Journal of
Social and Administrative Sciences
www.kspjournals.org
Volume 9 March 2022 Issue 1

AHP analysis of key success factors for enterprise transformation; From the viewpoint of project management process

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Abstract. Nowadays, project management, instead of operations, has become the main operation mode of an enterprise, while plenty discussions on using project management to help transformation of enterprises can be easily found in the existing literature. However, only a few stages of the project management process were applied in current frameworks, which could not provide an effective and comprehensive solution for an enterprise in crisis. In view of this, this study aimed to explore enterprise transformation from the perspective of project management process, proposing a whole transformation plan more coherent and complete. It would also suggest a fresh approach for exploring this research topic. The study found that the two phases of "planning" and "execution" are the most important ones for enterprise transformation. Therefore, it should be bold but cautious when formulating a transformation plan, and the plan should be precisely executed when being implemented. More importantly, this study connected the project management process with the enterprise transformation planning process, so that the enterprise transformation can be carried out more smoothly and have better probability of success.
Keywords. Enterprise transformation; Project management process; Analytical hierarchy process (AHP).
JEL. C52; L25; M14.

1. Introduction

The world is constantly evolving in a very rapid and unprecedented manner. Nevertheless, one thing is certain: businesses that fail to keep up with the ever-changing trend will not be able to reap huge profits and may suffer severe losses or even bankruptcy. Enterprises must develop a proper and efficient model for transformation to face the challenges of the environment, and it is also one of the purposes of this study.

In the past ten years, following the vigorous development of smart terminal devices, the emerging technologies such as the Internet of Things, fifth-generation mobile communications, artificial intelligence, and deep learning have subsequently had a huge impact on the industry. If

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companies fail to have a keen sense of the situation and further catch up with the trend, they are very likely to be marginalized or even eliminated. Cases such as this are plenty in the course of the industry development in recent years. For example, the advent of smart phones has had a major impact on the sales of personal computers, forcing computer companies to move into the manufacturing of mobile phones, and the voice service revenue for traditional telecom companies has also declined year by year due to free communication software, such that telecom companies had to be gradually transformed into information service companies. According to a study of McKinsey & Company in (2019), when a company initiates a transformation, there is roughly a 70% chance of failure. These failures may result from lack of a grand ambition from the CEO of a company, failing to bring up the attention of the team the importance and seriousness of the transformation, lack of discourses for convincing people the necessity of change, or failing to acquire the skills for addressing issues in the organization and the key capabilities for transformation, etc. Even with the best strategic intent, the failure to build a good team, combined with the lack of an effective process to tracking the plan, leads to many unmet transformation goals, which can hinder a successful transformation plan (McKinsey, 2019). For the above reasons, transformation is an inevitable way to go, and the key is the approach of transformation which can help the enterprise survive.

Nowadays, project management, instead of operations, has become the main business model of an enterprise. According to a study by the International Project Management Institute (PMI), the number of people engaged in project-based work will increase from 66 million people in 2017 to 88 million in 2027; the value of economic activity created by global project-based programs will increase from $12 trillion in 2013 to $20 trillion in 2027. It is estimated that by 2025, senior leaders and managers, regardless of industry or sector, are expected to spend at least 60% of their time selecting, prioritizing and driving project execution (PMI, 2017). This shows the increasing importance of project management as a professional competency in today's enterprise operations. Especially in an ever-changing environment, enterprises need to be continuously transformed to meet the expectations of stakeholders. This transformation process can be achieved through a complete project process (Krisnawati, 2015). For example: Philips, faced with a decade of stagnant sales and a continuous decline in its share price, launched an “Accelerate” program with the goal of transforming each product division into a focused organization that accelerate growth, and the core of this acceleration program is the project. Taking the project as the core, Philips used it as a management tool to break down the barriers of separate policies, and hence improving the deteriorating sales dilemma. Another case is Huawei. Huawei has always valued project management capabilities as part of its business model. Its leading project management experience and ability to continuously create new business models have helped Huawei become not only an industry

benchmark but also a corporate giant of today's network communication industry. This shows that project management is very important for enterprise transformation.

In view of this, this study aimed to explore the key successful factors of enterprise transformation from the perspective of project management process, taking business transformation as a complete plan with clear goals, scope, schedule and budget constraints that uses five stages to control. The literature, however, on this topic in the past was slightly insufficient. Garcia (2004) examined the forces that catalyze enterprise transformation and the process of implementing and executing large-scale transformations, using management literature and cognitive engineering tools to identify common phenomena associated with enterprise transformation. Garcia's study explored more on the catalytic power of transformation, but its process focuses on whether the use of resources during execution deviates from the goals. The entire study emphasized the enterprise transformation planning process, while the other stages are not explored in depth. Aier & Saat (2011) conducted a six-case study to evaluate and scale the enterprise transformation planning process, which comprised three main phases, namely strategic planning, operational planning, and implementation. In the strategic planning phase, the enterprise architecture planning is connected with the strategic process of the entire company to derive the transformation goals from the overall strategy, formulate a long-term vision, and then use the vision as a basis to define the direction of future actions. In the operational planning phase, the transformation needs are defined, evaluated, and a project is selected for them. Finally, in the implementation phase, the project will be executed and monitored. In Aier and Saat's model, a more complete project management process with four phases had already been proposed, yet there was no discussion on what to look for at the end of the transformation. According to the above discussion, this study believes that a transformation plan process should be more rigorous and complete, and hence proposes a connection of a project management process having five phases with enterprise transformation so as to construct a successful theoretical framework for enterprise transformation. It would also suggest a fresh approach for exploring this research topic.

