), giving the agent more autonomy in the process, making outcome-based contracts more efficient. On the other hand, the difficulty in measuring the outcome, as suggested by Eisenhardt (1989), can make outcome-based contracts less efficient. However, In the context of operation in cloud, the higher level of outcome measurability in cloud contracts (Asatiani et al., 2019) suggests a positive impact on outcome-based cloud contracts and a negative impact on behaviour-based cloud contracts.

H3a: The outcome measurability has a negative impact on behaviour-based cloud contract.

H3b: The outcome measurability has a positive impact on outcome-based cloud contract.

## 2.4 Impact of length of Relationship on Cloud Contract

The relationship between the parties involved in outsourcing is a critical factor in the success of outsourcing to cloud computing (Garrison et al., 2015). This relationship is essential in determining the outcome of outsourcing (Sanchis-Pedregosa et al., 2018).

In the realm of cloud computing, enterprises have a greater dependence on providers than in traditional outsourcing models (Comuzzi et al., 2013). This increased reliance increases the risk of opportunistic behavior from providers (Handley and Benton, 2012) which threaten the sustainability in the relationship. The quality of the relationship between the enterprise and the provider is positively correlated with the trust of the enterprise in continuing to use the cloud service (Chou, 2019). Key factors that positively impact the quality of the relationship include mutual business understanding, commitment, effective communication, and support from top management (Ee et al., 2013). A longer relationship is required to fully understand the business needs and goals, and this, in turn, leads to better business outcomes (Dyson, 2019). Hence, it can be concluded that with a longer relationship, enterprises have a stronger sense of trust in their provider's behavior and place more emphasis on the outcome of the contract. Therefore, a longer relationship has a positive impact on outcome-based cloud contracts.

In the field of business process management, human resources play a crucial role (Amaral et al., 2011, Weske et al., 2004). In outsourcing, one of the primary goals is to establish and maintain an agent-principal relationship. The longer the relationship lasts, the better both the agent and principal get to know each other (Eisenhardt, 1989). According to Eisenhardt (1989), as the principal becomes more familiar with the agent in a long relationship, monitoring and assessment become easier, making behaviour-based contracts more effective and outcome-based contracts less attractive. However, Steinle et al. (2014) hold a different viewpoint,

suggesting that the length of the agency relationship has no impact on the agent's opportunism, meaning that either type of contract is not necessarily efficient. This is because in a long-standing relationship, it may not be necessary for the principal to monitor the behaviour of the agent, as they already have a good understanding of each other. In this case, both parties may be more focused on outcomes.

In an outsourcing to cloud scenario, a longer relationship requires a higher level of investment from both the agent and principal, and this investment is linked to innovation (Wagner and Bode, 2014). Innovation is becoming increasingly important in business process outsourcing (Lacity and Willcocks, 2013). As the length of the relationship increases, so does the investment, and this investment is linked to innovation (Wagner and Bode, 2014). Innovation can lead to better performance (Oly Ndubisi and Iftikhar, 2012), and outcome-based contracts allow more freedom for the agent and principal to explore innovative opportunities. Therefore, contrary to what Eisenhardt (1989) proposed, in the context of BPO to cloud, the length of the agency relationship has a positive impact on outcome-based cloud contracts and a negative impact on behavior-based cloud contracts.

H4a: The length of agency relationship has a negative impact on behaviour-based cloud contract.

H4b: The length of agency relationship has a positive impact on outcome-based cloud contract

## 2.5 Research Model

This paper reviews the impact of agency theory elements on cloud contracts, including the investment in information systems, task programmability, outcome measurability and the length of the agency relationship. Based on this review, it is proposed that the investment in information systems, outcome measurability, and the length of the agency relationship have a positive impact on outcome-based cloud contracts and a negative impact on behaviour-based cloud contracts. Conversely, task programmability has the opposite effect on cloud contracts. Figure 1 summarises the development of these hypotheses. The following empirical study aims to validate the research model. The research model can be found in figure 4.

