Towards the development of a contingent use of systems development methodologies model

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Abstract

Systems development methodologies (SDMs) are categorised into the plan-driven SDM and the agile SDM classes. Research has demonstrated that no single SDM is suitable for every systems development project situation. The aim of the paper is to present aspects of a study that developed a contingent use of SDMs model to investigate the contingent use of SDMs, and tests the model empirically. The developed hybrid model is tested using survey data collected from 155 systems development organisations. The results demonstrate that SDMs are adopted and continuously tailored during the systems development project life cycle. This has theoretical and practical implications in the design of SDMs and the deployment of SDMs. The empirical findings and the model presented in this study can assist researchers to investigate the contingent use of SDMs and improve their implementation in systems development projects. The findings provide insights on how practice and theory co-evolve and inform one another.

Keywords: SDM, contingent use model, plan-driven SDM, agile SDM

1 Introduction

Research and practice present two main categories of SDMs namely the plan-driven class and the agile SDM class [23]. The plan-driven SDM class emphasizes the freezing of system development project scope, whereas the agile SDM class emphasizes the freezing of cost, schedule, and quality with the scope considered variable. The systems development project contextual setting consists of a unique set of systems development constraints, characteristics, and concerns that have to be met to achieve optimal interaction between the SDM characteristics and the systems development project contextual factors [23]. These systems' development constraints, characteristics, and concerns are hereafter referred to as contextual stressors. Project contextual stressors such as requirements dynamics [7] and organization culture [14] have been used to compare and contrast the two classes. Both the plan-driven SDM class and the agile SDM class have their strengths and limitations [16], [22] when evaluated on different systems development project contextual stressors.

Research on the agile SDM class has been given extensive attention [1] and some of the studies seek to demonstrate the superiority of the agile SDM class over the plan-driven SDM class [35]. Research and practice have changed this adversarial narrative towards a view in which SDMs coexist and are complementary to each other and that they may be combined to tap into the capabilities of one another in addressing specific systems development project contextual stressors [12], [19]. A common approach to adopting SDMs is to consider agile SDM class instances when the systems development requirements are dynamic and consider plan-driven SDM class instances when the systems development project requirements are stable [2], [17]. According to this viewpoint, adopting an SDM is a one-time conditional decision in which an agile SDM class instance is appropriate when requirements are volatile, and a plan-driven SDM class instance is appropriate when requirements are predictable. This study argues that the interplay between the SDM and systems development project contextual stressors affects requirements dependencies and interdependencies resulting in the need to constantly review and adjust the SDM to fit the systems development project contextual stressors as they evolve. Furthermore, evidence from research and practice suggests that no SDM class is best suited to all possible systems development project contextual stressors [3].

It is argued that each set of systems development project contextual stressors is unique, and therefore should be treated as such [11]. Research has shown that each systems development project is different and it requires a different SDM [3], [5], [11], however, the changes that require the adjustments during the systems development project life cycle have not been extensively investigated. The study views the systems development practitioner's challenge as not only to adopt the most appropriate SDM from among a variety of existing SDMs for each project's contextual stressors but, also to keep the adopted SDM fit with those contextual stressors throughout the project life cycle. Therefore, adopting an SDM for a systems development project is a process rather than a state. The continuous monitoring and evaluation of the fit between the SDM and the systems development project contextual stressors is referred to as the contingent use of SDMs in this study. This concept is defined in the next section.

There is a gap in empirical evidence concerning the state of the contingent use of SDMs. This study’s research question is: How can a contingent use of SDMs model be developed to investigate the contingent use of SDMs?

The remainder of the paper is organised as follows. A definition of the contingent use of SDMs is proposed in Section 2. The theoretical foundation of the contingent use of SDMs model is presented in Section 3. The research design and methodology for the study are described in Section 4. Results are presented in Section 5. Findings are presented in Section 6 and finally, conclusions and recommendations for further study are presented in Section 7.