Based on the above, this study conducted an expert questionnaire survey and then applied the Analytic Hierarchy Process (AHP) for the data analysis. Specifically, this paper has three main purposes: 1. constructing a theoretical framework that enables the successful transformation of enterprises, 2. exploring the order and weight of the importance of each factor, and 3. connecting the project management process with the enterprise transformation factors, so that the transformation process is purposeful and well-planed, so that the enterprise transformation can be carried out more smoothly and have better probability of successful transformation.

2. Literature review

The globalization of the market and the rapid development of technology have brought more challenges to business operations, and hence transformation has also become a major issue for most companies when trying to break through the current predicament or seeking new development opportunities for sustainable development. Therefore, this study would like to discuss the driving causes, scope, methods, and factors of success of enterprise transformation from the previous literature.

2.1. The driving causes and scope of enterprise transformation

The world is being changed by various forces, including constantly innovative technology and business models, variable customer needs, threats from competitors, and the impact of the spread of the virus around the world, all of which make business operations more and more difficult, and thus trigger large-scale or fundamental transformations in enterprises.

Regarding the driving causes for transformation, Hammer & Champy (1993) pointed out that in order to meet environmental challenges, fundamental changes and cost pressures of markets, products and services may be involved; McGinnis (2007) believed that emerging markets may be a strong promoter (or hindrance) of enterprise transformation; Winter & Fischer (2007) suggested that the driving cause comes from the attention of stakeholders, while other researchers believed that the advancement of information technology is the driving force behind the change (Rouse & Baba, 2006; Lahrmann, *et al.*, 2012). Second, what is the scope of enterprise transformation? Lavy & Merry (1986) pointed out that transformation refers to a major change in the fundamentals of an organization in order to survive, including the organization's mission, goals, and corporate culture. Rouse & Baba (2006) argued that transformation is a matter of doing new things in new ways, requiring fundamental changes. The above scholars' point of view is that through the core and fundamental changes in culture, behavior, and values, people with common ideas can work together to fight for the organization.

Rindova & Kotha (2001) indicated that transformation starts from the deep change and extension of products or services. Competitive advantages can be obtained by comprehensively and continuously seeking changes in products, services, and resources. The same point was made by Rouse (2005), who suggested that transformation involves new value propositions in terms of products and services, and the way they are delivered or provided. On the other hand, scholars such as Brown & Duguid (1991) held a different view and argued that transformation is a continuous improvement on the work process. There are also other scholars who claims that enterprise transformation is a situation improvement process or a series of activities that requires examination of the past, present, and future of the organization (Covin & Kilmann, 1988; Lahrmann, *et al.*, 2012). Ashkenas (2015) proposed that transformation is to reorganize

the organizational structure and transform according to the future vision or to find a new business model. Satell & Abdel-Magied (2020) further advocated that transformation is not just about making decisions in the conference room, but going deep into the actual behavior of the front line. He proposed that transformation may start with an ordinary and practical project. It can be seen that the scope of transformation ranges from changes in product and service markets to organizational restructuring, reshaping of culture and behavior, and improvement of work processes. Ultimately, there must be clear goals and a complete plan to implement.

2.2. Methods of enterprise transformation

The Total Quality Management (TQM) adopted by quality management master Dr. Deming requires many enterprises to focus on the process and design methods of the enterprise, making continuous change a daily work. The adoption of TQM is a comprehensive change for enterprises (Bozdogan, 2010). Business Process Reengineering (BPR) is a more transformative one that has led to a fundamental redesign of many business processes (Hammer & Champy, 1993). Business process reengineering, like total quality management, is a fundamental approach that involves the pursuit of day-to-day change and is more focused on the improvement of work processes (Hammer & Champy, 1993; Womack & Jones, 1997). In addition, Lean management (LM) also requires a commitment to improving performance, focusing on organizational culture and teamwork, and emphasizes processes and systems with an open mind, making changes from all levels of the company (McCarthy, 2006). LM, along with TQM and BPR, is one of the ways in which enterprises adopt in the early-phase of reformation.

Underdown & Aikman (2002) pointed out that enterprise transformation requires substantial changes to the company's culture, process and technology; however, the effects of the changes cannot be seen immediately. It may take some time for the changes to take effect. Garcia (2004) believed that during transformation, the enterprise must change its internal organizational structure, operating strategies, skills, and processes to compete and succeed in new industries. McCarthy (2006) argued that transformation requires a re-interpretation of the organizational culture's vision from "what it is" to "what it can be", which is a vision shift that motivates employees to pursue a cultural transformation. All of the arguments above called for transformation of the deeper structure in the organization, which requires commitments and determinations of senior leaders to lead the team to transform (Zhurakovskaya, Mitra, & Gupta, 2015).

Over the past two decades, business models and information technology have continued to evolve. Thus, it is important to adjust business models and information architectures to ensure compliance with current organizational goals and principles. Enterprise Architecture (EA) has also emerged and is deemed as an enterprise transformation tool for

coordination (Niemietz *et al.*, 2013). The main value proposition for management is better IT solutions that are aligned with business needs (Land *et al.*, 2008; Kappelman & Zachman, 2013; Labusch, *et al.*, 2014; Zhurakovskaya *et al.*, 2015), and the value of an enterprise is largely affected by its architecture. In terms of the structure and form, the architecture determines the ability of a large extended enterprise and its behavior, so for the design of enterprise architecture, it should apply a system engineer's method for identifying the required enterprise capabilities and the skills for designing the organization, processes, information and technology in the enterprise (Giachetti, 2012). In addition, there is also a need to consider how people interact with others and how they interact with technology (Rouse & Baba, 2006).

