# A Strategy Development Framework for Educational Technology: An integrated Design Science Research and Modified Delphi Approach

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**Abstract**: Emerging technologies are transforming educational practices, but successful integration requires improving the quality and efficiency of learning. New technology emerges in hype cycles but adoption and performance lag over time. A strategy development framework is needed for decision-makers to understand the complex interaction of all the factors to consider when making new technology investments. The research explores how strategy development occurs through the dynamic interaction of strategy with learning, and technology integration. It analyses the key elements of a strategy map for learning with technology and how they influence each other within the overall strategy map. The research design integrated the different cycles of Design Science Research (DSR) with a modified Delphi Technique in two phases of research. During the first research phase, Delphi panel members were interviewed to understand current challenges and practices in learning with technology. The results of the literature review and thematic data analysis from the interviews were used to create a hypothetical strategy map and a strategy development framework, as an artefact, as part of the DSR process. This framework was shared with Delphi members in the second phase of research, and they were requested to evaluate the framework for its fit and utility in similar contexts of learning with technology. The feedback contributed to the refinement of the artefact and highlighted the key operational focus areas for learning with technology. The key operational focus areas identified were the need to increase the basic technology literacy of students and educators, continuous professional development in terms of online pedagogy, and the need for principles in terms of multimedia design. Other focus areas were an online design blueprint and an improvement in learning and teaching experiences through efficiencies and productivity of ed-tech technologies. This study contributes a strategy development framework for educational technology which enhances theories around the analytical and conceptual processes when planning and implementing new emerging technologies in learning. Analytical processes include external and internal analysis and a SWOT analysis of aspects related to learning with technology. Other key outcomes of the study include a hypothetical strategy map for learning with technology which aligns business objectives to a financial, customer, internal business process and learning and growth perspective.

**Keywords:** Balanced scorecard, Educational technology, Emerging technology, Learning with technology, Strategy development, Strategy map

## 1. Introduction

Emerging technologies are a catalyst for educational innovation and can radically transform education. Technology innovations need to improve the productivity and efficiency of learning and the quality of learning (Serdyukov, 2017). The oversupply and proliferation of technological advances emerge in hype cycles but the adoption and performance of these technologies lag after a significant time lapse (Linden and Fenn, 2003). Technology adoption navigates through a cycle of initial over-enthusiasm, disillusionment and eventual productivity as described by the Gartner hype cycle (Linden and Fenn, 2003). An understanding of this cycle guides decision-making regarding the most relevant technological choices in terms of strategic goals. A strategy process enables decision-makers to make technology choices aligned with business goals. Chief Information Officers from institutional learning organisations indicated operational excellence through technology, as a primary goal of technology in their organisations (Gartner Inc., 2022). Organisations should guard against overinvestment in the early stages of the hype cycle but should also not ignore potential benefits in the long run (Linden and Fenn, 2003).

Strategic choices in terms of technology investments require decision-makers to make trade-offs between short-term profitability and sustainable performance in times of uncertainty (Pelser and Prinsloo, 2014; Dong, 2021). EdTech decision-makers are often expected to select EdTech tools from a wide range of technologies that will ensure an improvement in student outcomes. Real-world implementations, defining the scope and context of the operationalization of educational technology is required and will provide valuable guidance in facilitating this decision-making process (Hollands and Escueta, 2017).

Digital innovation and transformation are multi-dimensional and complex and involve stakeholders and decision-makers at all levels in an organization, to facilitate the changes required. Alignment with strategic objectives has an impact on infrastructure, tools, processes, strategies, experiences, and skills development. It requires a technology roadmap and a sound theoretical approach to inform a pedagogy for technology-based learning (Serdyukov, 2017; Sousa and Rocha, 2019; Balakrishnan and Das, 2020; Torraco and Lundgren, 2020).

The balanced scorecard (BSC) is an effective strategic management tool in higher education on an institutional or business unit level and links a strategic vision to measurable objectives. It is congruent with the Baldridge Criteria for Performance Excellence in Education. It is effective for strategic management and also for day-to-day operational performance management  (Karathanos and Karathanos, 2005; Chen, Yang and Shiau, 2006; Beard, 2009; Hladchenko, 2015). The most promising evidence for the integration of the analyze, design, develop, integrate and evaluate (ADDIE) model of learning design, with the BSC was however found in the *Learning Scorecard*  of Cronje (2008). In this model, the perspectives of the BSC are superimposed on the ADDIE elements of learning, proposing a holistic approach to align and integrate learning with business processes through a clear business strategy.

This study aims to provide a strategy development framework that will highlight the multiple factors that contribute to the effective implementation of emerging technologies in learning on both a strategic and operational level. This framework outlines critical elements associated with operational business performance when learning with technology. The authors view a strategy as an outcome of a process, written up in a company document. This study proposes a strategy development framework, highlighting analytical and conceptual processes that can be used in a strategy development process to derive a unique company strategy.

The research explores how strategy development occurs through the dynamic interaction of strategy with learning, and technology integration. It analyses the key elements of a strategy map for learning with technology and how they influence each other within the overall strategy map. Learning with technology occurs in business environments and academic institutions. The audience for this study is ideally decision-makers in educational or training institutions. It will be equally informative for teachers or instructional designers embracing new technological advancements in their practice or operation.

## 2.    Methodology

### 2.1    Abductive Theory Building

The study used models and concepts of an interdisciplinary nature to analyse findings in different phases of the research. Concepts related to strategic planning, business performance management, instructional design and educational technology were explored to understand the complex dynamics between strategy and learning with technology.

The theoretical underpinnings of the BSC and the (ADDIE) instructional design model, were integrated into an abductive structure for data analysis. The BSC was used to develop a strategy map that links strategy, technology, and learning. It was used to identify key dimensions of business performance and to contextualise these dimensions in terms of a "financial perspective, internal process perspective, learning and innovation perspective and a customer perspective" (Kaplan and Norton, 1993; Kaplan, 2009).

Learning interventions are designed systemically during the phases of the ADDIE paradigm (Gustafson and Branch, 1997). The design of learning material for online environments involves using many emerging technologies. The integration of elements of ADDIE and its underlying constructs with perspectives of the balanced scorecard was further enhanced through elements of design thinking. Iterative cycles of design thinking and principles of rapid prototyping enhanced the theoretical foundation for understanding learning with technology.

### 2.2 Research Design

The study was conducted in a multidimensional environment of external socio-technical dynamics as well as internal organisational dynamics. The iterative cycles of design thinking were central to the research design.