2 Definition of the contingent use of SDMs

Serrador and Pinto [29] point out that systems development practitioners often tailored systems development methodologies to fit the specific circumstances of a systems development project. In practice, each SDM, even the one regarded as the most appropriate, is tailored [16] or adapted [10] to suit systems development project context [8, 10], [16]. The observations made by researchers on the set of activities that are employed to create a fit of systems development methodologies with the systems development contextual stressors [8, 9], [16] led to the formulation of the following definition of contingent use of SDMs: *The contingent use of systems development methodologies is the entire set of activities that are performed to achieve an ideal fit between systems development methodologies and the systems development contextual stressors at any given point in time during the systems development project life cycle.*

The definition suggests that there is a need for context-specific systems development project characterisation which may occur preceding systems development (ex-ante), or during systems development (on-the-fly). The systems development project contextual stressors are used to determine the suitable approach to the contingent use of SDMs which may involve modifying an adopted SDM [19], combining SDMs or SDM components [31], or creating a new alternative SDM [16].

3 Contingent use of SDMs model

The study draws on insights from three theoretical models namely the Technology Acceptance Model (TAM) [34], the Task Technology Fit (TTF) [13], and the Diffusion of Innovation (DOI) [26]. The three models provide the appropriate theoretical synergies for the development of the hybrid model for the contingent use of SDMs. The hybrid model comprises a combination of the determinants from all three models, the TAM, the TTF, and the DOI. These three theoretical models are complementary to each other. The TAM [34] relies on the ex-ante evaluation of an SDM. That is when the adopting units encounter an SDM for the first time, perceived usefulness and perceived ease-of-use (PEOU) influence their decision to adopt it [34]. The benefits of using an SDM are compared with the effort required to use that same SDM. The TAM is concerned with the perceived psychological characteristics of an adopting unit towards adopting an SDM not necessarily the actual characteristics of the SDM. The TTF construct is biased towards investigating the post-ante matching of task characteristics and the functionality offered by an SDM. The TTF has an evidence-oriented focus on how the SDM supports the adopting unit's task accomplishment [13]. The DOI [26] focuses on the learning process about the SDM from adoption to use. It is underpinned by the gradual reduction of ignorance (gaining experience) related to an SDM. The model is presented in Figure 1. The adoption decision outcome chain is the backbone of the contingent use of SDMs. The adoption decision outcome chain is a three-phased process as shown in Figure 1. The phases are pre-adoption, adoption, and post-adoption. These three phases entail information-seeking and information-processing activities that an adopting unit goes through. Each phase consists of a chain of decision outcomes (DOs) on an SDM or its components. The decision outcome chain allows the adopting unit to constantly monitor and evaluate the dynamics of contextual stressors during the systems development project lifecycle and respond accordingly when the need arises.