Due to the development of project management theory in recent years, in addition to the original five management processes (that is, the five processes of initiating, planning, executing, monitoring and controlling, and closing) and the complete aspects of the ten major bodies of knowledge (PMI, 2016), it has become a means of transformation adopted by many enterprises after integration of the content of agile (Giachetti, 2012; Prammer, 2014; Rosa & Silva, 2015). According to the research, companies with a series of "well-defined" plans for transformation are more likely to be successful than those companies that adopt "ill-defined" strategies (Giachetti, 2012). Darwish (2020) showed that business transformation is achieved through many separate projects, so project management has been used as a tool and framework to enable organizational change for a better, faster and less expensive performance.

2.3. The use of project management can create more value for the enterprise

For successful execution of a project, the proper application of project management methods has also become a prevailed discipline. According to the literature, there are many enterprise transformations that adopt project management methods to translate enterprise transformation goals into action plans (Abe *et al.*, 2007; Chofreh, *et al.*, 2015; Lahrmann, *et al.*, 2012) The purpose is to utilize limited resources on the most urgent and important things to obtain maximum benefits, and to prevent or control risks. In the process of enterprise transformation, proper control of scope, schedule, cost, and quality is regarded as one of the most important functions of project management (Milosevic & Srivannaboon, 2006; Foorthuis, *et al.*, 2012; Rico, 2014; Trad & Kalpic, 2018).

In addition to the traditional advantages of trade-offs in scope, schedule, cost and quality constraints, and the control of resources and risks, Krisnawati (2015) and Mosthaf & Wagner (2016) indicated that the ultimate goal of enterprise transformation projects is to deliver business value. Abe *et al.* (2007) believed that in addition to creating business value, necessary links to follow-up projects must be provided to maximize the overall financial goals. Moreover, project management introduces temporary

organizations to join part of the old organizational structure or replace the old one (Packendorff, 1995; PMI, 2016). It is considered as an organizational innovation, a cross-functional organization that break away from the original departmentalism and facilities the emergence of new ideas or behaviors, including new products or services, new process technologies, new organizational structures or management systems, or new projects or plans related to organizational members (Damanpour & Evan, 1984; Damanpour, 1996). The research of Dalcher (2012) further showed that the application of project management framework can improve the effectiveness of human resources in the organization, while improving the efficiency of work and increasing the value of the organization.

2.4. Success factors for enterprise transformation

From the previous literature, we know that project management can provide many benefits to enterprises. Therefore, if the enterprise transformation can properly use the project management tool, it will be able to achieve the transformation goal. The following reviewed the transformation success factors that scholars have proposed, and discussed them in the order of a project management process.

2.4.1. Initiating phase

At first, the company must have a clear idea of why they are transforming; next, it should set out goals which they want to achieve; and finally, the tasks in the transform processes are prioritized and executed. When an enterprise encounters environmental challenges and must to be transformed, it should set out a clear goal for the final result fo the transformation. Collins & Porras (1996) pointed out that far-sighted companies often have a so-called "bold mission" as a means of motivating progress, a "big", "thrilling" and "bold" goal to create an effective "wishful future". Setting a goal that goes beyond current capabilities and reality, company can be inspiring. All businesses need to start their transformation process with a clear goal so as to unite the members of the organization to move towards the set goal (McCarthy, 2006; Aier & Saat, 2011; Ashkenas, 2015). Vision is a shift from "what is" to "what can be" (McCarthy, 2006), transforming the ambitious goal from words into a lively, captivating, vivid image that is imprinted in the minds of members of the organization. Once the transformation architecture is established, the vision acts as a beacon that defines the direction and priority of future actions (Aier & Saat, 2011). In addition, the organization's senior team also needs to articulate the company's vision and prospects from time to time, in order to encourage members of the organization and guide the masses of interested parties to look forward to the realization of this great wish (Gilbert *et al.*, 2012).

Mintzberg (1987) once said "Strategy as plan" (Strategy is a plan), interpreting concisely the meaning of the strategy. Underdown & Aikman (2002) also pointed out that a well-defined program refers to a successful strategy for business transformation; specifically, companies that are transformed through a series of well-defined plans will be more successful

than companies that do not have a well-defined strategy. The success of an enterprise's transformation lies not in the strategy adopted, but in whether the strategy can be "acted according to plan", that is, whether it can be carried out in a planned, step-by-step and sequential manner. In the process of enterprise transformation, operations related to manpower, resources and finance are often used as means of strategy to rank and use the resource according to their importance. Therefore, the selection of projects is even more important (Aier & Saat, 2011; Labusch & Winter, 2013; Nieto-Rodriguez, 2016). Maylor *et al.* (2006) also indicated that with proper project governance, an organization can achieve successful delivery of project outputs, fully communication with stakeholders and an understanding of their needs to reach its goals and gain project benefits.

2.4.2. Planning phase

During the planning phase, companies must undertake a series of renovation projects for the things they want to change.

Rouse (2005) believed that transformation may involve new value propositions in terms of products and services, the way to deliver and support these products, or the method for organizing enterprises to provide these products and services. Gilbert *et al.* (2012) argued that when the external economic environment and market changes dramatically, companies should either review their current products and services, rethink and reposition their core businesses to adapt to external markets, or create an independent, disruptive business to develop into future growth drivers. Adensamer (1996) pointed out that in order to meet the needs of customers and provide value to customers, enterprise transformation must be adjusted to the operating process so as to compete and succeed in the new industry. Hesselberg (2019) believed that enterprise transformation requires an organizational design that manages people, assets, optimizes resource selection or processes, and creates value for the company. Finally, management guru Peter Drucker once said: "Culture eats strategy over breakfast", which means that corporate culture is far more influential than strategy. Furthermore, culture is the default social order of an organization: it shapes attitudes and behaviors in broad and persistent ways (Groysberg, *et al.*, 2018). If the senior management of the company can reshape the culture that the company wants, it will also be of great help to the transformation.