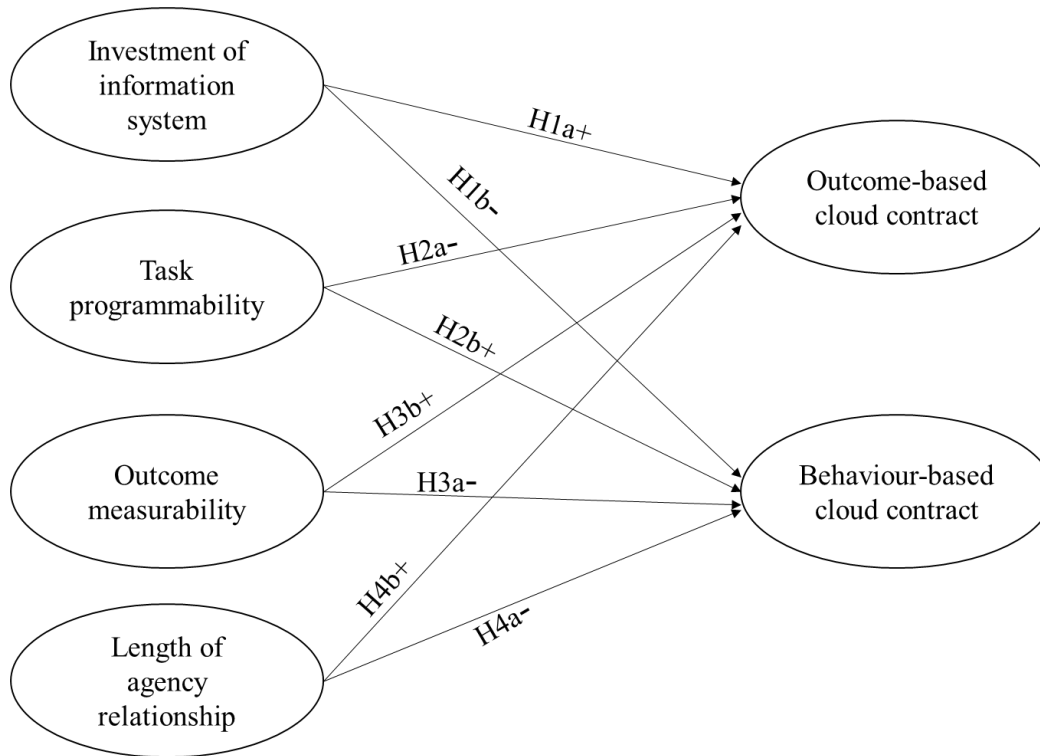


Figure 4: Research Model

### 3. Research Method

This study employed the survey research methodology to obtain quantitative data from a representative sample of the population (Edith et al., 2008). A structured questionnaire was used to collect the data, and the participants were asked to respond to the questions using a 7-point Likert scale. This scale ranges from 1 (strongly disagree) to 7 (strongly agree), allowing for a numerical measurement of the variables under investigation. The self-administered questionnaire utilizes existing scales that have been developed and validated through prior research.

To determine the suitability of each respondent for this study, screening questions were utilized (Blair, 2014). Given that the focus of the study is on individuals knowledgeable about cloud contracts, three screening questions were devised. The first question pertained to the respondent's work experience. It was believed that the more experience an individual has in their job, the more skills and knowledge they acquire (Rowe, 2018). In this study, a minimum of 8 years of work experience was set as a requirement for eligibility. Typically, individuals with 8 years of experience are more likely to have acquired some management and front-line working skills and achieved certain milestones in their careers (kiranpatils, 2015). This makes them more willing to share their thoughts about work-related topics (kiranpatils, 2015). The second screening question determined whether the respondent's organization outsources business processes to cloud computing or provides cloud computing services. This helped select respondents who were familiar with cloud computing. The third screening question asked whether the respondent had directly or indirectly participated in cloud contract-related work over the previous three years, such as drafting cloud contracts, negotiating cloud contracts, managing cloud providers, or providing technological support for cloud contracts. Through this question, respondents who had practical experience and knowledge of cloud contracts were selected. The eligibility criteria were that a respondent had to answer "Yes" to all three

questions to proceed with the remaining questions. If a respondent answered "No" to any of the questions, they were not invited to participate further.

The questionnaire used in this study is divided into two parts. The first part includes the screening questions and demographic information, such as the gender, age range, and industry category of the respondent. The second part is the main body of the questionnaire and measures the key constructs of the research model, including the behaviour-based cloud contract, outcome-based cloud contract, investment in information systems, task programmability, outcome measurability, and length of the agent relationship.

In order to collect high-quality responses and ensure a large sample size, this study employed the services of a professional survey research firm Wenjuanxing. The use of a survey research firm is a common practice in social research and provides an efficient and effective means of collecting a large number of samples (Schoenherr et al., 2015, Bearden and Haws, 2012). By 2020, the number of respondents in this company has reached more than 4 billion cumulatively (Wenjuanxing, 2023). As the number of sending out the questionnaire was huge, the company did not provide the response rate.

Generally, the ratio of sample to the each parameter is 10 (Hair, 2019). In this study, the parameters are 23 (Figure 6), so the number of minimum sample size should be 230. Secondly, the estimation procedure for SEM analysis is maximum likelihood estimation (MLE). The smallest sample size for MLE that could generate valid and stable results is 50 (Hair, 2019). Thirdly, more constructs requires larger sample size. More complexity model needs larger sample size. In this study, the construct is 6 (behaviour-based cloud contract, outcome-based cloud contract, investment of information system, tasks programmability, outcome measurability and length of the agent relationship). The minimum sample size for 6 constructs is 150 (Hair, 2019). Fourthly, the more missing data are, the larger sample size is required. Finally, the less average amount of variation among the measurable indicators is, the larger sample size is required. Therefore, in this study, given the unknown number of missing data at this stage, the minimum sample size for this study should be more than 230. According to Hair (2019), The larger sample size is, the less deviation of data from the multivariate normality will be. So, in order to secure the accurate of the analysis, the Wenjuanxing company was required to handover at least 600 complete questionnaires. In the end, 685 questionnaires were handed over from the survey research firm in 2019. The data were collected from China.