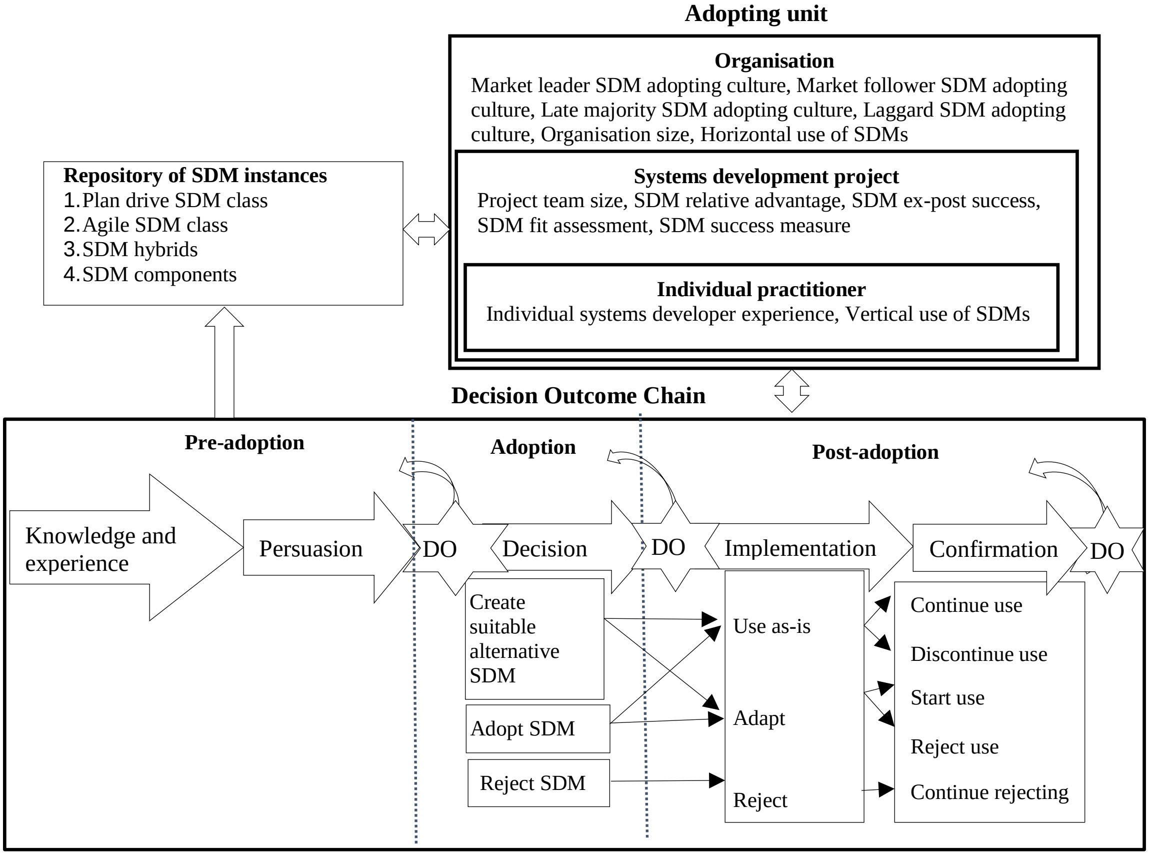

Figure 1: The contingent use of SDMs model

Based on the contingent use of SDMs models a set of hypotheses are formulated. The adopting unit is abstracted into three levels, the organisational, the system development project, and the individual practitioner level. Each hypothesis links the elements from the adopting unit and the elements in the decision outcome chain.

The adopting unit, after adopting an SDM may start using it as is. When no gaps exist between the actual and the expected performance of the SDM then, the adopting unit may confirm continued use [30]. However, if the adopted SDM fails to fit the expected task requirements, it may be adapted and further decisions made after SDM has been reassessed. Therefore, the adopting unit will constantly and continuously assess the fit of an SDM to the task at hand. Consequently, the following hypothesis is formulated:

H1: The SDM fit assessment positively influences the contingent use of SDMs.

The classification of organisational culture in this study was specifically targeted at the responsiveness of an organisation in adopting SDMs as contingent innovations. Rogers [26] categorized responsiveness to the adopting of contingent innovations into five adopter classes: the innovators, early adopters, early majority, late majority, and laggards. The main characteristic of innovators' culture is to embrace a contingent innovation for its own sake [26]. No organisation is expected to embrace an SDM for its own sake. The innovator and the early adopters are grouped under the market leader category. Consequently, the study considered the following four categories: market leader, market follower, late majority, and laggards. These would correspond to developmental, rational, hierarchical, and group culture respectively. The adopter category in which an organisation falls is considered as a reflection of its SDM adopting culture. The market leader SDM adopting culture is comfortable with changing its behaviour to take advantage of the opportunities without wasting time [26]. The market leader SDM adopting culture is quick and flexible to adopt a new SDM or adapt an already adopted SDM contingently. Consequently, the following hypothesis is formulated:

H2a: There is a positive relationship between the market leader SDM adopting culture and the contingent use of SDMs.

There are several systems development communities to which organisations or team members may pay allegiances, such as the Agile Alliance, the ScrumAlliance, the Project Management Institute (PMI), and the Institute of Electrical and Electronics Engineers (IEEE). It has been found a significant positive relationship between rational (market follower) organisational culture and the deployment of plan-driven SDMs [18]. Consequently, the following hypothesis is formulated:

H2b: There is a negative relationship between the market follower SDM adopting culture and the contingent use of SDMs.