2.4.3. Executing phase

The focus during the execution phase is the capabilities, resources, or new technologies and skills that are available to make the transformation process smooth and deliver great results. Prahalad & Hamel (1997) suggested that core competencies are communication, participation, and commitment to work across organizational boundaries, involving people at many levels and all departments of a company, which require communication and negotiation with different stakeholders. It can be seen that communication and coordination between departments is highly related to business performance. Rouse (2005) believed that the business

scope defined by the enterprise may change after the transformation. This process requires the reorientation of the main resources in the organization; in addition, it it also necessary to acquire key resources to meet the challenges of the transformation, These resources must be unique and distinct to distinguish them from competitors to generate advantages (Wernerfelt, 1989). Especially, the transformation of business model innovation requires key resource investment to create a unique value proposition (Osterwalder, *et al.*, 2014). Johnson, Christensen, & Kagermann (2008) pointed out that when an enterprise has key resources (such as personnel with special skills, technology, equipment, access, etc.), it can create products that meet the value proposition of the enterprise, and can also obtain unique products to build the competitive advantage.

In recent years, due to the rapid development of Internet technology and digital content, a wave of digital transformation has emerged, which boasts the introduction of new technologies to improve operational efficiency. These new technologies mainly include artificial intelligence, robotics and automated manufacturing, Internet of Things, big data, etc. (Sousa & Rocha, 2019). They are becoming more and more popular among enterprises. The introduction of new technologies helps organizations rethink their business strategies. When competitors introduce new technologies one after another, the transformation is more urgent with stronger intensity than the competitions. However, Frankiewicz & Chamorro-Premuzic (2020) had a different view, arguing that the focus of digital transformation is not on technology, but on talent, and the considerable challenge for the future is to focus on retraining and upgrading people's skills in many ways, so that they can adapt better to a digitized and virtualized world.

2.4.4. Monitoring and controlling phase

At this phase, it is necessary to compare whether the action is consistent with the plan. If there is a difference between the two, action will be taken. Therefore, the task of monitoring is to make the plan move towards the goal. This process is carried out anytime, anywhere without being limited to a specific time.

In the process of transformation, the risks that are potentially harmful to the enterprise must be identified and countermeasures should be proposed so that a stop loss point for the risk can be set (Mitra, 2015; Lahrmann *et al.*, 2012), Rouse (2005) believed that transformation involves allocating attention and resources in order to anticipate and adapt to changes in external variables, i.e. controlling the future state of the business with high predictive value relative to the "road ahead" rather than the road behind, and giving it an acceptable certainty and risk. Therefore, risk control is necessary, and seeking for a fluck shall not be allowed. In addition, progress tracking must be frequently compared to set goals in order to successfully link individual and organizational performance (DeWaal, 2014); measuring and analyzing shall be performed when anomalies occur, and variation should be identified and corrected (PMI, 2016). Furthermore,

during the transformation process, the company's senior management should not only participate the process, but also show support for the transformation goals and continue to improve based on objective measurement results. It's important to show that leaders are consistent in decision-making, stick to commitments, and continue to convey the message they want their subordinates to know (Smith, Lewis, & Tushman, 2016). Lack of leadership commitment has been proven to be one of the main reasons why many transformation programs failed (McCarthy, 2006).

2.4.5. Closing phase

After the transformation has reached the later phase and the set goals are achieved, the results should be shared with organizational members and stakeholders (Chofreh, *et al.*, 2015). The appreciation and gratitude can be expressed to the team through the testimony of stakeholders, and rewards and promotions shall be given to the meritorious personnel. Furthermore, the whole process should be recorded as experience learning and inheritance, and the way to run a sustainable business should be also considered. Incentives and rewards must be the driving force for people to change, especially when the change spreads to every part of the organization (Buys & Stander, 2010). The study of McCarthy (2006) pointed out that, employees will make more efforts to focus on the direction of key performance measurement to improve the company's performance reward and recognition. Beckhard & Harris (1977) also proposed that in order to increase the motivation for change, there needs to be pulling factors, for example, incentives and rewards should be in place. Such study shows the multiplier effect between incentives and performance.

Senge (1997) put forward the theory of "learning organization" to provide a good antidote for enterprises in transition. When the environment changes drastically and rapidly, enterprises must continue to learn and surpass themselves in order not to be abandoned by the times. Levy (2017) also argued that organizations need a holistic approach to benefit from their own knowledge, learn lessons and pass it on. The management guru Drucker further pointed out that "enterprises are made up of people, and employees must be taken care of", which is the foundation of business sustainability (Drucker, 1973). Prahalad & Hamel (1997) also said that the most important a leader can do is to make the business sustainable and continue developing. Porter & Kramer (2019) also pointed out that business must reconnect company's achievements with social progress, creating not only economic value, but also social value. How to be "sustainable" is the challenge to be faced in the later phase of transformation.

3. Research method

The formation of the research structure, the sources of operational definitions, the principles of research object selection, and the analysis steps of AHP are explained in this part. The detail can be referred to in the following sections.

3.1. Research framework and operational definitions

The framework of this study was developed by first identifying factors related to enterprise transformation through extensive literature research, then classifying them into five phases of the project management process, and finally conducting in-depth interviews with three experts with experience in enterprise transformation. The three experts are:

Expert 1: A senior associate manager of an information service company, and a well-known expert in digital transformation, who often participates in various discussions on digital transformation;

Expert 2: A special assistant to the general manager in a company with 6,000 people, who shouldered important tasks in the process of company transformation and completed the product transformation of subsidiaries;

Expert 3: A general manager of a management consulting company who had 15 years of work experience in corporate counseling, and knew the pain points encountered in the process of enterprise transformation.

