

## A Success Model for Project Management During National Crises

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### *Abstract*

*In project management, success is the ultimate goal. Success requires appropriate tools and techniques. Given the multi-dimensions of uniqueness in projects, success tools and techniques should be customized to suit a particular project or a set of closely related projects. In this paper the national crisis was selected as the context in which project success is sought. After reviewing the notion of project context, success factors and project strategy, the authors provided a theoretical explanation and a generic model of the relationship between project strategy, success factors and project success. Following this explanation, the authors analyzed a set of 24 cases from the British aviation industry that occurred during the crisis of World War 2. Based on the results of such analysis, the authors created a success model containing the strategies and success factors needed for successful project management in such a context. The authors then analyzed another case that is different from the first set of 24 cases. The model was validated and refined based on the second case. The authors then showed the application of the model on other cases unrelated to the previous ones. The authors concluded with remarks about the importance, contribution, implication and limitations of this study.*

**Key Words:** *Project Management, Project Success, National Crisis, Success Strategy, Success Factor.*

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### **Introduction**

Project management as a discipline emerged in the middle of the 20th century to enhance the chances of successful delivery of complex projects (Johnson, 2013). Since then, the research about project success has not stopped. This paper fits into this theme of project management research.

Project success is very popular theme in the area of project management research. It has been addressed under many sub-themes such as success factors (Müller & Jugdev, 2012), success criteria (Wai *et al.*, 2012), success definition (Van Niekerk & Steyn, 2011) and success frameworks (Howsawi *et al.*, 2011). These sub-themes are often coupled with a certain context such as the industry type, the geographical location or the cultural medium. The context, or in other words, the environment and circumstances of a project can influence the aspects of project success such as the success factors and strategies (Balachandra & Friar, 1997; Engwall, 2003; Maaninen-Olsson & Müllern, 2009). Different contexts may have different effects; consequently, the aspects of project success may differ from one context to another (Balachandra & Friar, 1997). For example, competent project manager is a common project success factor (Pinto & Slevin, 1987). However, in the construction industry it is necessary to have a physically capable construction project manager because this type of projects needs many on-site movements; while in a software project, a project manager with a mobility limitation can perform well because this type of industry does not require a lot of movement.

There are a wide variety of possible contexts for projects. **Table 1** presents examples of such contexts from project management literature.

Table 1: Examples of research articles with context focus

The research topic	The context
Studying the challenges of project management in public sector (Waddell, 2010)	Ownership type: Public vs. Private
The cultural barriers to the use of western project management in Chinese enterprises (Wang & Liu, 2007)	Culture: Western vs. Chinese
Critical managerial factors affecting defence projects (Dvir <i>et al.</i> , 2006)	Industry type: Defence
Analysis of factors critical to construction project success in Malaysia (Yong & Mustaffa, 2012) A study on project success factors in large construction projects in Vietnam (Nguyen <i>et al.</i> , 2004)	Industry type: Construction Geographical locations: Malaysia + Vietnam

Among these contexts is the context of national crises. Managing projects in such a context may require different approach from that of peacetime (Howsawi *et al.*, 2014c). However, until now the knowledge about project management during national crises has been very limited (Hrůzová & Thornton, 2011). One of the first definitions of project management during national crises was proposed by Howsawi *et al.* (2014c) as “the application of knowledge, skills and techniques to execute and deliver projects effectively and efficiently in a situation or time at which a nation faces intense difficulty, uncertainty, danger or serious threat to people and national systems and organizations and a need for non-routine rules and procedures emerge accompanied with urgency”. The newness of this concept encourages research on project success in this context; that is project success during national crises.

When success happens once in a national crisis context, the factors or strategies that led to success in that context can be extracted from that particular case. However, when the success is repeated in different cases of similar contexts then the search can be for the pattern or the model that enables the repetition of that success. Based on that, the objective of this paper is to develop a qualitative generic success model that can be applied to managing projects during national crises so the chances of successful delivery of those projects will increase. This objective will be achieved using multiple case studies for the creation and the validation of the model.