#### 2.2.1 Integration of Design Science Research (DSR) and Delphi

Figure 1 illustrates how the different DSR cycles facilitated the research process. This study adopted the four different cycles of DSR as a guiding framework for research (Drechsler and Hevner, 2006). The integration of the different Delphi phases is illustrated at the bottom of the picture with the arrows. The change and impact cycle represents the contextual environment and links with the comprehensive literature review which analysed the internal and external dynamics impacting learning with technology. The literature provides insights regarding trends in the external environment, and capabilities in the internal environments, and integrates it on a conceptual level with a strengths, weaknesses, opportunities, and threats (SWOT) analysis to identify opportunities and threats in the environment.

The relevance cycle facilitates problem identification and was integrated with the first phase of Delphi where participants were interviewed to determine their understanding and experiences in the contextual environment. Participants were asked to describe how emerging technologies are changing business operations from a learning perspective in terms of the different phases of ADDIE. The interviewer prompted responses in line with the dimensions of the BSC, namely financial, customer, internal process and learning and growth perspective. They also shared success stories, failures and measures of success. Interviews with Delphi participants in phase one were subsequently analysed through an abductive theory-building process to construct a hypothetical strategy map to highlight the different elements to be included in an overall strategy map.

The design cycle represents the development and testing of an artefact. The results from the thematic analysis of the interviews were combined with insights from the literature review to develop a hypothetical strategy map and to identify operational focus areas (Section 3). The environmental analysis, together with the hypothetical strategy map was presented to panel members in a video presentation as the draft artefact, in the second phase of Delphi. They were requested to evaluate the proposed strategy development framework for its fit and utility in a dynamic context and to rate the operational focus areas in terms of their importance to practice. They received a structured questionnaire through a web-based interface and were asked to rate the different operational focus areas on a 4-point Likert scale. The responses for each focus area were summated by allocating a numerical value to the responses (strongly disagree, 1; disagree, 2; agree, 3 and strongly agree, 4). The average values were then used to rank the focus areas in terms of importance. The artefact is documented as a strategy development framework in Sections 3 and 4 and was improved through iterative design methodology and contributed to the knowledge base which integrates with the rigour cycle.

#### 2.2.2 Delphi

The Delphi technique is a group communication technique, structured to solicit the opinions from a group of experts regarding a specific complex problem (Linstone and Turoff, 1975). The technique has been developed to facilitate interaction and group dynamics while maintaining the anonymity of respondents. If respondents are known to each other, confrontation regarding a specific matter could lead to the risk of conforming to the opinions of others or withholding controversial opinions. The technique uses structured feedback to ensure that all participants get relevant and applicable information and reduces unnecessary "noise". The structured feedback allows participants to reflect and revise their own opinions. The group responses are then analysed statistically (Dalkey and Helmer, 1963; Dalkey, 1969). The Delphi technique has evolved in terms of how it is applied in different fields and many variations exist (Linstone and Turoff, 1975).

The Delphi method is widely used in framework development and theory building. The iterative cycles of the Delphi technique provide experts with the opportunity to develop a collective understanding of a theory and to provide feedback on components thereof. This can enhance practice as well as theory and contributes to construct validity (Okoli and Pawlowski, 2004).
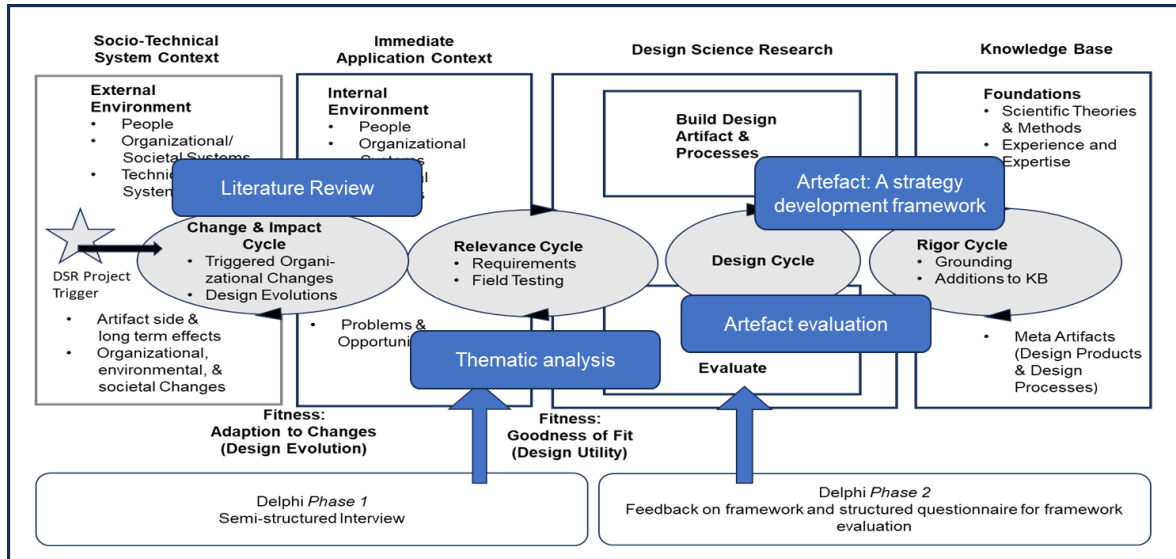
Note: Adapted from A four-cycle view of DSR (Dreschler and Hevner 2016: 5)

**Figure 1: Integrated DSR and Delphi process**

### 2.2.3    Types of artefacts and its evaluation in DSR

The different types of artefacts of DSR are broadly classified in terms of constructs, models, methods, and instantiations  (March and Smith, 1995). Peffers et al., (2012) also added algorithms and conceptual frameworks or meta-models to the classification. The outcome of this study is presented in the format of a strategy development framework developed through iterative cycles of problem identification, analysis, design, and evaluation. In a study on evaluation methods for artefact types, Peffers et al., (2012) found that a framework can effectively be evaluated by a panel of experts through a Delphi study.

### 2.2.4    Panel selection criteria

Purposive sampling was used to identify seven participants to form part of the Delphi panel and to participate in two phases of panel processes remotely, via electronic platforms. Participants were selected based on their unique understanding of complex phenomena in context and were considered "information-rich" individuals (Patton in Onwuegbuzie and Leech, 2007). Table 1 highlights the selection criteria that were used to ensure that participants came from specialist clusters or managerial levels in the field of learning with technology. Participants were selected from business and higher educational organisations.