After literature review and expert interviews, the research structure was formed, as shown in Figure 1:

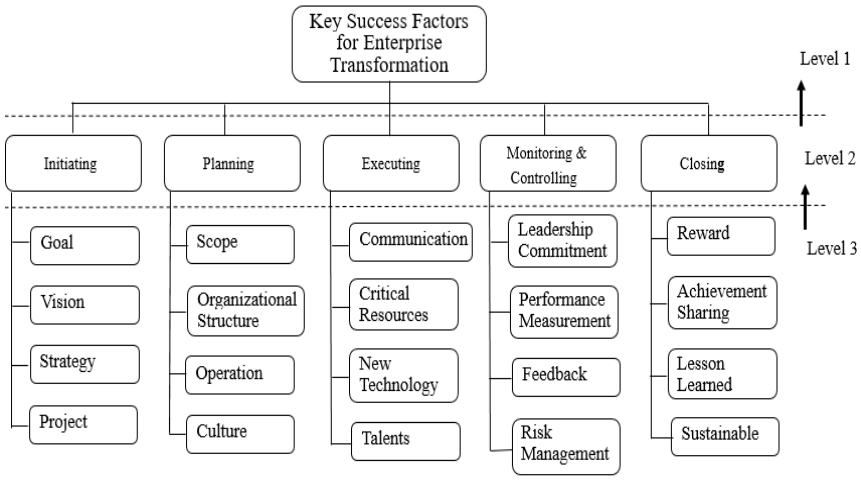

Figure 1. *Research framework*

The operational definition of the transformation phases and factors in this study is shown in Table 1 and 2:

Table 1. *Level 2 factors operational definitions*

Level 2	Operational Definitions and Citing Sources.
Initiating	Processes used to define a new project or a new phase of an existing project by being authorized to initiate a project or phase. (PMI, 2016)
Planning	Processes of defining a course of actions to establish project scope, refine project goals, and achieve project goals. (PMI, 2016)
Executing	Processes for carrying out the work defined in the project management plan to meet project requirements. (PMI, 2016)
Monitoring and Controlling	Processes to track, review and adjust project progress and performance, identify items that need to be changed in the plan, and initiate the processes required for the corresponding changes. (PMI, 2016)
Closing	Processes used to formally complete or close a project, phase or contract. (PMI, 2016)

Table 2. *Level 3 factors operational definitions*

Level 2	Level 3	Operational Definitions and Citing Sources
Initiating	Goal	Setting a goal that goes beyond current company capabilities and reality is an inspiring statement. (Collins & Porras, 1996)
	Vision	Shifting from "what is" to "what could be" (McCarthy, 2006)
	Strategy	"Strategy as plan". (Mintzberg, 1987)
	Project	Making the most efficient use of organizational resources through appropriate project governance (i.e., project evaluation and selection) (Maylor *et al.*, 2006)
	Scope	Involving new value propositions in products and services, the ways to deliver and support those products, or the methods to organize the business to provide these products and services (Rouse, 2005)
Planning	Organizational Structure	An organizational design that manages people and assets, optimizes resource selection or processes, and creates value for the company. (Hesselberg, 2018)
	Operation Process	Steps for activities that provide value to customers by satisfying their needs. (Adensamer, 1996)
	Culture	Culture as the tacit social order of an organization: It shapes attitudes and behaviors in wide-ranging and durable ways. (Groysberg, *et al.*, 2018)
	Communication	Commitment to communication, engagement, and commitment to work across organizational boundaries, involving people at many levels of the company and across all departments. (Prahalad & Hamel, 1997)
Executing	Critical Resources	Resources which must be unique and distinct from competitors. (Wernerfelt, 1989)
	New Technology	New technologies that can help organizations rethink business strategies, mainly artificial intelligence, robotics and automated manufacturing, Internet of Things, big data, etc. (Sousa & Rocha, 2019)
	Talents	Multifaceted skills for adapting to a digital and virtualized world. (Frankiewicz & Chamorro-Premuzic, 2020)
	Leadership Commitment	Leaders who are consistent in their decisions, keep their commitments, and consistently communicate what they want their subordinates to know. (Smith, Lewis, & Tushman, 2016)
Monitoring and Controlling	Performance Measurement	Tracking progress against established goals, linking individuals to organizational performance. (DeWaal, 2014)
	Feedback	Measuring and analyzing when anomalies occur to identify and correct variation. (PMI, 2016)
	Risk Management	Monitoring potential hazards to the business that must be identified and strategies developed. (Mitra *et al.*, 2015)
	Reward	To increase motivation for change; there needs to be pull factors such as incentives and rewards should be in place. (Beckhard & Harris, 1977)
Closing	Achievement Sharing	Sharing results with organizational members and stakeholders, express affirmation and gratitude to the team. (Chofreh *et al.*, 2015)
	Lesson Learned	A holistic approach to how organizations can benefit from their knowledge. (Levy, 2017)
	Sustainable	Refering to business of the enterprise which must reconnect the company's achievements and social progress, not only to create economic value, but also to create value for the society. (Porter & Kramer, 2019)。

3.2. Research objects

The survey respondents selected for this study included business leaders, senior managers, lecturers in management consulting firms, university professors, and project management experts with PMP certificates in companies. Respondents selected from these fields had sufficient enterprise transformation experience and related professional knowledge, expect to form a good recipe for enterprise transformation from their valuable experience and professional knowledge.