The topic of this paper draws its importance from the fact that national crises are more prevalent now than ever before in terms of severity and frequency. For example, the frequency of financial crises has doubled

since the 1970s (Bordo *et al.*, 2001). Also, the frequency and severity of natural disasters is also rising (Degg, 1992; Gurenko & Dumitru, 2009). In 2011 five incidents of civil unrest broke out in five Middle Eastern countries three, of which are neighbours. These are real national crises that the authors witnessed one of them during a visit to Egypt in 2012. These crises resulted in thousands of deaths, lack of security, economic recession and regime overthrow.

Despite the odds of national crises, projects continue to be initiated and implemented. Consequently, there is a need for the knowledge about how to succeed during national crises and this is the rationale of this paper.

## Research Design

The field of project management is a learning discipline that benefits from the past experiences and what are believed to be best practices (Atkinson, 1999). Since the discipline is practice-based, the knowledge creation should also be conceived as practice-derived. In this regard, management expert Drucker said “What constitutes knowledge in practice is largely defined by the ends, that is, by the practice” (Drucker, 1985). This philosophy is the fundamental, theoretical base of knowledge creation in this paper.

In applying this philosophy, the authors firstly analyzed a portfolio of case studies consisting of 24 aircraft projects from the British aviation industry during the national crisis of World War 2 (WW2)(Howsawi *et al.*, 2014d). The resulting success strategies and their dynamics form the foundation for creating the initial success model for project management during national crises. Secondly, the authors analyzed a case study of a project in a national crisis setting, but with significant differences as shown in Table 2. This second case study is the construction of the Aswan High Dam in Egypt during the national crises of the 1960s (Howsawi *et al.*, 2014a). This second case study works as a validation case for the initial model created after the first portfolio of case studies from the British aviation industry. Necessary re-wording might be done on some titles of the initial model.

Table 2: The differences between the main two stages of case studies of this paper

	<b>The first portfolio of case studies (The British aviation projects)</b>	<b>The second case study (The AHD project)</b>
<b>The context</b>	National crisis	National crisis
<b>The type of the national crisis</b>	War	War
<b>Number of projects included in the analysis</b>	24 small projects	Single mega project
<b>The industry</b>	Aviation – aircraft	Construction- dam
<b>The cultural surrounding</b>	English- European-Industrialized nation	Arab- Middle Eastern- Agricultural nation
<b>The political regime</b>	Democratic	Military
<b>The geographical location</b>	UK-Europe	Egypt- Middle East
<b>The time period</b>	1940s	1960s

Thirdly after the validation of the model, the authors discuss the model with reference to several cases different from those used in the creation and validation of the model. The basic premise of these three stages is that if the model can fit the three very different stages, then it is a valid model.

## Project Success, success Factors and success strategies: Definition and Relationship

There is no single universal definition for project success. Rather, success is specifically defined for each project or closely related projects (Howsawi *et al.*, 2014b). Whatever the definition is, there must be some

causes or elements that caused that success. Many studies about project success use the term “success factor” to describe the contributing element in the success of a given project. The word “factor” means “a circumstance, fact, or influence that contributes to a result” (OxfordUniversity, 2012). It is defined by project management scholars as “those inputs to the management system that lead directly or indirectly to the success of the project” (Cooke-Davies, 2002). Also is defined as “ the elements of a project which, when influenced, increase the likelihood of success” (Müller & Jugdev, 2012).

The literature of project management contains many lists of success factors. These lists are often called critical success factors (CSFs). Table 3 below presents some of these lists.