**Table 1: Selection criteria for Delphi panel participants**

| Criteria | Where to find respondents |
|---|---|
| Strategic insight and futuristic mindset | Strategy specialist |
| Key decision-makers in shaping systems to drive change, new methods, and policies | Directors, divisional managers |
| Instructional design experts with knowledge of emerging technologies and applied technical expertise. | Senior instructional design specialists |

Members were further selected based on their professional qualifications, academic rank, interest in the subject matter of the study, and willingness to participate. Some panel members were requested to participate based on their participation at other academic conferences or forums.  Table 2 gives an anonymised description of the role and profile of the Delphi panel members. The researcher facilitated the debate through the research instruments and structured feedback. Participants remained anonymous to all other participants throughout the process. The names of participants were completely removed from the research report, and numbers alone were allocated to participants to maintain their privacy and anonymity in the study. The different perspectives of the panel members are integrated into the discussion section.

**Table 2: Panel members of the Delphi panel**

| Nr | Institution | Role and profile | Academic rank/position |
|---|---|---|---|
| *1* | Distance education institution<br><br>SA | Managing director/ instructional designer<br><br>The company sells courses online. The courses are mainly focused on Accounting, HR, Occupational Health, and Safety. The focus is on courses that sell high volumes and have a high ROI. A small number of courses are custom-designed. | Managing director |
| **2** | Learning design and delivery company (International) | Managing director/ instructional designer<br><br>All courses are designed based on client needs. Focus is on mobile learning and on-the job training initiatives as well as compliance training. | Dr |
| **3** | Private university in SA | Head: Instructional design<br><br>The university has a clear strategy for student segmentation and online design blueprints for different online modalities. | Dr |
| **4** | Public university<br><br>Africa | Coordinator: Institute of Distance Education<br><br>The university is exploring alternative delivery channels. Focus is on providing guidelines for expanding online offerings and providing basic literacy programmes. | Dr/ Prof |
| **5** | Public university<br><br>SA | Head: Instructional design<br><br>A central design unit develops interactive and multimedia learning materials. The design unit works in multidisciplinary teams to facilitate design and implementation. | Dr |
| **6** | Government education department | Head of policy and implementation<br><br>The participant is responsible for national guidelines and policies on infrastructure deployment in government schools. Responsible for change management and change agent training. | Dr |
| **7** | Private school UAE | Head of data management<br><br>The participant is responsible for data management and facilitates technology infrastructure decisions at a private school in Dubai. | Senior manager |

## 3. Analysis and Discussion

This section will first describe the environmental analysis and will then continue to discuss the hypothetical strategy map in the form of a BSC. It will also unpack the detailed components of the BSC and will highlight the operational focus areas which emerged from the analysis.

### 3.1 Environmental Analysis

#### 3.1.1 External analysis

A literature review on key trends in terms of emerging technologies and operational learning design practices highlighted major themes in learning with educational technology. Key elements associated with each theme are discussed below.

*Generative AI*

The recent boom in generative AI made educators acutely aware of the need for new competency frameworks to prepare learners to thrive in an AI-powered world. Professional capacity building is required to provide teachers with the skill to use AI in instructional activities and assessment practices that will improve student learning (Pedró, 2019; Baidoo-Anu and Owusu Ansah, 2023)

*Blended learning / hybrid integration*

Blended learning has emerged as a dominant theme when designing learning environments and includes theories, methods, and technologies in synchronous and asynchronous environments (Cronje, 2020; Joosten et al., 2020; Singh, 2021;).

*Technology-supported collaborative learning*

A collaborative learning environment, facilitating interaction among peers and tutors needs to consider design elements to integrate "cognitive presence, social presence, and teaching presence" effectively in a virtual learning environment. Online collaboration and support contribute to a sense of closeness and belonging in an online environment (Garrison, Anderson and Archer, 1999; Berry, 2019; Vlachopoulos and Makri, 2019; Ferri, Grifoni and Guzzo, 2020; Mishra, Gupta and Shree, 2020; Rasheed, Kamsin and Abdullah, 2020)

*Immersive learning experiences (Virtual reality (VR), Simulation, Game-based learning)*

Immersive learning environments such as VR and gamification can have high entertainment value but require technical competence and engineering skills. Further research is required to determine the effectiveness of such learning environments (Baker, Bujak and Demillo, 2012; Vlachopoulos and Makri, 2019; Joosten et al., 2020; Hamilton et al., 2021)

*Adaptive learning/ Educational analytics*

Adaptive learning puts the student and his/her unique characteristics, abilities, knowledge competencies and preferences at the centre of the learning experience (Muñoz et al., 2022). AI-powered adaptive learning systems collect data and analyse the behaviour of students. It will suggest an optimal learning route and learning material based on students' learning patterns and unique abilities (Alam, 2022). Adaptive learning technology requires a solid technology infrastructure which includes appropriate hardware, software, and internet connectivity for execution. The design of these systems needs to accommodate the complex requirements to be adaptable and responsive to individual learners. Real-time data challenges and the interoperability and integration complexity of LMSs remain significant challenges (Muñoz et al., 2022).

*Digital assessment*

There is a strong need to develop and enhance online assessment strategies to accommodate the requirements of learning styles, learning outcomes, pedagogy, and delivery to assure academic integrity and security. (Gaytan and McEwen, 2007; García-Morales, Garrido-Moreno and Martín-Rojas, 2021)

*Micro-credentials*

Discomfort about the implementation of micro-credentials is a global concern. It could provide a new income stream for short courses but major uncertainty around stackable components in curriculum design, and specifically standardization, validation, and accreditation in the context of a quality framework, remain at the centre of the debate (Kato, Galán-Muros and Weko, 2020; McGreal and Olcott, 2022)

### 3.1.2    Internal analysis

A strategic framework or roadmap for the deployment and integration of digital technologies needs to consider the core capabilities (Wu et al., 2008) required for learning with technology. Such a macro-level strategy for a digital eco-system incorporates all digital components such as hardware, software, applications, training modules, knowledge components and processes and must facilitate the integration and interoperability of emerging and legacy technology components (Uden, Wangsa and Damiani, 2007). Data protection and information security, system reliability and protection against viruses are important components of technical management and support (Almaiah, Al-Khasawneh and Althunibat, 2020).