This study uses China as the data collection source for several reasons. Firstly, according to Global Industry Analysts (2021), the global business process outsourcing (BPO) to cloud market value is predicted to grow at a Compound Annual Growth Rate (CAGR) of 18.8% from 2020 to 2026, and the BPO to cloud market in China is expected to have a similar growth rate (18.6%) during the same period. This similar rate of growth suggests that a similar number of cloud contracts will be signed in China as in the global market. Secondly, China's cloud computing market is growing at the fastest speed in the world, with a projected increase from 6.5% in 2020 to 10.5% in 2024 (Interesse, 2022). This rapid growth in the Chinese cloud computing market is likely to result in an increasing number of cloud contracts being signed in China, rather than in other countries with larger shares of the cloud computing market, such as the US. As a result, there will be a higher number of updated cloud contract practitioners (targeted respondents) in China. Thirdly, China is the second-largest economy in the world (Global Industry Analysts, 2021) and has a huge potential cloud computing market, which

attracts enterprises to invest in outsourcing to cloud computing (Murray, 2021). Since any investment in cloud computing begins with signing a cloud contract, this may lead to issues being identified more quickly than in countries that adopt cloud computing at a slower pace, making this study valuable for later adopters in other countries. Finally, the legal environment in China is relatively stable, with the Ministry of Industry and Information Technology (MIIT) releasing a Notice on the Regulation of Cloud Service Market's Business Conduct in 2016, updated in 2019. This regulation provides clarity about the cloud computing market's regulation, which is an essential consideration in cloud contracts. Therefore, the BPO to cloud market in China is representative from a cloud contract research perspective, making it an ideal location for data collection in this study

This study employs Structural Equation Modelling (SEM) and Confirmatory Factor Analysis (CFA) as the analytical techniques for conducting a comprehensive multivariate data analysis. According to Hair (2019), there are six steps in SEM which incorporates CFA. These steps are: 1. Defining Individual Constructs, 2. Developing the Overall Measurement Model, 3. Designing a Study to Produce Empirical Results, 4. Assessing the Measurement Model Validity, 5. Specifying the Structural Model, and 6. Assessing Structural Model Validity. The first four steps focus on analysing the measurement model using the CFA tool. The entire process of data analysis is depicted in Figure 5.

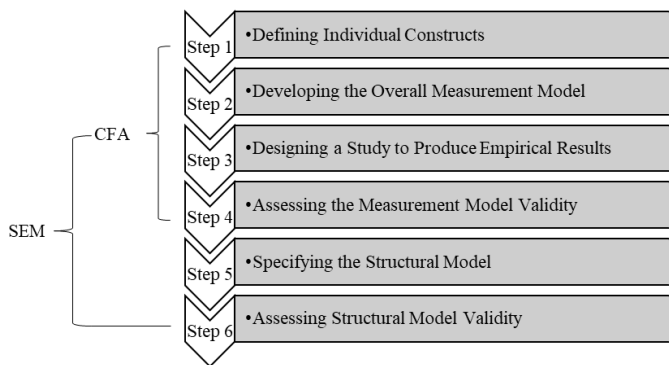


Figure 5: Data Analysis Process

#### 4. Research Results

Validity is another important issue that needs to be addressed in the measurement model (Hair, 2019). This study performed the discriminant validity which represents the measurement items are distinct from each other when they measure the same construct (Hair, 2019). The estimation of discriminant validity is the comparison between square root of AVE and the correlation of two constructs. The acceptable level of discriminant validity is that the square root of AVE should be greater than the correlation of two constructs (Fornell and Larcker, 1981, Hair, 2019).

Table 1 and Table 2, the value of square root of AVE for investment of information system, task programmability, outcome measurability, length of agent relationship, behaviour-based cloud contract and outcome-based cloud contract are 0.761, 0.764, 0.727, 1.000, 0.806 and 0.801. All the value of the constructs is greater than the correlation between the two constructs. Therefore, the measurement model meets the requirement of discriminant validity.

Table 1: Validity of the Measurement Model

| Measurement Variables     | Error | Latent Variable               | Factor Loading | Error Variance | AVE   | CR    | Square Root of AVE |
|---------------------------|-------|-------------------------------|----------------|----------------|-------|-------|--------------------|
| Investment_IS_Q22         | e23   | Investment System             | 0.765          | 0.372          | 0.579 | 0.811 | 0.761              |
| Investment_IS_Q21         | e8    |                               | 0.751          | 0.472          |       |       |                    |
| Investment_IS_Q20         | e9    |                               | 0.766          | 0.372          |       |       |                    |
| Task_Programmability_Q26  | e11   | Task Programmability          | 0.741          | 0.420          | 0.584 | 0.760 | 0.764              |
| Task_Programmability_Q25  | e12   |                               | 0.787          | 0.319          |       |       |                    |
| Outcome_Measurability_Q35 | e15   | Outcome Measurability         | 0.800          | 0.427          | 0.528 | 0.892 | 0.727              |
| Outcome_Measurability_Q34 | e16   |                               | 0.803          | 0.384          |       |       |                    |
| Outcome_Measurability_Q33 | e17   |                               | 0.731          | 0.393          |       |       |                    |
| Outcome_Measurability_Q32 | e18   |                               | 0.738          | 0.495          |       |       |                    |
| Outcome_Measurability_Q31 | e19   |                               | 0.758          | 0.384          |       |       |                    |
| Outcome_Measurability_Q30 | e20   |                               | 0.708          | 0.450          |       |       |                    |
| Outcome_Measurability_Q29 | e21   |                               | 0.725          | 0.495          |       |       |                    |
| Outcome_Measurability_Q28 | e22   |                               | 0.509          | 0.993          |       |       |                    |
| Behaviourr_CC_Q14         | e6    | Behaviour based CC            | 0.778          | 0.242          | 0.649 | 0.896 | 0.806              |
| Behaviourr_CC_Q15         | e5    |                               | 0.789          | 0.233          |       |       |                    |
| Behaviourr_CC_Q16         | e4    |                               | 0.848          | 0.202          |       |       |                    |
| Outcome_CC_Q17            | e3    | Outcome based CC              | 0.812          | 0.244          | 0.641 | 0.886 | 0.801              |
| Outcome_CC_Q18            | e2    |                               | 0.846          | 0.203          |       |       |                    |
| Outcome_CC_Q19            | e1    |                               | 0.741          | 0.293          |       |       |                    |
| Length_Relationship_Q36   | e7    | Length of Agency relationship | 1.000          | 0.000          | 1.000 | 1.000 | 1.000              |