The late majority SDM adopting culture avoids the risks of breaking new ground by pragmatically weighing the costs-benefits ratio experienced by both the market leader SDM adopting culture and the market follower SDM adopting culture organisations. Control and order are important in the market follower SDM adopting culture. A significant positive relationship between hierarchical (late majority) organisational culture and the deployment of plan-driven SDMs have been found [18]. Consequently, the following hypothesis is formulated:

H2c: There is a negative relationship between the late majority SDM adopting culture and the contingent use of SDMs.

The laggard SDM adopting culture trails behind every other SDM adopting culture. They may be affiliated to some systems development communities of practice and take time to embrace change if that change is not coming from their affiliations. Generally, they are slow in adopting new approaches. Consequently, the following hypothesis is formulated:

H2d: There is a negative relationship between the laggard SDM adopting culture and the contingent use of SDMs.

The size of an organisation affects the way members interact and share information. The size influences resources, level of specialisation, and applicable communication protocols [5], [36]. The larger the organisation, the more formal would be the support structures for the systems development activities [5]. Consequently, the following hypothesis is formulated:

H3: The organisation size negatively influences the contingent use of SDMs.

The performance of the system development project artefact over a time scale is another measure of the SDM success [32]. The tried and tested SDM may be evaluated by the systems development project artefacts it successfully developed. The success history of an SDM may lead to systems development practitioners resisting changes and adaptation of the SDM in the hope of maintaining the previous success. The success of an SDM (doing it right), is evaluated by the systems development project artefact success (getting it right). Consequently, the following hypothesis is formulated:

H4: The SDM ex-post success negatively influences the contingent use of SDMs.

The systems development project artefact success is interpreted as an indicator of SDM success. It is argued that a systems development project artefact is a result of a successful deployment of an SDM and contingent use of an SDM [10]. Consequently, the following hypotheses are formulated:

H5: The SDM success measure positively influences the contingent use of SDMs.

The experienced systems development practitioner assesses the fit of the SDM to the contextual stressors and adapts it accordingly. With more experience in using various SDMs, a systems development practitioner would know which SDM works, where, when, and why resulting in the systems development practitioner's flexibility in adoption, adaptation, changing, and rejection of SDMs as is necessary [20]. Consequently, the following hypothesis is formulated:

H6: The individual systems development practitioner's experience positively influences the contingent use of SDMs.

The increase in the systems development project team size may lead to an increase in the level of communication formality and development coordination challenges [5], [15]. Consequently, the following hypothesis is formulated:

H7: The systems development project team size negatively influences the contingent use of SDMs.

The SDM knowledge usage is measured in terms of either horizontal use, that is, across projects, or vertical use, which is the intensity of SDM knowledge use. The horizontal use entails the breadth of SDM knowledge use across the development of projects. The vertical use entails the depth of SDM knowledge application on each systems development project [27]. The high level of horizontal and vertical use of SDM knowledge may result in the contingent use of SDMs. Consequently, the following hypotheses are formulated:

H8: The horizontal use of SDM positively influences the contingent use of SDMs.

H9: The vertical use of SDM positively influences the contingent use of SDMs.

The relative advantage of an SDM accounts for the effort needed to tailor the SDM to fit the specific systems development project [33]. When the SDM is fit for purpose then there is the minimum effort required to tailor it to the specific system development contextual stressors. Consequently, the following hypotheses are formulated:

H10: The SDM relative advantage to the systems development project contextual stressors positively influences the contingent use of SDMs.

4 Research design and methodology

This research is based on a comprehensive study that uses the Diffusion of Innovation Model, the Task-Technology Fit Model, and the Technology Acceptance Model to investigate the contingent use of systems development methodologies [23]. The research methodology selection is informed by the positivist paradigm and quantitative in nature. The survey was used as the research method [24] and a questionnaire was developed as a survey data-generating instrument, piloted and administered by the researchers. The questionnaire instrument was organised into two main parts. The first part items collected demographic data and the second part consisted of operationalised items that collected data on the contingent use of SDMs. The operationalised items requested the respondents to indicate their level of agreement or disagreement with statements on a six-point Likert-like scale (1-strongly disagree to 6- strongly agree). No neutral point was provided in order for the respondents to express their absolute orientation.