Core capabilities to be included in the digital eco-system (based on the e-learning hypercube model) of Wu et al., (2008) include:

- Technology infrastructure for communication and delivery involves network infrastructure, applications platforms and devices.
- Technology for content development includes technology used for content creation, packaging, and delivery.
- Capabilities to design learning environments include learning and teaching theories; strategies, and methods for online learning; methods for collaborative learning; and new evaluation and assessment methods for online learning environments.
- Technology support to learners, instructors, and institutions.

### 3.1.3    SWOT analysis

Although the SWOT analysis is primarily a group activity involving representatives of different strategic and operational levels in an organisation (Pickton and Wright, 1998; Harrison, 2010), the researcher used it as a mechanism to plot the factors identified through the internal and external analysis in various categories of the SWOT matrix.

The SWOT analysis in Figure 2, indicates the relative position of the internal and external factors identified through this study in a generic SWOT matrix. Some internal factors can be strengths or weaknesses based on the current implementation of management control and rigour in a specific environment. The external dynamics can be a threat to existence or provide valuable opportunities for new technological innovations. Factors driving internal efficiencies are related to cost efficiencies and productivity, design excellence in terms of emerging online environments and the skills and capacity of learners and educators. External factors mainly concern factors related to technology infrastructure and access as well as innovations due to emerging technologies.
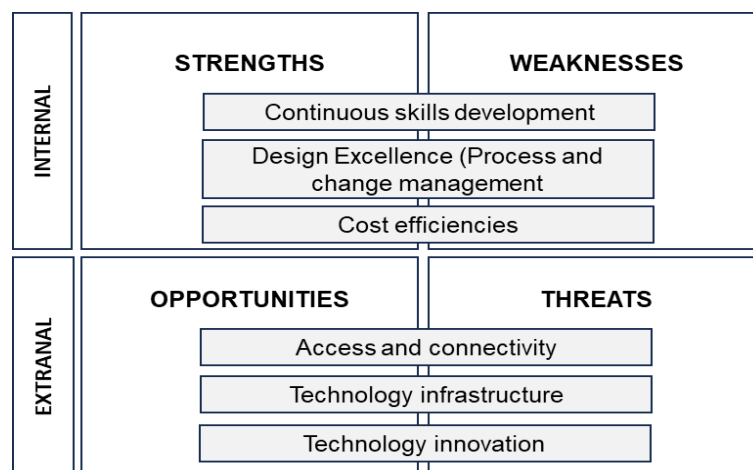


**Figure 2: SWOT Analysis**

### 3.2    The BSC for Learning With Technology

The balanced scorecard (BSC) provides a comprehensive framework of critical areas in the business and how it links to a company's strategic vision and objectives The overall objective of "Operational Excellence in Learning" was used as a strategic vision for this BSC. The "conceptual foundations" of the BSC and specifically the "guiding question for each perspective" were used to identify the activities and focus areas for each perspective in the context of the overall strategy map. The BSC was constructed based on the work of Kaplan (2009) and Kaplan and Norton (1993, 1996, 2004) from the thematic analysis of the interviews of Delphi panel participants.

Figure 3 is a visual presentation of the BSC for learning with technology. The financial perspective contains traditional financial measures and includes measures related to shareholder value. Improved learning and teaching experience and increased efficiency and productivity of learning have been added to the financial perspective due to the importance of these factors in a learning environment. The customer perspective includes measures that link directly to the portfolio of learning interventions offered to specific student groups based on unique learner profiles. The internal process perspective focuses on core capabilities and related internal processes in terms of learning design, delivery, and implementation. The learning and growth perspective builds capacity through continuous professional development initiatives and technology infrastructure that aim to improve performance in the financial, process and customer perspective.

The impact of elements in the learning and growth perspective on financial performance is not directly measurable. It does have a chain of causal relationships, indicated by the blue arrows, with critical aspects in the process and customer perspectives, that lead to financial performance. Core output measures such as profitability and increased efficiency and productivity in learning are lagging indicators, while the leading indicators relate to the uniqueness of the business in terms of activities that will lead to profitability and the optimal mix of courses associated with specific online business models.

The BSC model provides an aggregated view of how these different elements influence each other causally when linked to a single vision or strategic objective. In this strategy map the arrows indicate the direction of causal

influence. The colour of the bubbles indicates the intensity of the responses by participants who were interviewed. The light grey bubbles had the lowest number of mentions while the dark blue bubbles had the highest number of mentions.
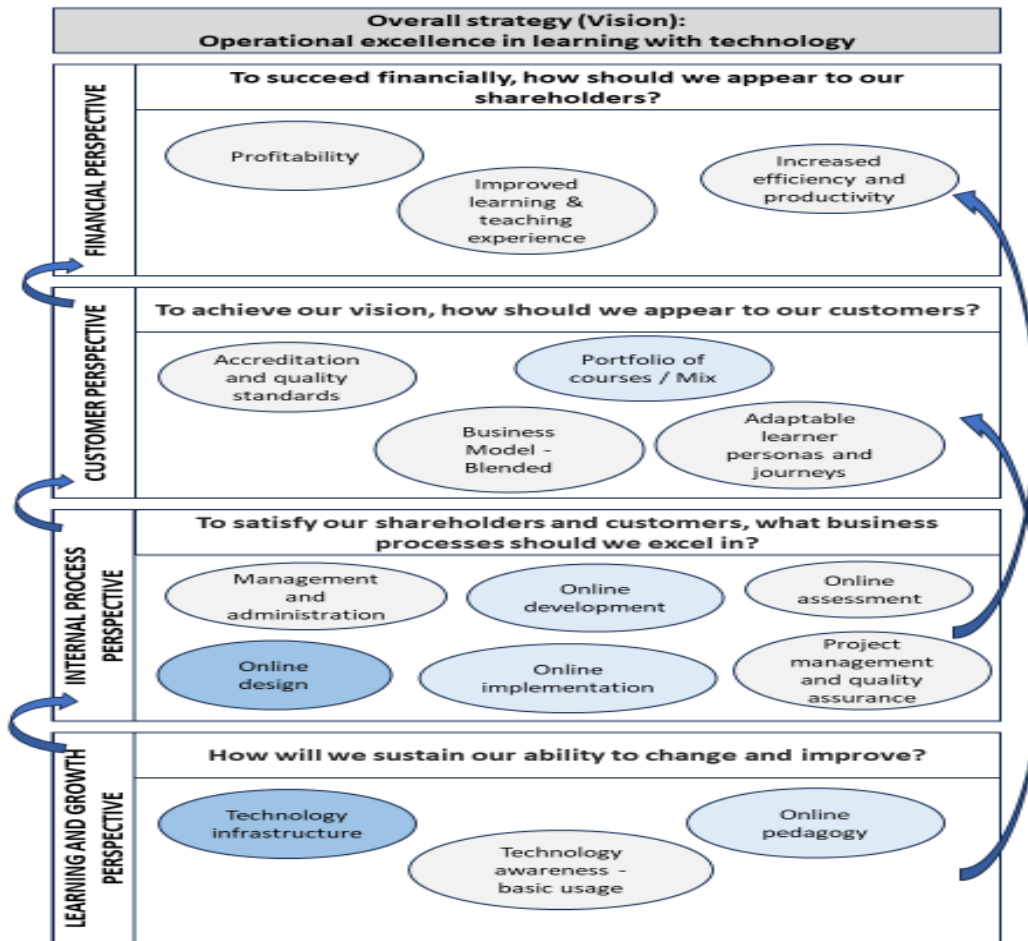