Table 3: Selected critical success factor lists

Author	CSFs
(Nguyen, <i>et al.</i> , 2004)	<ol style="list-style-type: none"> <li>1. Competent project manager</li> <li>2. Adequate funding until project completion</li> <li>3. Multidisciplinary competent project team</li> <li>4. Commitment to the project</li> <li>5. Availability of resources</li> </ol>
(Iyer & Jha, 2006)	<ol style="list-style-type: none"> <li>1. Project manager’s competence</li> <li>2. Top management support</li> <li>3. Monitoring and feedback</li> <li>4. Favourable working conditions</li> <li>5. Commitment of all project participants</li> <li>6. Owner’s competence</li> <li>7. Interaction between project participants</li> <li>8. Good coordination among project participants</li> <li>9. Availability of trained resources</li> <li>10. Regular budget update</li> </ol>
(Jo & Barry, 2008)	<ol style="list-style-type: none"> <li>1. Projects are designed in accordance with government objectives</li> <li>2. A trained and experienced project manager is required for project success</li> <li>3. Stakeholder involvement is important for project success</li> <li>4. Full-time project managers are required in order to ensure project success</li> <li>5. The availability of technical experts to implement projects is important for project success</li> <li>6. Political support is an important factor to ensure successful project implementation</li> <li>7. Lack of funding to complete projects is the main factor that hampers project success</li> <li>8. Timely payment to the client is important for successful project completion</li> <li>9. A regular progress meeting on projects, to ensure that implementation is progressing according to plan</li> <li>10. Detailed planning of projects, according to which projects are measured during implementation</li> <li>11. Holding of close-out meetings at the end of projects, in order to capture lessons learned</li> <li>12. The lessons learned during close-out meetings are used to improve future projects</li> </ol>
(Yu & Kwon, 2011)	<ol style="list-style-type: none"> <li>1. Minimization of conflict between stakeholders</li> <li>2. Optimization of legal and administrative services</li> <li>3. Standardization of decision making process</li> <li>4. Good communication and information sharing</li> <li>5. Reasonability of project master and implementation plans</li> <li>6. Suitability of project management system</li> <li>7. Establishment of appropriate organizational structure</li> </ol>

	<ol style="list-style-type: none"> <li>8. Cooperativeness of stakeholders on project</li> <li>9. Performance management at each phase</li> <li>10. Balanced adjustment between the public and the private interests</li> </ol>
(Yong & Mustafa, 2012)	<ol style="list-style-type: none"> <li>1. Financial capability</li> <li>2. Control of subcontractors' works</li> <li>3. Cooperation in solving problems</li> <li>4. Competence</li> <li>5. Commitment</li> <li>6. Skilful workers</li> <li>7. Adequacy of design details and specifications</li> <li>8. Industry-related issues (availability of resources)</li> <li>9. Communication among project stakeholders</li> <li>10. Involvement to monitor the project progress</li> <li>11. Effective allocation of man power</li> <li>12. Shared authority and responsibility between the clients, consultants and contractors</li> <li>13. Nature (weather conditions)</li> </ol>

These lists keep evolving and there is no consensus upon them. However, different lists agree upon several individual CSF despite the different contexts of the studies such as different geographical location or different ownership type; public or private (Chan *et al.*, 2004; Dvir *et al.*, 1998; Fortune & White, 2006). For example, a study on large construction projects in Vietnam (Nguyen, *et al.*, 2004), a study from Indian construction industry (Iyer & Jha, 2006), a third study about the success factors in government owned projects (Jo & Barry, 2008) and a fourth on multiple public and private firms in multiple industries (Mishra *et al.*, 2011) all agree that the first or second most important factor for success is the competency of the project manager. This highlights the fact that several success factors are generic or common but can be tailored to fit a specific project. For example “competent project manager” is a common success factor. It can be customized by adding industry and culture dimensions so it becomes “competent IT project manager in Chinese enterprises”. This example leads to the next fact that projects (and consequently their success factors) are not isolated islands (Engwall, 2003). They are necessarily linked to several elements such as their environment or stakeholders or parent organization (Besner & Hobbs, 2008). For example “availability of resources” is an essential success factor mentioned in many studies. This factor was influenced by other elements at higher level. For example, the control of raw materials in United Kingdom by the British government during WW2 significantly affected the availability of resources to many projects (Backman & Fishman, 1941). This example shows how a contextual or environmental element affects an essential project success factor. Based on this fact the authors assume that success factors are dependent variables that are affected by “something” at higher level. We may at this point call that “something” a strategy.