Table 2: Correlations between Constructs

| Construct            |      | Construct             | R      |
|----------------------|------|-----------------------|--------|
| Outcome-based-CC     | <--> | Behaviour-base-CC     | 0.694  |
| Outcome-based-CC     | <--> | Investment-System     | 0.713  |
| Outcome-based-CC     | <--> | Task-Programmability  | 0.688  |
| Outcome-based-CC     | <--> | Outcome-Measurability | 0.659  |
| Behaviour-based-CC   | <--> | Investment-System     | 0.575  |
| Behaviour-based-CC   | <--> | Task-Programmability  | 0.679  |
| Behaviour-based-CC   | <--> | Outcome-Measurability | 0.549  |
| Behaviour-based-CC   | <--> | Length-Relationship   | -0.099 |
| Investment-System    | <--> | Task-Programmability  | 0.673  |
| Investment-System    | <--> | Outcome-Measurability | 0.719  |
| Task-Programmability | <--> | Outcome-Measurability | 0.758  |
| Outcome-based-CC     | <--> | Length-Relationship   | -0.13  |

To evaluate the measurement model, this study employed various Goodness-of-fit (GOF) statistics including the Chi-square ( $\chi^2$ ) statistic, Degrees of Freedom ( $df$ ), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Parsimony Normed Fit Index (PNFI). The data analysis was conducted using Amos 27 software.

The results of the measurement model evaluation in the Confirmatory Factor Analysis (CFA) stage are presented in Table 3. As demonstrated in Table 3, the measurement model demonstrates a good fit. Following the validation of its validity and necessary modifications, the measurement model is presented in Figure 6.

Table 3: The CFA Goodness-Of-Fit (GOF) Indices of the Measurement Model

| Basic GOF                    | Acceptable Range                                            | Results from AMOS |
|------------------------------|-------------------------------------------------------------|-------------------|
| $\chi^2$                     | Meaningless due to large sample size                        | 585.592           |
| $df$                         |                                                             | 216               |
| <b>Absolute Fit Measures</b> |                                                             |                   |
| RMSEA                        | <0.08<br>(Awang, 2012, Shadfar and Malekmohammadi, 2013)    | 0.052             |
| <b>Incremental Fit Index</b> |                                                             |                   |
| CFI                          | $\geq 0.9$<br>(Awang, 2012, Al-Mamary and Shamsuddin, 2015) | 0.944             |
| <b>Parsimony Fit Index</b>   |                                                             |                   |
| PNFI                         | >0.5<br>(Shadfar and Malekmohammadi, 2013)                  | 0.781             |

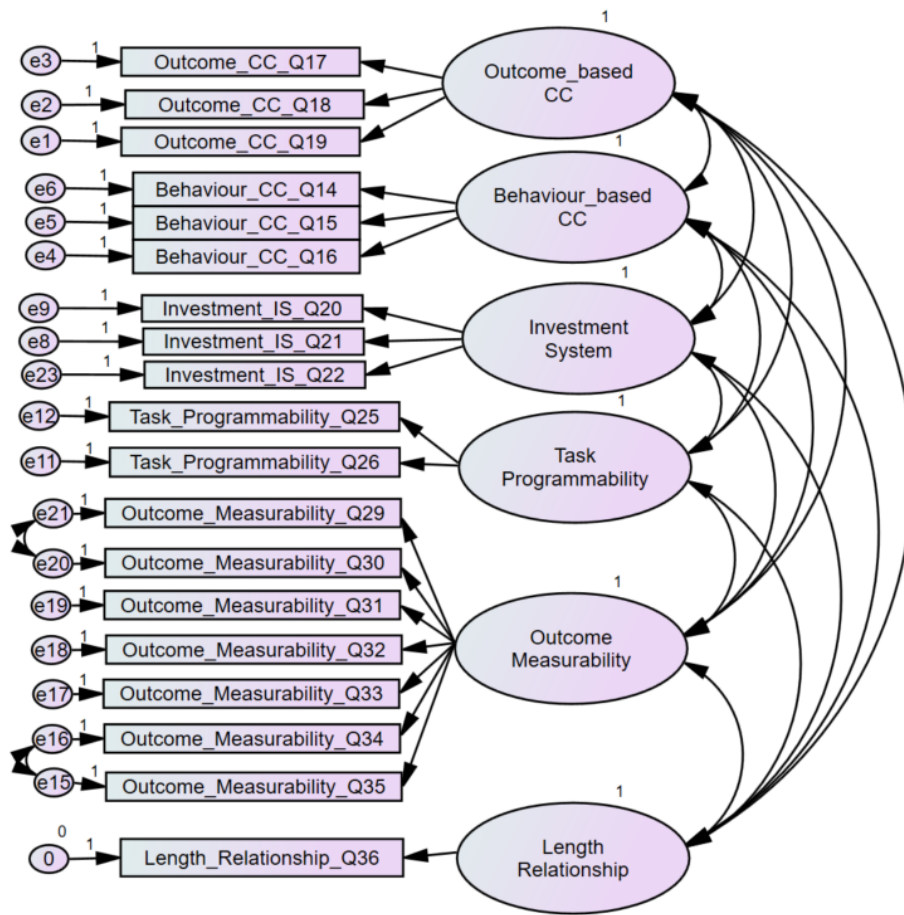


Figure 6: The Measurement Model after the Modification

In the SEM stage, similar fit indices were used to assess the model fit. The results of the Goodness-of-fit are presented in Table 4. The values of the fit measures in the SEM model are slightly different from those in the CFA model, however, the SEM model still demonstrates a good fit.