**Figure 3: The BSC for learning with technology**

**3.3    The BSC Unpacked in Terms of Operational Components**

In this section, every perspective of the BSC in Figure 3, is unpacked, based on the core themes and elements associated with the leading question in each perspective. We call this BSC a strategy map.

*3.3.1    The financial perspective*

"To succeed financially, how should we appear to our shareholders?" (Kaplan, 2009) In a business environment, profitability and other financial measures are the ultimate lag factor of good practices. However, in a learning environment, improved learning through effective technology use is the ultimate lag factor. Because improved learning and increased efficiency and productivity are primary goals of operational excellence, the author decided to allocate these themes to the financial perspective.

The role and function of the training unit will also determine if the unit will have financial objectives or not. In some organisations, the unit will have a service delivery function to support other units in the organization. The individual roles of the people participating in a strategy session will determine the lenses through which they interpret the utility of the strategy map. The financial decision-maker might want to include some parameters to measure activities related to learning with technology. Figure 4 highlights the elements allocated to the financial perspective as indicated with bubbles.

Profitability is mainly concerned with the cost of new technology and the diversification of income streams in an e-learning environment. Improved learning and teaching experience refers to satisfaction, engagement, and

user experience as well as completion ratios. Increased efficiency and productivity refer to the effective use of technology and the resultant increase in learning outcomes.
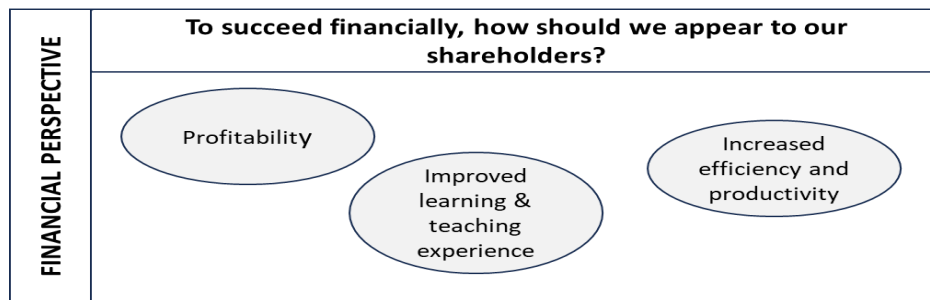


**Figure 4: The financial perspective**

*3.3.2     The customer perspective*

"To achieve our vision, how should we appear to our customers? "(Kaplan, 2009). Figure 5 highlights the elements allocated to the customer perspective as indicated by the bubbles. The customer perspective involves important decisions in terms of an online or face-to-face delivery model and its synchronous and asynchronous components. The types of courses can vary from accredited qualifications, compliance training, and industry-specific training courses to micro-credentials and short courses.  Segmentation of learner personas involves adaptive learning approaches and student journeys while cognizant of generational differences in technology knowledge and usage patterns. Accreditation links to the required standards when providing courses.

Feedback from Delphi participants indicated that the customer perspective should be adaptive to individual contexts. The customer in educational settings differs from the customer in corporate environments and customer segmentation will depend on the unique characteristics of clients and customers. The customer requirements therefore must be interpreted for the unique contextual environment in which the strategy map will be applicable.
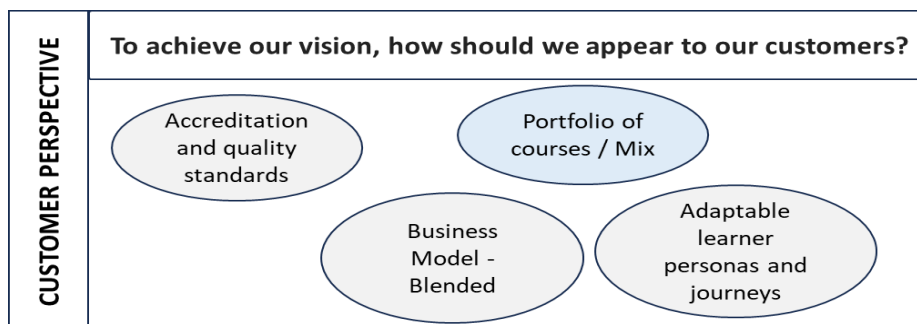


**Figure 5: Customer perspective**

*3.3.3     Internal process perspective*

"To satisfy our shareholders and customers, what business processes should we excel in?" (Kaplan, 2009) The categories correlate strongly with the ADDIE phases in an online environment. These categories are online design, online development, online implementation, and online assessment. Other themes such as management and administration, project management and quality assurance align with aspects of organisational management. Figure 6 highlights the elements allocated to the internal process perspective as indicated with the bubbles.

Online design is mainly concerned with an online design blueprint, highlighting different learning models and styles and their synchronous and asynchronous components. Design principles ensure constructive alignment between learning objectives, the use of digital media, activities, and assessment for optimal learning outcomes. It also provides for different instructional strategies such as game-based learning, augmented reality, on-the job shadowing or peripheral participation in a community of inquiry. Online development requires principles for multimedia development for different modalities, and specifications for different modes of learning delivery such as on-line, blended, face-to-face or mobile and is also concerned with different types of digital learning material. Online implementation is concerned with digital navigation standards for online delivery as well as on-

line help and technical support. Online communication and collaboration create a sense of belonging and WhatsApp groups can be an important tool to facilitate student support. It is also concerned with feedback, scaffolding and support in terms of learning methods and materials. Online assessment involves new policies and guidelines for authentic assessment as well as different types of online assessment, such as portfolios of evidence in the digital world. Guidelines are also required for assessment of work done with the help of AI.