The concept of strategy is probably as old as the early writing about the art of war. This concept was initiated in the military arena then it found its way to other fields of science (Patanakul & Shenhar, 2012). The linguistic meaning of strategy is “a plan of action designed to achieve an overall aim” (OxfordUniversity, 2012).

In the project management arena the term “project strategy” is relatively new (Patanakul *et al.*, 2012). There are several definitions for project strategy in the project management literature. It is defined as “a direction in a project that contributes to success of the project in its environment” (Artto *et al.*, 2008). Also it is defined as “The project perspective, position, and guidelines for what to do and how to do it, to achieve the highest competitive advantage and the best value from the project” (Patanakul & Shenhar, 2012; Poli & Shenhar, 2003). Other attempts to define the project strategy such as (Poli, 2006; Yang, 2012; Zhiye *et al.*, 2009) all used one of the mentioned definitions. Apparently both definitions are similar with more elaboration in the second one.



On the basis of the definitions of the terms, “project strategy” and “project success factors”, the authors assert that the strategy is a higher-level driver to enhance or diminish a particular factor or factors. The project strategy should be well-formulated at the beginning of the project as it holds significant importance in the success of or failure of a project (Anderson & Merna, 2003). Using a general influence diagram, Figure 1 illustrates the strategy-factor relationship in regards to project success.

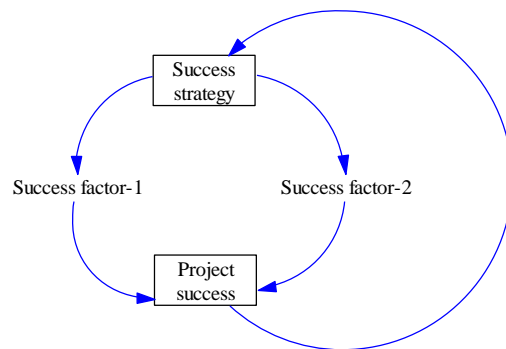


Figure 1: Basic project success-factor-strategy relationship model

The success strategy enhances the success factor which in turn increases the likelihood of project success. When a project succeeds, this success supports the strategy and endorses its correctness. In reality there are multiple strategies that can be applied simultaneously in a project. These strategies can have mutual impact upon each other. Also the factor can be supported by more than one strategy. This leads to more a complex model to describe the strategy-factor relationship to project success as shown in Figure2.

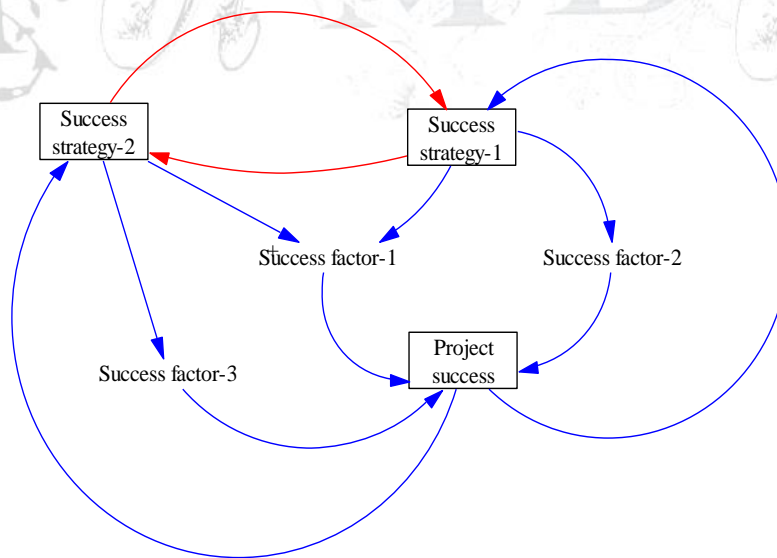


Figure 2: Multiple-link project success-factor-strategy relationship model

The complexity of the model increases by increasing the number of strategies included, the number of factors included and the number of relationships between each factor and the supporting strategies. This complexity is illustrated in Figure 3. For abbreviation, the authors will call this model the “generic success model”.