A one-page request letter was sent to organisations explaining the purpose of the survey requesting the prospective respondents to participate. A clause to protect the identities of respondents and their organisations was included in the request letter. The letter also assured strict confidentiality of the data collected and explained the rights of the respondents. To improve the validity and reliability of the responses, the request letter provided core concept definitions as reference points in completing the questionnaire.

A total of 573 systems development organisations were identified in South Africa through their web presence. All the organisations were considered eligible to participate in the survey and were invited to participate. The refusal rate was 35.6%. A questionnaire package consisting of a consent letter and a self-administered questionnaire was sent to each one of the 369 eligible organisations that agreed to participate in the survey. The first preference was the systems development project manager. However, in the case of the manager not being available, other systems development practitioners were co-opted to complete the questionnaire. The unit of analysis is the organisations whereas the unit of inquiry is the systems development practitioners.

A total of 162 questionnaires were completed and returned, giving a response rate of 28.3% which is acceptable [28]. The SPSS version 26 was used for data analysis and the first cycle of data analysis constituted data cleaning. 155 (27.1%) were usable and 1.2% of the received questionnaires were discarded due to missing key data values. The discarded cases were within the acceptable data loss range [4]. The Cronbach's alpha was used to indicate good internal consistency of the items in the scale, in which all the items indicated Cronbach's alpha greater than 0.7. The dimensionality of the scale was determined by the Principal Factor Analysis (PCA) and Promax with Kaiser Normalization rotation. The second cycle of data analysis constitutes descriptive statistics.

5 Results

The following subsections present the empirical results of the study.

5.1 Descriptive statistics

The size of an organisation determines the type and amount of resources available and the communication protocols among other important characteristics. The respondents came from organisations of varying sizes. The majority (42.6%) of the respondents came from organisations with 251 or more employees followed by organisations with 51-250 employees which constituted (33.5%) of organisations and lastly, organisations with 1-50 employees constituted 23.9%.

5.2 Experience of respondents in the use of SDMs

The respondents had varying levels of experience in the use of systems development methodologies. The experience of the respondents is associated with the technical knowledge on SDMs acquired over years. The majority (81.3%) of the respondents had experience of six years and above.

5.3 Variability in the use of SDMs

The implementation of SDMs varies from one organisation to the other, from one system development project to another and across similar systems development project contexts, and within the same systems development project context over time [3], [6]. The results shown in Table 1 indicate the responses given on a 6-point Likert-like scale on variability in the use of SDMs.

Table 1: Variability in the use of SDMs

N=155	Mean	Std. Dev	Frequencies as percentages					
			1	2	3	4	5	6
Deviation from the SDM prescription was caused by the need to reconfigure some components.	4.2	1.34	5.2	6.5	18.7	23.2	30.3	16.1
Deviation from the SDM prescription was caused by the need to remove some irrelevant components.	4.0	1.31	3.9	8.4	23.9	25.8	24.5	13.5
Deviation from SDM prescription was caused by the need to address some missing components.	3.8	1.39	7.7	9.0	22.6	29.0	19.4	13.3
We created alternative SDMs based on components from existing SDMs.	3.8	1.71	12.3	14.8	18.1	14.2	18.1	22.6
No deviation at all from the SDM prescription.	3.0	1.70	19.4	31.0	16.8	7.1	12.3	13.5

A Cronbach's analysis was conducted on the 5 items and Cronbach's alpha value for the 5 items was 0.71. This indicated that the 5 items had adequate inter-item reliability. Before performing PCA, the suitability of data for factor analysis was assessed. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) value was 0.741, which is classified as good [25]. To test whether the variables did not correlate too highly or too lowly with other variables [25] Bartlett's Test of Sphericity was conducted. The Bartlett's Test of Sphericity of $\chi^2(10)$ = 171.016, $p < 0.0001$ indicated that the correlations between the items were sufficiently high [25]. The Kaiser criterion revealed that there was only one component with eigenvalues greater than 1 [25] that explained 48,8% of the variance. The component formed the contingent use of SDMs composite variable.