The most important themes in this perspective are the need for design principles and guidelines in terms of instructional strategies, linked to a design blueprint; the need for principles and guidelines in terms of multimedia development; delivery on the learning platform through excellence in navigation, orientation, and support; and guidelines for assessment.

This perspective is also adaptable to the situational context. The elements to be included will vary if the design team is situated in an organization or institution with state-of-the-art design tools and an LMS infrastructure or if the instructional designer is a freelance consultant. A freelance consultant might prefer to work with available open-source technologies and design will be less governed through design principles and blueprints.
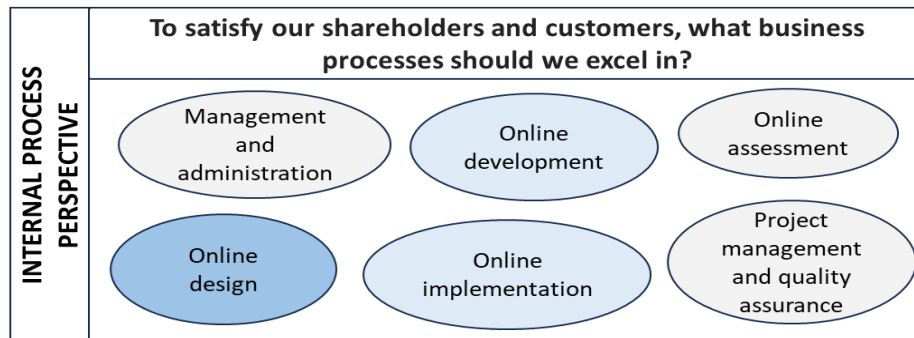


**Figure 6: The internal process perspective**

### 3.3.4 *Learning and growth perspective*

"How will we sustain our ability to change and improve?" (Kaplan, 2009: This cluster of themes deals primarily with building capacity for future growth and development. It focuses broadly on technology infrastructure and skills development. Once again, the elements to be included aim for a holistic and complete picture of what the strategy should incorporate. As with the other perspectives, the unique context of an organization in terms of infrastructure and skills development will determine the elements to include in the overall map. The technical complexities will vary in different organisations. Figure 7 highlights the elements allocated to the learning and growth perspective as indicated with the bubbles.

Technology infrastructure involves the full technology ecosystem and includes the hardware software and support. It included learning management systems, authoring tools, data management and strategic and operational support in terms of the technology infrastructure. An online pedagogy involves all aspects related to instructional design for online courses, AI literacy and online assessment literacy. Technology awareness and basic usage programmes need to support both learners and educators to effectively use digital educational tools.
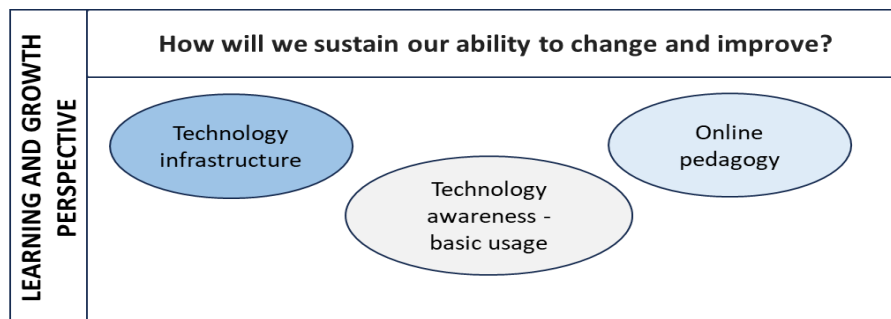


**Figure 7: Learning and growth perspective**

### 3.4 Operational Focus Areas

The leading questions for each perspective contributed to the identification of core themes and elements for each perspective. Table 3 highlights the operational focus areas which were identified for each perspective. This represents a tactical plan of action.

**Table 3: Operational focus areas**

| Perspective | Operational focus areas |
|---|---|
| Financial perspective | Optimize profitability through the diversification of income streams and the management of infrastructure and operational costs. (Profitability) |
| | Improve the learning and teaching experience through efficiencies and productivity of ed-tech technologies (Efficiency) |
| Customer perspective | Provide an optimal basket of blended learning interventions (Blended mix). |
| | Understand student personas and journeys based on unique technology profiles and other student analytics (Customer personas). |
| Process perspective | Develop an online design blueprint, incorporating design principles, instructional strategies, and constructive alignment of learning objectives and outcomes with the use of ed-tech tools and instruments (Online design blueprint). |
| | Develop learning materials based on principles for multi-media development for optimal delivery across different modes (synchronous, asynchronous, online, face-to-face etc.) (Principles of multi-media design). |
| | Implement learning interfaces according to principles of navigation and support (learner, social and technical) (Oline navigation). |
| Learning and growth perspective | Plan for the optimal technology architecture (LSM and stand-alone tools and components) and ensure continuous support and management of the platform (Optimal technology architecture). |
| | Continuous professional development (CPD) in terms of online pedagogy which includes instructional design skills, writing skills, technical design skills, and curriculum design skills. AI literacy and AI assessment literacy as part of continuous professional development (CPD). |
| | Provide basic technology usage and skills programmes for learners and educators involved in learning with technology (Basic skills). |