Examining the individual parameter estimates is a crucial step in evaluating the model validity and testing the hypotheses (Hair, 2019). Table 5 provides information on the unstandardized and standardized parameter estimates, standard error, critical ratio, and P value. The results were generated using Amos software and show \*\*\* if the P value is less than 0.01. With the exception of the relationships between behaviour-based CC and outcome measurability and output-based CC and outcome measurability, all other relationships have P values less than 0.05, indicating statistical significance. As a result, all relationships except for H3a+ and H3b- are supported by the sample data. In total, six out of eight hypotheses are supported, as shown in Table 5, further reinforcing the validity of the SEM model.

The comprehensive results of the data analysis are presented in Figure 7, and a summary of the findings can be found in Table 6.

Table 4: Comparison of Good-of-Fit Measures between CFA Model and SEM Model

| Basic GOF                    | Acceptable Range                                               | CFA model<br>(After<br>Modification) | SEM model |
|------------------------------|----------------------------------------------------------------|--------------------------------------|-----------|
| $\chi^2$                     | Meaningless due to large<br>sample size                        | 264.382                              | 295.322   |
| $df$                         |                                                                | 136                                  | 137       |
| Normed Chi-square            | <5<br>(Schumacker, 2010)                                       | 1.944                                | 2.156     |
| <b>Absolute Fit Index</b>    |                                                                |                                      |           |
| RMSEA                        | <0.08<br>(Awang, 2012, Shadfar and<br>Malekmohammadi, 2013),   | 0.039                                | 0.043     |
| <b>Incremental Fit Index</b> |                                                                |                                      |           |
| CFI                          | $\geq 0.9$<br>(Awang, 2012, Al-Mamary<br>and Shamsuddin, 2015) | 0.979                                | 0.974     |
| <b>Parsimony Fit Index</b>   |                                                                |                                      |           |
| PNFI                         | >0.5<br>(Shadfar and<br>Malekmohammadi, 2013)                  | 0.762                                | 0.764     |

Table 5: Structural Parameter Estimates for SEM Model

| Research Hypothesis | Construct          |   | Construct             | Unstandardized Parameter Estimate | Standard Error | Critical Ratio | p     | Standardized Parameter Estimate |
|---------------------|--------------------|---|-----------------------|-----------------------------------|----------------|----------------|-------|---------------------------------|
| H1b-                | Behaviour based CC | < | Investment System     | 0.222                             | 0.073          | 3.033          | 0.002 | 0.223                           |
| H1a+                | Outcome based CC   | < | Investment System     | 0.376                             | 0.065          | 5.759          | ***   | 0.379                           |
| H2b+                | Behaviour based CC | < | Task Programmability  | 0.748                             | 0.112          | 6.656          | ***   | 0.721                           |
| H2a-                | Outcome based CC   | < | Task Programmability  | 0.495                             | 0.087          | 5.678          | ***   | 0.48                            |
| H3a-                | Behaviour based CC | < | Outcome Measurability | -0.172                            | 0.093          | -1.851         | 0.064 | -0.173                          |
| H3b+                | Outcome based CC   | < | Outcome Measurability | 0.02                              | 0.077          | 0.255          | 0.799 | 0.02                            |
| H4a-                | Behaviour based CC | < | Length Relationship   | -0.025                            | 0.009          | -2.705         | 0.007 | -0.099                          |
| H4b+                | Outcome based CC   | < | Length Relationship   | -0.032                            | 0.008          | -3.854         | ***   | -0.124                          |