5.4 Contingent use of SDMs regression analysis

Before the application of the standard multiple regression, a preliminary analysis was conducted to ensure no violation of standard linear regression assumptions occurred. The normality of the data was tested by plotting the distributions of the residuals in a histogram of which the bell curve indicated that the data are normally distributed. The independent variables showed that the data points in the Normal Probability Plot (P-P) of the regression standardised residuals followed an approximately straight diagonal line from bottom left to the top right indicating non-violation of linearity. The largest value of the Mahalanobis' distance was 32.639 with a Cook's Distance of 0.00089, which is far less than 1 indicating the validity of the outlier assumption [25]. The test for multicollinearity was performed by checking the Variance Inflation Factor (VIF) values as indicated in the standardised regression Table 2. The VIF were all less than 10, suggesting that the multicollinearity assumption was not violated.

The assumptions for standard multiple regression were reasonably met to perform standard multiple regression analysis. The standard multiple regression was conducted to test each of the formulated hypotheses for the contingent use of SDMs. The model as a whole explained 44.9% of the variance in the contingent use of SDMs in the data set, $F(13,154) = 10.649$, $p < 0.001$. The contingent use of SDM regression results are presented in Table 2.

Table 2: Contingent use of SDMs regression results

Model		Unstandardized Coefficients		Standardized Coefficients	VIF
		B	Std. Error	Beta (*β*)	
1	Explanatory variables				
	Intercept	1.130	0.831		
	Organisational level				
	Organisation size (number of employees)	-0.121*	0.053	-0.163*	1.452
	Market leader SDM adopting culture	-0.660*	0.267	-0.279*	3.563
	Market follower SDM adopting culture	-1.001***	0.258	-0.446***	3.694
	Late majority SDM adopting culture	-0.829**	0.278	-0.325**	3.341
	Laggard SDM adopting culture	-0.556*	0.274	-0.221*	3.310
	Horizontal use of SDMs	0.103	0.066	0.099	1.132
	Systems development project level				
	Systems development project team size	0.205**	0.066	0.229**	1.515
	SDM success measures	0.242**	0.090	0.180**	1.239
	SDM fit assessment	0.226*	0.104	0.140*	1.162
	SDM ex-post success	-0.557***	0.128	-0.315***	1.477
	SDM relative advantage	0.536***	0.102	0.386***	1.502
	Individual systems development practitioner level				
	Individual systems development practitioner experience in systems development projects	0.200***	0.054	0.247***	1.262
	Vertical use of SDMs	0.158	0.065	0.149	1.039
	R^2	**.495**			
	Adjusted R^2	**.449**			
	F	**10.649********			

Dependent Variable: SDM contingent use * $p < .05$, ** $p < .01$, *** $p < .001$, ****$p < .0001$

A standard multiple regression analysis was conducted using 13 explanatory variables. The explanatory variables were grouped under three levels of abstraction through which contingent use of SDMs is theorised. These are the organisation, the systems development project, and the individual systems development practitioner levels as highlighted in Table 2.

The regression result for assessing the appropriateness of an SDM (SDM fit assessment), throughout a systems development project life cycle indicated a significant and positive relationship with the contingent use of SDMs (β = 0.140, p < .05). This supports hypothesis *H1*. The four SDM adopting cultures indicated statistically significant negative associations with the contingent use of SDMs market leader SDM adopting culture(β = -0.279, *p* < .05), market follower SDM adopting culture (β =-0.446, *p* < .001), late majority SDM adopting culture (β = -0.325, *p* < .001) and laggard SDM adopting culture (β = -0.221, *p* < .05). The hypothesised relationship *H2a*, *H2b, H2c, H2d* were supported.

The contingent use of SDMs is neither agile nor plan-driven oriented. No culture orientation was favourable for the contingent use of SDMs. These results were unexpected since the market leader SDM adopting culture was hypothesised to have a positive relationship with the contingent use of SDMs. Perhaps this is because the market leader SDM adopting culture embraces the latest innovation and fails to consider specific contextual stressors of a systems development project at hand.