The ranking of the different focus areas is reflected in Figure 8. The areas where there were some disagreements were related to profitability, an optimal technology architecture roadmap and customer personas. This is a result of the unique circumstances in which participants were operating and their business objectives. The strongest agreement was in terms of the need to increase the basic technology literacy of students and educators, continuous professional development in terms of online pedagogy, and the need for principles in terms of multimedia design. Other focus areas were an online design blueprint and an improvement in learning and teaching experiences through efficiencies and productivity of ed-tech technologies.
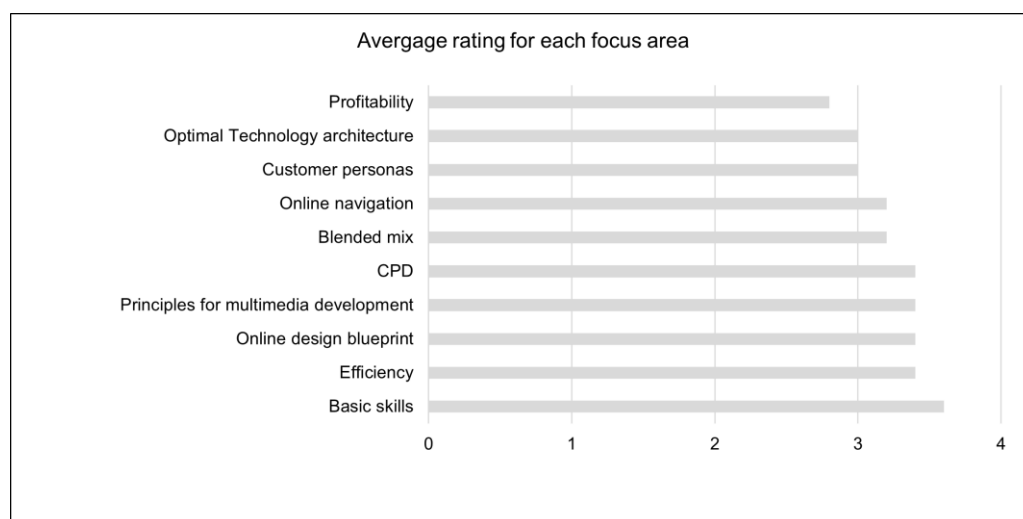


**Figure 8: Average rating for each focus area**

Analysis indicated further that most Delphi participants agreed that the conceptual framework has strategic importance and is adaptable to its context. Participants also agreed that the framework contributes to operational efficiencies and effectiveness and was sufficient in terms of the level of detail.

## 4. The Strategy Development Framework

Through the iterative processes of analysis and design, a strategy development framework emerged. Figure 9 highlights the analytical and conceptual processes in the strategy development framework.  It starts with an analysis of the internal and external environment of learning with technology.  The external analysis focuses on trends in emerging technologies and the operationalization thereof, while core capabilities in a technical ecosystem are used to analyse the internal environment. The SWOT analysis brings the internal and external environment together by identifying potential opportunities and threats for learning with technology. The elements identified in the internal and external environment are then mapped through a conceptual process in the categories of the balanced scorecard or strategy map. Operational excellence was chosen as the strategic objective guiding the development of the strategy map. The "guiding question for each perspective" then determines how individual elements are allocated in the overall strategy map. Individual elements determine the operational focus areas and tactical plan of action.
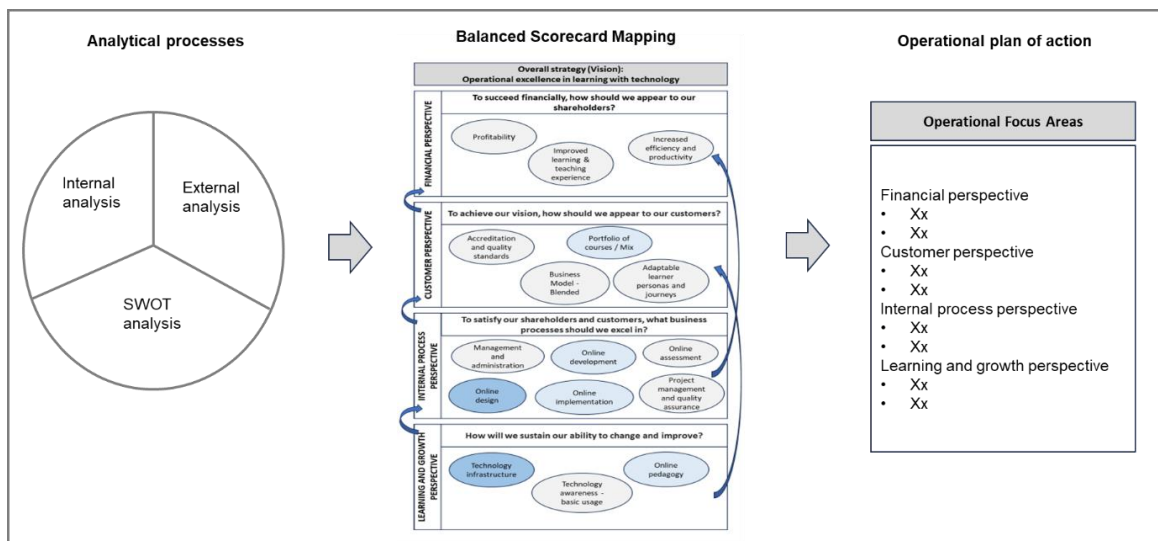


**Figure 9: Strategy development framework**

### 4.1 Strategy Development in its Situational Context

Strategy formulation and implementation develop through various stages of strategy development. The process starts with strategic analysis, continues through strategy formulation, and then drives outcomes through decision-making and implementation (Fuertes et al., 2020). It requires the interplay of variables on different levels of complexity considering the external environmental dynamics, the organisational context and ongoing strategic processes such as operational planning, resource allocation, monitoring and feedback Okumus (2001).

Although the BSC translates elements from the overall strategy into critical performance elements from different perspectives, it is not a stand-alone strategy document and often supports other strategy documents and statements (Porter, 1996; Collis and Rukstad, 2008). The BSC is effective as a strategy tool within a strategy process. It is a tool to operationalize strategic direction and drive strategy implementation (Tapinos, Dyson and Meadows, 2011).

### 4.2 Design Principles of the Framework

The framework development process was guided by design principles such as the objective or intent of the framework, operational applicability, concepts related to design thinking and the openness of the framework.

#### 4.2.1 Overall intent driving the framework

The primary goal of this framework is to improve operational excellence in learning with technology. This was also the primary goal of technology according to Chief Information Officers from institutional learning organisations (Gartner Inc., 2022).

The intent is further to ensure constructive alignment between learning objectives, educational technology and its affordances, instructional strategies and learning outcomes. Investment decisions regarding new technology require an understanding of how tools can be used with effective instructional approaches and methods to maximize the productivity of learning and increase cost and time efficiency (Serdyukov, 2017).

### 4.2.2    Applicability in the organisational context – operational

The strategy development framework is intended to have practical value on an operational level in support of an overall strategy. The strategy map should ideally be derived from strategic objectives and themes in an organisational context. The applicability of the framework is therefore concentrated on an operational level with a specific focus on improving efficiencies.

The framework will be useful in a corporate environment or educational institution, specifically for an educational design unit or team of instructional designers who are embracing new technological advancements in their field of practice or operation. It is further suggested that it is designed as a group process with representation from different roles such as IT architecture, financial decision-makers, technical instructional designers, and educators to appreciate the potential richness of the framework in its totality.