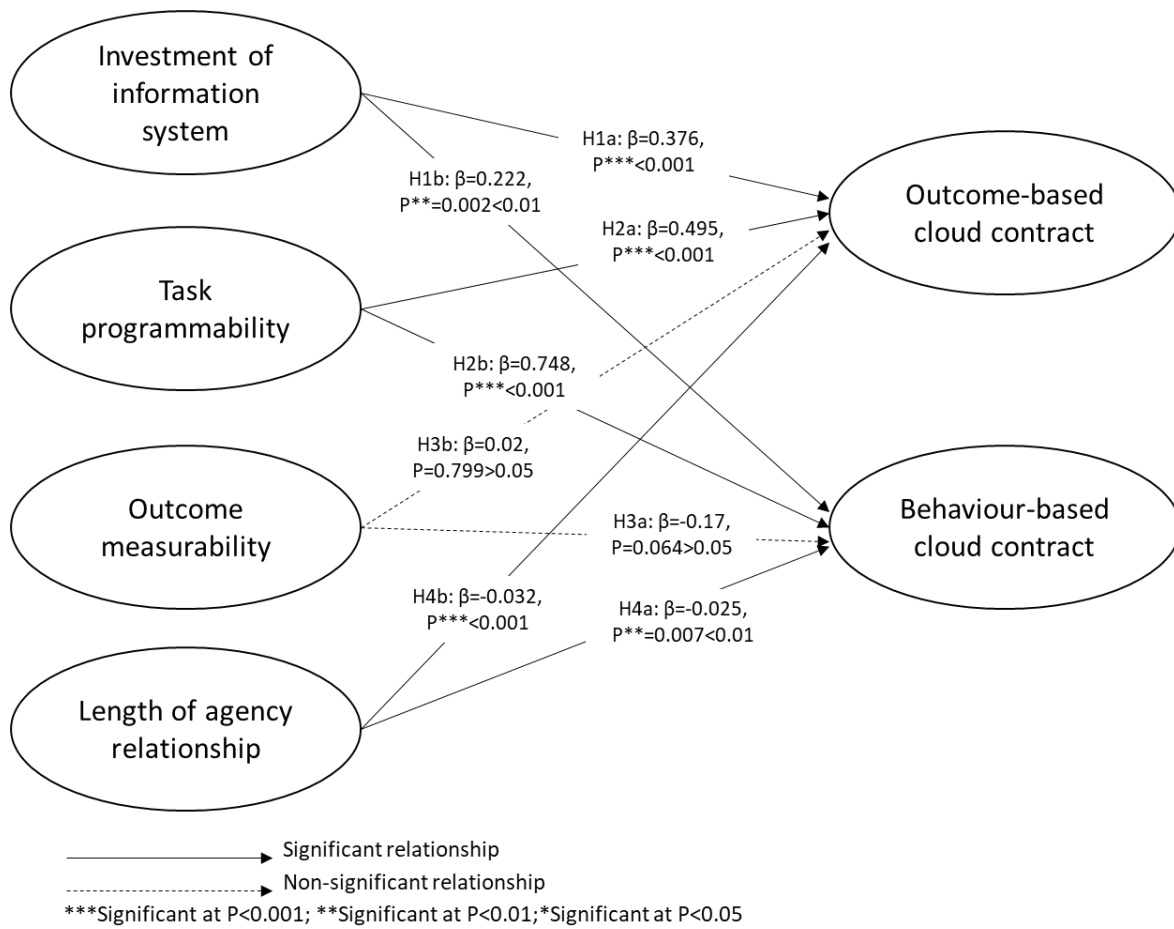


Figure 7: Results of the Data Analysis

Table 6: Summary of Findings

| Hypothesis                                                                                         | Supported? |
|----------------------------------------------------------------------------------------------------|------------|
| H1a: The investment in information system has a positive impact on outcome-based cloud contract.   | Yes        |
| H1b: The investment in information system has a negative impact on behaviour-based cloud contract. | Yes        |
| H2a: The task programmability has a negative impact on outcome-based cloud contract.               | Yes        |
| H2b: The task programmability has a positive impact on behaviour-based cloud contract.             | Yes        |
| H3a: The outcome measurability has a negative impact on behaviour-based cloud contract.            | No         |
| H3b: The outcome measurability has a positive impact on outcome-based cloud contract.              | No         |
| H4a: The length of agency relationship has a negative impact on behaviour-based cloud contract.    | Yes        |
| H4b: The length of agency relationship has a positive impact on outcome-based cloud contract.      | Yes        |

## 5. Discussion

This section discusses the results based on the hypotheses. The hypotheses that are supported by the data are emphasized with additional explanations, while the unsupported hypotheses are explained with possible explanations.

H1a: The investment in information system has a positive impact on outcome-based cloud contract.

H1b: The investment in information system has a negative impact on behaviour-based cloud contract.

The results of the data analysis support H1a and H1b. However, these findings differ from those predicted by traditional agency theory (Eisenhardt, 1989). This is likely due to the unique nature of cloud contracts compared to traditional outsourcing contracts.

Firstly, in cloud contracts, parts of task responsibilities are transferred from the providers to the enterprises, such as self-service evaluation (Schneider and Sunyaev, 2016), which requires more investment in information systems from the enterprises. This transformation makes the monitoring of provider behaviour meaningless. Secondly, the role of the IT department changes from a planner in traditional outsourcing contracts to a service integrator in cloud contracts (Schneider and Sunyaev, 2016), where they are more concerned with the outcome rather than the process. This shift in focus leads to more investment in information systems to achieve desired outcomes. Thirdly, the ownership of the infrastructure investment (except IaaS) is predefined and belongs to the cloud providers (Schneider and Sunyaev, 2016), removing the obligation for the enterprises to monitor the provider's behaviour in this area. Finally, the enhanced investment in information systems can result in more uncertain legal issues in cloud computing, as the cloud outsourcing market is still immature and regulations have not caught up with the technology (Schneider and Sunyaev, 2016). This lack of clear regulations makes it difficult to draft behaviour-based cloud contracts.

Moreover, the investment in information system provides several benefits to both cloud providers and enterprises, such as increased efficiency, innovation and better collaboration.

Firstly, investment in information system can save time and effort for both parties by improving the monitoring tool. For example, by investing in a traffic surveillance system, less human resource is needed to monitor the traffic condition, making the outcome-based cloud contract more attractive than the behaviour-based cloud contract which requires more time and effort to assess behaviour (Gaebert and Kautz, 2021).

Secondly, investment in information system leads to innovation by providing a platform for both parties to access skills, knowledge and technology from outside the company (Sivaraman and Manickachezian, 2019). Innovation is an outcome of knowledge management (Quintane et al., 2011) and is more likely to be adopted in outcome-based contracts (Hypko et al., 2010).