3.3. Analytic hierarchy process

Analytic Hierarchy Process (AHP) is a set of decision-making methods developed by Thomas L. Saaty in 1971. After several years of continuous revision and verification, Saaty organized this theory into a special book called "The Analysis Hierarchy Process" in 1980. The book "Decision Making for Leader: The Analytical Hierarchy Process" was revised in 1986 to make this theory more complete. Since the development of this theory, it has been widely valued by scholars from all walks of life. Many scholars have conducted various researches using the AHP and found that AHP has a wide range of contributions in decision-making, especially in uncertain situations and decision-making with several evaluation criteria problem.

In the study of Saaty et al., AHP was suggested to be applied to the following twelve categories of problems (Saaty & Vargas, 1982): planning, generating alternatives, determining priorities, choosing the best option or policy, resources allocating, determining requirements, predicting outcomes or risk assessment, system design, performance measurement, ensuring system stability, optimization, conflict resolution. Therefore, the application of the analytic hierarchy process was to obtain the strengths and weaknesses of the elements of the hierarchical structure through the quantification and aggregation of the opinions of multiple experts and decision makers. The analysis steps were simply organized as follows:

Step 1. Problem Description.

Step 2. List all factors related to the problem.

Step 3. Build a hierarchy.

Step 4. Design and distribute questionnaires: design according to the level 2 and level 3 factors hierarchical relationships. The questionnaire was distributed to the target respondents, and the respondents were asked to rate the importance of the two factors one by one Step.

Step 5. A pairwise comparison matrix was created from the lsit, and the geometric mean and weight of each factor were calculated, as shown in the following example.

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \Lambda & a_{1m} \\ a_{21} & 1 & \Lambda & a_{2m} \\ \mathrm{M} & \mathrm{M} & \mathrm{O} & \mathrm{M} \\ a_{m1} & a_{m2} & \Lambda & 1 \end{bmatrix} = \begin{bmatrix} 1 & a_{12} & \Lambda & a_{1m} \\ 1/a_{12} & 1 & \Lambda & a_{2m} \\ \mathrm{M} & \mathrm{M} & \mathrm{O} & \mathrm{M} \\ 1/a_{1m} & 1/a_{2m} & \Lambda & 1 \end{bmatrix}$$

With the above formula, the geometric mean was calculated for each horizontal individual factor (n values were multiplied together and then the nth root was opened) with weights (geometric mean of individual factors/sum of geometric mean of all factors).

Step 6. In order to check whether the pairwise comparison matrix met the requirements of consistency, the maximum eigenvalue and eigenvector should be calculated.

The calculation formula is as follows:

(1) Eigenvector Wi

$$W_i = \left(\prod_{j=1}^{m} a_{ij}\right)^{1/m} \Big/ \sum_{i=1}^{m}\left(\prod_{j=1}^{m} a_{ij}\right)^{1/m}$$

where m is the number of decision factors.

(2) Maximum eigenvalue

The pairwise comparison matrix was multiplied by the obtained eigenvector Wi to obtain a new vector Wi ', and then the average multiple between the two as λmax was calculated.

$$\lambda \max = (1/m)*(W_1'/W_1 + W_2'/W_2 + \ldots\ldots + W_m'/W_m)$$

(3) In order to evaluate whether the judgments before and after the decision were consistent, a consistency test should be performed on the pairwise comparison matrix. It was measured by calculating the consistency index C.I. (consistency index) and the consistency ratio C.R. (consistency ratio) of each level.

Table 3 is the stochastic indicator table when the decision factor is m.

C.R.= C.I./R.I.

If C.R.≦0.1, it can be considered that the entire evaluation process is consistent.

$$\text{C.I.} = \frac{\lambda_{\max} - m}{m - 1}$$

Table 3. *Stochastic indicator table*

m	1	2	3	4	5	6	7	8	9	10
R.I.	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

Source: (Saaty, 1980)

4. Results and discussion

4.1. Sample description

The survey respondents of this study were all experts who had been screened in advance and had relevant experience in enterprise transformation. The questionnaires were sent through social media software, mailed by e-mail, or hand-delivered in person. The survey time was from January to February, 2022. In the end, 31 questionnaires were returned. After the consistency check, 27 were valid questionnaires,

including 8 corporate owner, 7 high level managers, 4 lecturers from management consulting companies, 2 university professors, and 6 project management experts who held the International Project Manager Certificate (PMP).

4.2. Consistency analysis

When the questionnaires were returned, a consistency check was carried out for each questionnaire to determine whether it was a valid questionnaire. The analysis steps were as follows.

Step 1: Screen valid questionnaires

In the design of the questionnaire, the importance order of each factor had been required in advance for each decision matrix, and the subsequent responses were checked for logical consistency. Among the 31 questionnaires recovered in this study, there were 27 qualified questionnaires that were checked for consistency, and these 27 questionnaires were used as AHP data analysis.

Step 2: The consistency between the second-level main factor and the third-level sub-factors was verified.

Then, the consistency test of each matrix of the second-level main factors and the third-level sub-factors in this study was carried out, and the C.I. value (Consistency Index) of each matrix was obtained. Then, divided by RI (Random Index), the consistency ratio C.R. (Consistency Rate) was obtained. It can be known from Table 4 that each matrix C.R. is less than 0.1, all within the acceptable range. This indicated that respondents' responses to the questionnaire were logically consistent, and the entire study had high reliability.