Organisation size indicated a significant negative influence on the contingent use of SDMs (β = -0.163, *p* < .05). The finding confirms the hypothesised relationship in hypothesis *H3.* It is also consistent with previous findings on the impact of organisational size in the adoption and use of SDMs [5], [32].

The ex-post success of an SDM indicated a significant negative relationship with the contingent use of SDMs (β = -0.315, p < .001). The finding supports hypothesis *H4.* The result is logical, as a history of success of an SDM may result in the users resisting change or adjustment to an SDM that performed successfully on previous occasions.

The SDM success measure significantly and positively influenced the contingent use of the SDMs (β = 0.180, p < .01). This supports the hypothesised relationship in hypothesis *H5*.

The individual systems development practitioner experience in systems development projects was significantly and positively related to the contingent use of SDMs (β = 0.247, *p* < .001). That is, respondents who had high levels of experience in systems development projects rated the contingent use of SDMs favourably. The individual systems development practitioner, with high levels of experience in systems development projects, can make a detailed evaluation of an SDM in use. The finding supports the hypothesised relationship in *H6.* The finding is consistent with evidence from the literature that experience is an influential factor in SDM adoption [3], [6], [21].

The systems development team size (β = 0.229, p < .01) was significantly and positively related to the contingent use of SDMs. Respondents from larger systems development teams indicated a high propensity towards the contingent use of SDMs. This supports hypothesis *H7,* but in the opposite direction. This is likely because when the team increase in size, the SDM is adapted to meet the requirements of team roles assignment and division of systems development tasks.

There was no statistically significant relationship found between the horizontal use and the contingent use of SDMs. Therefore, the hypothesised relationship in hypothesis *H8* was not supported. The relationship between the vertical use of SDMs and the contingent use of SDMs was non-significant. Thus, there was no credible evidence to support the hypothesised relationship in *H9*.

The SDM relative advantage indicated a statistically significant and positive relationship with contingent use of SDMs (β = 0.386, p < .01), and this supported hypothesis *H10*. Respondents indicated that they judged SDMs based on their relative advantage over others given the specific systems development contextual stressors. This finding is consistent with previous studies' findings on adopting the most appropriate SDM based on the project situation [3], [5], [11].

6 Findings

Thirteen hypotheses were formulated and empirically tested using empirical evidence from the systems development industry in South Africa. A standard multiple regression model assessment demonstrated the predictive power of the contingent use of SDMs model based on the empirical evidence for the study. The empirical validation indicated that only eleven hypotheses were supported. A summary of the hypotheses testing results is presented in Table 3. The final model is presented in Figure 2.

Table 3: Hypothesis testing results

Hypothesis tested	Results
H1: The SDM fit assessment positively influences the contingent use of SDMs.	*Supported*
H2a: There is a positive relationship between the market leader SDM adopting culture and the contingent use of SDMs.	*Supported but opposite direction*
H2b: There is a negative relationship between the market follower SDM adopting culture and the contingent use of SDMs.	*Supported*
H2c: There is a negative relationship between the late majority SDM adopting culture and the contingent use of SDMs.	*Supported*
H2d: There is a negative relationship between the laggard SDM adopting culture and the contingent use of SDMs.	*Supported*
H3: The organisation size negatively influences the contingent use of SDMs.	*Supported*
H4: The SDM ex-post success negatively influences the contingent use of SDMs.	*Supported*
H5: The SDM success measure positively influences the contingent use of SDMs.	*Supported*
H6: The individual systems development practitioner's experience negatively influences the contingent use of SDMs.	*Supported*
H7: The systems development project team size negatively influences the contingent use of SDMs.	*Supported but in the opposite direction*
H8: The horizontal use of SDM positively influences the contingent use of SDMs.	*Not supported*
H9: The vertical use of SDM positively influences the contingent use of SDMs.	*Not supported*
H10: The SDM relative advantage to the systems development project contextual stressors positively influences the contingent use of SDMs.	*Supported*

The research question posed for the study was: How can a contingent use of SDMs model be developed? The study first proposed a working definition of the contingent use of SDMs to provide a frame of reference. Based on the Diffusion of Innovation Model, the Task-Technology Fit, and the Acceptance of Technology Model, an initial version of the contingent use of SDMs model was drafted from literature. This initial version of the contingent use of SDMs was then validated against empirical evidence from the systems development industry in South Africa. The initial version of the contingent use of SDMs model evolved after validation to the second version of the contingent use of SDMs model which is presented in Figure 2. The main contribution of this research is the development of a contingent use of SDMs model to describe and explain the contingent use of SDMs in systems development organisations.