Lastly, investment in information system enhances collaboration by improving information sharing and communication between the two parties (Ganotakis et al., 2013). Effective communication is the foundation of collaboration (De Sisto and Handmer, 2020) and leads to better outcomes such as improved product design, function and quality (Ganotakis et al., 2013). Therefore, outcome-based cloud contracts are more attractive under better collaboration between cloud providers and enterprises (Uvet et al., 2021).

Due to these advantages, together with the benefits which are highlighted in the literature review section, high level of investment in information system makes the outcome-based cloud contracts are more favoured by enterprises.

H2a: The task programmability has a negative impact on outcome-based cloud contract.

H2b: The task programmability has a positive impact on behaviour-based cloud contract.

The hypothesis H2a and H2b are supported by the data. The cloud contract is distinct from traditional outsourcing contracts in several ways. The majority of cloud contracts are less customized (Dhar, 2012), meaning some aspects are predefined, resulting in higher levels of task programmability. This makes it easier to monitor the tasks which are discussed in literature review section and the study confirms that task programmability has a positive impact on behaviour-based cloud contracts and a negative impact on outcome-based cloud contracts. However, there are still some outcome-based cloud contracts because of the lack of transparency regarding account management, data storage location, and the involvement of sub-contractors (Bushey et al., 2015). Therefore, task programmability is a crucial factor in the selection of contract types (Goodale et al., 2008) and is still relevant in cloud contracts today.

H3a: The outcome measurability has a negative impact on behaviour-based cloud contract.

H3b: The outcome measurability has a positive impact on outcome-based cloud contract.

The hypotheses H3a and H3b are not supported by the data. The possible explanations are that the measurement of outcomes in cloud computing can be challenging, as outcomes in certain job roles such as attorneys, accountants, and planners often rely heavily on intangible information (Lovelock, 1983). On the other hand, outcomes from cloud computing can sometimes be quantifiable and deal with simulation or algorithm issues (Tiganoia et al., 2019; Taylor et al., 2018) which are tangible. When enterprises possess knowledge of measurable outcomes, they are able to monitor the processes and a behaviour-based contract is more appropriate.

In addition, to improve the level of outcome measurability, some enterprises opt for a smart contract based on blockchain technology (Aguilera et al., 2021, Dorsala et al., 2020, Xu et al., 2020). In a smart contract, outcomes can be automatically measured and penalties can be imposed for any violations (Kuo et al., 2017). Both enterprises and cloud providers must work together to ensure that the blockchain-based smart contract meets their requirements, leading to increased interaction in the process and making behaviour-based contracts more appealing.

Moreover, when outcomes have a high level of measurability, enterprises are more likely to focus on the processes to achieve desired results. For example, a measurable outcome in cloud computing could be a service disruption of no more than 3 seconds. While the 3-second threshold is quantifiable, the reasons for disruptions could range from poor system performance to data centre outages or operational mistakes. In this scenario, enterprises are more likely to focus on processes such as disaster recovery, incident response, and business continuity plans to ensure that service disruptions remain within acceptable levels (Dwares, 2021). Therefore, outcome-based contracts are not always ideal for measurable outcomes.

H4a: The length of agency relationship has a negative impact on behaviour-based cloud contract.

H4b: The length of agency relationship has a positive impact on outcome-based cloud contract

The data supports the hypotheses H4a and H4b. As mentioned in the literature review section, long agency relationships foster trust between enterprises and providers (Van Thiel and Yesilkagit, 2011) which balance the sustainability for the relationship. As enterprises build confidence in their providers' behaviour, a behaviour-based contract becomes less necessary. Furthermore, long agency relationships make it easier for enterprises to monitor and evaluate the provider's behaviour (Eisenhardt, 1989). However, this monitoring can sometimes lead to

a defensive attitude from the provider, who may feel that it is intrusive and indicative of distrust from the enterprise (Ju and Gao, 2017, Gans et al., 2001). In such cases, an outcome-based contract is perceived as more trustworthy.

Moreover, the importance of human resources in Business Process Management (BPM) has been noted in previous studies (Amaral et al., 2011, Weske et al., 2004). During long relationships, the managers of both enterprises and providers may become familiar with each other, reducing the need for behaviour monitoring. Additionally, a focus on outcomes may improve the social relationship between the two parties, as it provides clear goals for the provider (Ju and Gao, 2017).

Meanwhile, long agency relationships can lead to relationship-specific investments and facilitate innovation (Ju and Gao, 2017). As the two parties engage in a longer relationship, they have more opportunities to share accumulated knowledge and skills, which can drive innovation. However, previous literature has also identified "dark sides" of long agency relationships that can lead to complacency, boredom, and a lack of motivation, all of which can undermine innovation (Vafeas and Hughes, 2016). In either case, updating outcome assessment criteria is important to maintain the focus on outcomes.

In cloud computing, long agency relationships are still possible, although the duration of cloud contracts may be shorter than traditional outsourcing contracts (Dhar, 2012). Providers may offer short or medium-term contracts initially, which can be automatically renewed if both parties are satisfied (Uncitral, 2019). However, long agency relationships do not guarantee the ability to monitor or assess a provider's behaviour effectively (Steinle et al., 2014), making an outcome-based cloud contract the optimal choice.

The findings of the study suggest that the investment in information systems and the length of the agency relationship have a positive impact on outcome-based cloud contracts and a negative impact on behaviour-based cloud contracts. Conversely, task programmability has the opposite effect on cloud contracts. These results provide valuable insights for researchers studying cloud contracts and offer guidance on what factors should be considered when evaluating cloud contracts as either a process control (behaviour-based) or an outcome control (outcome-based). They help to strike a balance between enterprises and cloud providers, fostering a sustainable relationship.