Table 4. *Consistency check of each matrix*

Level 2	Level 3	C.R.	Qualified
Key Success Factors for Enterprise Transformation		0.0261	Yes
	Initiating	0.0025	Yes
	Planning	0.0018	Yes
	Executing	0.0062	Yes
	Monitoring & Controlling	0.0069	Yes
	Closing	0.003	Yes

4.3. AHP data analysis

All the interviewed experts have been listed and the consistency test of the matrix of main factors and sub-factors of each stratum has been carried out. Next, through the analysis of AHP data, the research results of the main factors and sub-factors of each stratum were explained as follows:

4.3.1. Analysis from the perspective of project management process

This study explored the success factors of enterprise transformation from the perspective of project management process, and took these five process phases as the second-level main factors. The weights obtained were

0.17, 0.26, 0.23, 0.2, and 0.13, among which the “planning” factor had the highest weight of 0.26, the “executing” factor had the second highest weight, and the “closing” factor had the highest weight of 0.26. The weight of 0.13 was the lowest. Please refer to Table 5 for relevant information.

The results of the study show that: in the entire transformation process, the "planning" phase is considered to be the most important factor, and the management team should consider whether the current product or service is due to a competitor's better product launch, poor quality, a weak function which makes consumers feel dissatisfied, or a more serious problem. That is, the value proposition delivered by the enterprise to the customer is no longer recognized by the customer, so the organization has to engages the most fundamental change. Therefore, the planning phase is all about finding out what the company is doing wrong or not doing it well enough, and getting to the heart of the problem for reform.

Table 5. *The results of the level 2 main factors analysis*

Level 1	Level 2	Weight	Ranking	λmax	C.I.	C.R.
Key Success Factors for Enterprise Transformation	Initiating	0.17	4	5.117	0.0293	0.0261
	Planning	0.26	1			
	Executing	0.23	2			
	Monitoring & Controlling	0.2	3			
	Closing	0.13	5			

4.3.2. Initial phase analysis

There were four factors in the initial phase, the highest weighted factor was "vision" with a weight of 0.28; next was "strategy" with a weight of 0.26; next was "goal" with a weight of 0.25; and the lowest was "Project", with a weight of 0.2. Please refer to Table 6 for relevant information.

The research results show that: "vision" is considered to be the most important. When an enterprise encounters difficulties and challenges, it is the responsibility of the management team to tell organizational members and stakeholders the reasons why they need to change and the goal where the organization should head to, draw a beautiful dream to boost the morale of the team, then formulate an action policy for the goal the organization wants to achieve, and execute it step by step according to the plan.

Table 6. *Initial phase analysis results*

Level 2	Level 3	Weight	Ranking	λmax	C.I.	C.R.
Initiating	Goal	0.25	3	4.0066	0.0022	0.0025
	Vision	0.28	1			
	Strategy	0.26	2			
	Project	0.2	4			

4.3.3. Planning phase analysis

There were four factors in the planning phase. The factor with the highest weight was "scope" with a weight of 0.37, the next was "culture" with a weight of 0.24, followed by was "operation process" with a weight of 0.2, and the lowest was "Organizational Structure" with a weight of 0.19. Please refer to Table 7 for relevant information.

The research results show that: "scope" is considered the most important, and its weight is much higher than other factors, because selling products or services is the lifeblood of enterprises. However, in recent years, the life cycle of products has been getting shorter and shorter. Consumers' idea of "needed product" is changing. When formulating a product strategy, whether it is an innovator or a follower, companies need to quickly find a market position and tailor-made products or services that meet the needs of customers success.

Table 7. *Planning phase analysis results*

Level 2	Level 3	Weight	Ranking	λmax	C.I.	C.R.
Planning	Scope	0.37	1	4.0072	0.0024	0.0018
	Organizational Structure	0.19	4			
	Operation Process	0.2	3			
	Culture	0.24	2			

4.3.4. Executing phase analysis

There were four factors in the execution phase. The factor with the highest weight was "critical resources" with a weight of 0.34, the next was "communication" with a weight of 0.27, followed by "talent" with a weight of 0.24, and the lowest was "new technology" with a weight of 0.16. Please refer to Table 8 for relevant information.

The results of the research show that: "critical resources" is considered to be the most important. As companies implement new strategies, they are unlikely to use existing internal resources. However, they must actively develop new resources externally. This can be achieved through mergers and acquisitions, alliances, or authorization, agreement and other methods. If the companies can apply these methods to these key resources and cultivate the ability to use this resource, they can establish a unique competitive advantage.

Table 8. *Executing phase analysis results*

Level 2	Level 3	Weight	Ranking	λmax	C.I.	C.R.
Executing	Communication	0.27	2	4.0167	0.0056	0.0062
	Critical Resources	0.34	1			
	New Technology	0.16	4			
	Talents	0.24	3			

4.3.5. Monitoring & Controlling phase analysis

There were four factors in the monitoring phase. The highest weighted factor was "leadership commitment" with a weight of 0.39, the next was "risk management " with a weight of 0.27, followed by "feedback" with a weight of 0.18, and the lowest was "performance measurement" with a weight of 0.16. Please refer to Table 9 for relevant information.

The research results show that: "leadership commitment" is considered to be the most important, and it is a process without a time point in the monitoring phase of the transformation. On this long road, apart from keeping the direction of progress on track, the most important thing is to get the support and encouragement of the company leaders. At this level, the leaders should not only participate in, but also inspire the team to boost morale and lead the company to the goal with determination.

Table 9. *Monitoring & Controlling phase analysis results*

Level 2	Level 3	Weight	Ranking	λmax	C.I.	C.R.
Monitoring & Controlling	Leadership Commitment	0.39	1	4.0165	0.0055	0.0069
	Performance Measurement	0.16	4			
	Feedback	0.18	3			
	Risk Management	0.27	2			

4.3.6. Closing phase analysis

There were four factors in the end phase. The highest weighted factor was "sustainable" with a weight of 0.33, the next was "lesson learned" with a weight of 0.30, followed by "reward" with a weight of 0.22, and the lowest is " achievement sharing" with a weight of 0.15. Please refer to Table 10 for relevant information.