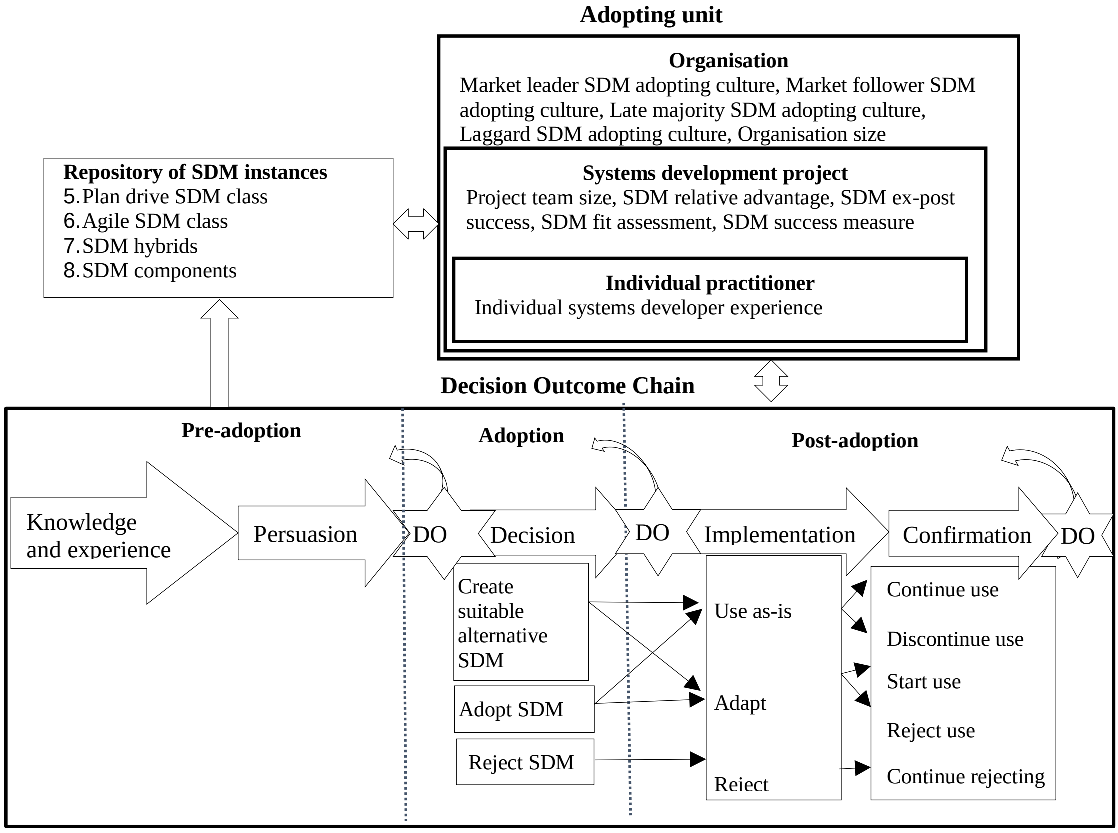

Figure 2: The final contingent use of SDMs model

7 Conclusions

The SDMs are used contingently in the South African systems development industry. The contingent use of the SDMs model provides the foundation for future empirical studies investigating the contingent use of SDMs, and it is expected to evolve.

This study does not claim the generalisability of the findings because it is limited to those participants that voluntarily participated from a single country. Furthermore, in a survey, respondents may induce bias due to differences in the experiences they have and roles they assume within their organisations. Each organisation was represented by one respondent which may restrict the scope of perspectives of each organisation that participated in the survey.

The model is still in its early stages of development and needs further validation and refinement using empirical evidence.

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