### 4.2.3    Design thinking and rapid prototyping

The framework incorporates complex systemic processes and environmental dynamics in different iterative and practical innovative cycles. This allows for its adaptability and sustainability when future technological trends emerge. The principles of rapid prototyping are also integral to the model. Rapid prototyping allows for parallel cycles of research, design, development, and implementation of modular components.  Modularity allows changes to a segment or unit without affecting the total unit. Plasticity refers to the time and cost efficiency of such changes. The approach is feasible and compatible with real-world design processes (Tripp and Bichelmeyer, 1990; Brown, 2008).

### 4.2.4    Open and adaptive to environmental context

Three different types of strategy models exist namely linear, adaptive, and interpretive and give a perspective on how strategy development occurs. The researcher resonates with the characteristics of the adaptive model as it aligns with the intent of this research.

The adaptive model is situational and can vary depending on the context. It continuously monitors the external environment and assesses internal conditions to match capabilities to opportunities and threats. It is an open and dynamic process consisting of conceptual and analytical exercises and is not only the responsibility of top management but leaders on all levels can contribute to strategy development (Chaffee, 1985).

## 4.3    Limitations of the Framework

Strategy development is complex and involves many role-players from various levels in an organisation. A good strategy will include a competitor analysis with a benchmarking exercise in terms of how internal capabilities compare with those of competitors. This framework does not focus on the position or capabilities of competitors but focuses specifically on improving its capabilities through internal efficiencies. The analysis of an external environment could include many determinants, but the study focussed on key trends in emerging technologies.

The balanced scorecard as a strategy implementation tool needs to be translated from an overall business strategy and its strategic themes and objectives. Since operational excellence is a key theme in learning with technology, identified through the literature review, it was chosen as the hypothetical theme and guiding principle for the strategy map.

Strategy development occurs through the collective intelligence created in group processes. In this research, the Delphi technique was used to gain insights from participants. The Delphi technique requires that the participants remain anonymous to each other, and no informal group interaction was allowed. The outcome could have been different if a team of people in the same organisation participated in the same analytical and conceptual processes through a workshop.

## 4.4    Recommendations for Further Research

Further research to understand the effective use of strategy development tools that can assist decision-makers in making technology investments in the face of disruptive innovation is recommended. The operational focus areas of learning with technology identified through this research indicated the needs and requirements for practice. There is an opportunity to develop some of these constructs through research. These constructs are

programmes for basic technology literacy for educators and learners; continuous professional development of an online pedagogy; development of a basic design blueprint for online learning; and guidelines for multi-media design of learning materials.

## 5. Conclusion

The strategy development framework suggests an approach that could be transferable to unique circumstances in a changing environment. An analysis of internal and external factors provides the context for analysing strengths and weaknesses in terms of opportunities and threats. The BSC gives a comprehensive picture of all factors to be considered strategically in terms of a company or institution's vision or objectives. The operational focus areas focus attention and future efforts to remain competitive and sustainable.

The strategy development framework defines some characteristics which guide implementation in a practical context. This study chose operational excellence as intent and strategy implementation on an operational level through a balanced scorecard map as the level of practice. Rapid prototyping provides flexibility in terms of individual components in the overall framework. Finally, the framework is open and adaptive and can be modified to fit any environment of learning with technology. It is responsive to changes in technology and other business changes. It will be ideal in a group context where the collective intelligence of group members can contribute to the richness of individual elements in the overall map and plan.

The hypothetical strategy map includes all the themes and elements for each perspective and gives a view at first glance of the total picture and how the elements fit together. These elements can function as placeholders during a strategy development process and can be adapted to an individual context. Participants agreed that the most important focus areas of the framework were the need to increase the basic technology literacy of students and educators. Other areas were continuous professional development in terms of an online pedagogy; the need for principles in terms of multimedia design; an online design blueprint and an improvement in learning and teaching experiences through efficiencies and productivity of ed-tech technologies.

Figure 10 presents the logical flow of research through different phases and the associated contribution of each activity. The research makes a methodological contribution to Design Science Research by combining the DSR process with a modified Delphi technique discussed in Section 2. The conceptual output represents the practical contribution and delivers a hypothetical strategy map for learning with technology that can be applied in a dynamic context and highlights key operational focus areas in Section 3. The research makes a theoretical contribution in presenting the strategy development framework for education technology in Section 4. The framework enhances theories around the analytical and conceptual processes when planning and implementing new emerging technologies in learning.
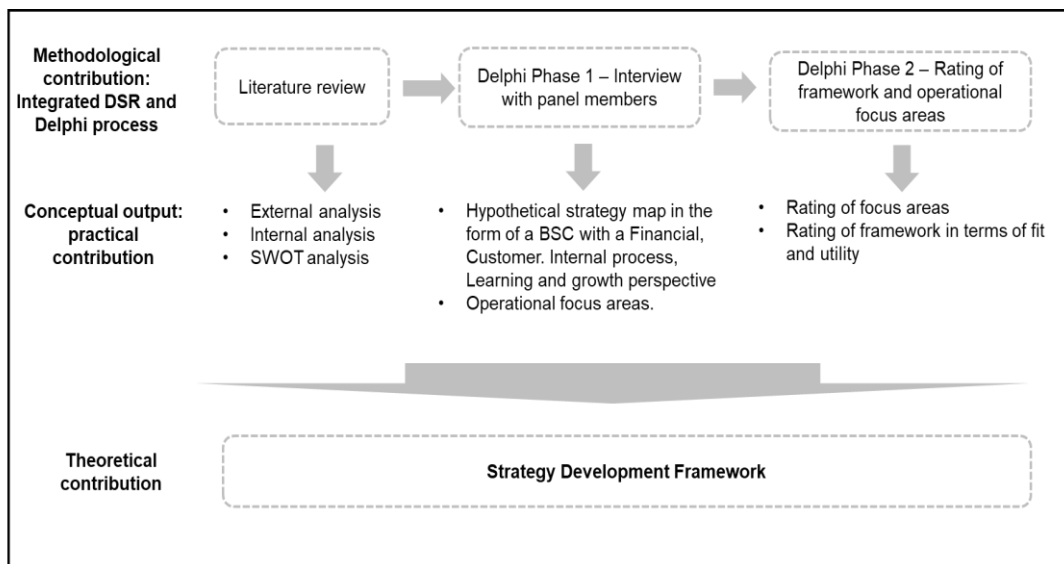


**Figure 10: Research progression and contribution**

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