The research results show that: "sustainable development" is considered to be the most important, and the transformation of a company is of course to continue to survive. However, companies should not only focus on short-term performance, but also long-term sustainable operation. The value of a company is reflected in terms of attitude towards society, environment and governance, which is a responsibility and a road that leads to a happy and bright future in line with the world.

Table 10. *Closing phase analysis results*

Level 2	Level 3	Weight	Ranking	λmax	C.I.	C.R.
Closing	Reward	0.22	3	4.0055	0.0018	0.003
	Achievement Sharing	0.15	4			
	Lesson Learned	0.3	2			
	Sustainable	0.33	1			

4.3.7. The overall weight and ranking of the success factors of enterprise transformation

For the calculation of weight and ranking of the twenty sub-factors in the third level of this study, please refer to Table 11 for these data. The top five factors can be seen from the research results: the highest weight was "scope" with a weight of 0.0979; the second was "leadership commitment" with a weight of 0.0795; the third was "critical resources" with a weight of 0.0773; the fourth was "culture" with a weight of 0.0634; and the fifth place was "communication" with a weight of 0.0617. When the top five sub-factors were added together, the weight was as high as 0.3798, accounting for nearly 40%. The total weight of the remaining 15 sub-factors was about 62%, and its importance was quite obvious to the success of enterprise transformation. Further analysis showed that among the top five important sub-factors, the top three belonged to three different phase, namely "planning", "executing", and "monitoring & controlling". Two sub-factors entered the top five, which showed that the two phases of "planning" and "executing" were considered to affect the success of the enterprise transformation plan in the process of transformation. Therefore, when formulating a transformation plan, we must be bold and careful. The planning and execution process must implement and confirm the proposed course of action.

Table 11. *Overall factor weight and ranking*

Main factors	Weight	Sub-factors	Local Weight	Global Weight	Ranking
		Goal	0.25	0.042	13
Initiating	0.17	Vision	0.28	0.047	10
		Strategy	0.26	0.044	11
		Project	0.2	0.034	17
		Scope	0.37	0.098	1
Planning	0.26	Organizational Structure	0.19	0.051	9
		Operation Process	0.2	0.052	8
		Culture	0.24	0.063	4
		Communication	0.27	0.062	5
Executing	0.23	Critical Resources	0.34	0.077	3
		New Technology	0.16	0.037	15
		Talents	0.24	0.055	7
		Leadership Commitment	0.39	0.079	2
Monitoring & Controlling	0.20	Performance Measurement	0.16	0.032	18
		Feedback	0.18	0.037	16
		Risk Management	0.27	0.055	6
		Reward	0.22	0.03	19
Closing	0.13	Achievement Sharing	0.15	0.02	20
		Lesson Learned	0.3	0.041	14
		Sustainable	0.33	0.044	12

5. Conclusions

This study associated twenty factors of enterprise transformation with the five stages of the project management process from the previous literature review and the practical experience of experts in the business sector; and the study further constructed a theoretical framework for enterprise transformation. Through the analysis of AHP data, the two stages and five factors with the highest weight were obtained, which formed the key success factors of enterprise transformation. This theoretical framework makes up for the lack of process integrity and comprehensive solutions in the past enterprise transformation process using project management methods. In addition, this research also proposed a more complete framework to respond to the "digital transformation" boom that has been triggered in recent years. Although the name of the factor "digital transformation" is not seen in the research framework, the real meaning of digital transformation is not only the innovation of technology and the introduction of information system, but also the change in organizational structure, corporate culture and operational processes. It is similar to the theoretical framework of this study, which is to multiply appropriate technologies, talents, resources, processes and corporate operations to enhance the organization's ability to cope with external impacts. Therefore, the theoretical framework of this study has basically covered the dimensions of digital transformation. Given the foregoing, this study has accomplished the purpose of finding the key success factors of enterprise transformation. It is hoped that more enterprises can adopt this theoretical framework and make good use of project management, so that the process of enterprise transformation can be carried out more smoothly and increases the probability of success, which will be the greatest contribution of this study.

Although this study has adopted a rigorous analytic hierarchy process to evaluate decision-making, and obtained the weight and importance ranking of all factors, there are still some limitations in the research process that make this study not perfect. For example, this study discusses the transformation of enterprises in the perspective of project management process. Therefore, the size of the selected enterprises must have more than three departments and the number of employees should not be too small so as to comply with the organizational structure, communication and coordination factors in the framework design. For this reason, microenterprises (defined as those employing less than 10 employees) were excluded because such business operations may not have a complete project management process in five phases. This type of business is more suitable for applying agile methods, so it is not within the scope of this study. In addition, most of the respondents interviewed in this study worked for companies that were located in Taiwan. There are regional industrial factors in these samples. Whether the research results can be generalized and applied should be further explored.

The use of project management to assist enterprise transformation has been widely adopted and applied. However, the methods and skills of project management are also constantly advancing with the times. In the face of the ever-changing environment and the variable needs of customers, and for the objectives of shortening the product development cycle and promoting work efficiency, it is necessary for enterprises to re-examine the way of project management and technology practice. In recent years, the enterprise world has actively introduced agile methods, allowing organizations to focus on continuous learning and early delivery of results, and create greater business value for enterprises. This is the trend of the times. In the future, the following study will discuss how agile project management can help enterprises to transform by replacing the longer project management process with a shorter iteration cycle, in order to better meet the needs of the current enterprise transformation strategies. The non-industrial disruptions of the global Covid19 pandemic during the research period of this paper make the transformation of enterprises even more urgent. This factor is rarely seen in the previous literature. It is necessary to analyze this issue in depth in the future so that this theoretical framework can be improved.

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