## **6. Conclusion and Future Research Direction**

In order to explore the sustainability in cloud contract, this study adopts agency theory to investigate the impact of investment of information system, task programmability, outcome measurability and length of agency relationship on cloud contract. An empirical study is conducted. More than 600 data are collected and analysed, using CFA and SEM data analysis methods. The findings and possible explanation are discussed in previous section.

The answer to research question 1 is that the investment of information system, task programmability, outcome measurability and length of agency relationship should be considered in cloud contracts to maintain a sustainable agency relationship between the enterprise and cloud provider. The answer to research question 2 is that investment in information systems and the length of the agency relationship have a positive impact on outcome-based cloud contracts and a negative impact on behaviour-based cloud contracts. While task programmability has the opposite effect on cloud contracts. The impact of outcome measurability on cloud contract is insignificant in this study.

The results of this study offer important insights into the managerial implications of cloud contracts. Firstly, the study indicates that the investment in information systems has a positive effect on outcome-based cloud contracts and a negative impact on behaviour-based cloud contracts. Given the importance of technology in determining business process outsourcing (BPO) decisions, enterprises should focus more on outcomes and less on behaviours when outsourcing processes to the cloud. For example, trade-offs between investment in information systems and improvements in aligning business and technology, or increasing the use of information and communication technologies, should be made before outsourcing decisions are made. Outcome-based contracts should clearly articulate the expected improvements, while behaviour-based contracts should focus less on these details.

To reduce outsourcing risks, address security issues and keep sustainability in cloud computing, enterprises should invest in their information systems to upgrade their IT infrastructure. Outcome-based contracts should specify the risks and security outcomes, such as the number of attacks and information leaks during the contract duration. Investment in information systems should be part of a broader business process management strategy that is supported by top management.

In addition, task programmability has a positive impact on behaviour-based cloud contracts and a negative impact on outcome-based cloud contracts. If enterprises want to focus on process control, they should make tasks more programmable. Conversely, if they want to focus on outcome control, they should focus less on task programmability. Enterprises should have the skills and knowledge required to understand programmable tasks if they choose behaviour-based contracts, and they may find more outsourcing options by looking further afield.

Furthermore, the results suggest that outcome measurability has a negligible positive impact on outcome-based cloud contracts and a negative impact on behaviour-based cloud contracts. This suggests that traditional agency theory does not apply in cloud contracts, and further empirical studies are needed to validate this hypothesis. For example, in a cloud-based customer relationship management system, the attitude of the staff operating the system may be more important than performance measurability in improving customer satisfaction and retention. Similarly, cost savings from BPO to the cloud may be offset by increased technology training and integration costs, so outcome measurability may not be necessary in outcome-based cloud contracts. The results of cloud applications in the education sector are often investigated, but whether this approach is applicable to other sectors remains to be seen.

Finally, the results of this study show that the length of agency theory has a significant impact on cloud contracts, particularly in the context of outcome-based and behaviour-based contracts. Shorter duration contracts are more focused on the process of cloud providers, while longer duration contracts are more outcome-driven and emphasize the importance of social interaction and innovation. The study also highlights the importance of considering the type of cloud contract and the length of the agency relationship when entering into a cloud computing agreement. The enterprises could take advantage of the longer duration of the agency relationship to improve their outcome by increasing the frequency of informal social interaction and setting innovation as a formal outcome in the cloud contract. This will help to reduce the business process outsourcing risks and increase the efficiency of communication and coordination between the enterprises and the provider. All of these will help to keep sustainability in the agency relationship.

Apart from the practice contribution, this study also contribute to agency theory as a Supplementation. This study revisits the agency theory and tests four elements' impacts on the cloud contract. The four elements are investment of information system, task programmability,

outcome measurability and the length of relationship. Through quantitative research study, the analysis results support six hypotheses out of eight. It is found that unlike the traditional agency theory (Eisenhardt, 1989), there are three elements have different impact on cloud contract which are investment of information system, outcome measurability and the length of relationship. This study provides the possible explanations for the results. As the cloud contract is not like the traditional outsourcing contract, it has lots of unique characteristics (Dhar, 2012) which makes parts of the traditional agency theory are not consistent with the results. It contributes to the knowledge of agency theory by supplementing exceptional cases in agency theory.

To gain a deeper understanding of sustainability in the cloud computing, further research is necessary in the future.

*Factor ranking.* The ranking of the importance of these factors could also be investigated to gain a deeper understanding of their impact on cloud contracts. Despite the fact that the four elements (investment in information systems, task programmability, outcome measurability, and length of agency theory) have an impact on cloud contracts, their level of impact and importance may vary. Further research is necessary to determine the significance of each of these factors in the context of cloud contracts.

*Exploring scenario application.* Cloud contracts may not always be strictly outcome-based or behaviour-based, but rather a hybrid of the two types of contracts. Further research is required to determine the scenario that best fits outcome-based, behaviour-based, or hybrid cloud contracts.

*More perspectives are encouraged to research cloud contract.* Despite the advancements made in the present study on exploring the influential factors in the sustainability in cloud contracts, there is still limited research in this area. In order to further expand the understanding of the sustainability in cloud contracts, it is encouraged to explore other aspects, such as balancing economic outcomes and environmental impact to achieve Green cloud computing. For instance, cloud contracts can be designed to include objectives that aim to reduce energy consumption or carbon emissions as a form of outcome control.

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