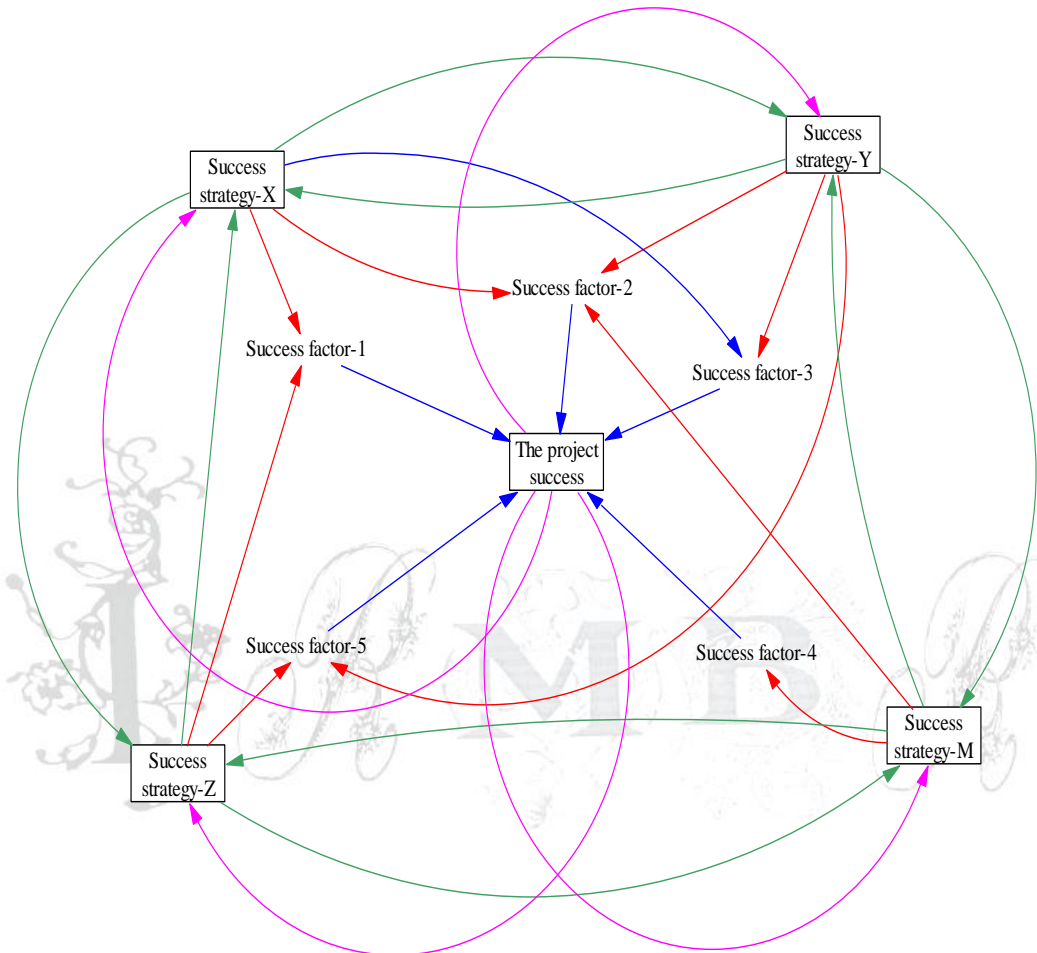


Figure 3: Generic success model

Figure 3 depicts the generic success model that describes the relationship between project success, success factor and success strategy.

### Effective strategies for Successful Project Management during WW2 in the British aviation industry

The first stage of this research comprises an investigation of the successes of British aviation projects during the crisis of WW2.

WW2 was a global crisis that affected the whole British socioeconomic system. The characteristics of a national crisis as a context of project management which was mentioned by Howsawi *et al.* (2014c) materialized in this crisis as follows:

- **Government intervention:** The British Government intervened in all aspects of the British socioeconomic system such as material supply and employment, even in private firms (Backman & Fishman, 1941; Murphy, 1942). The British Government gave special support to the aviation industry.
- **Emerging threats and opportunities:** Threats such as bombing and sabotage disturbed industries. These threats prevented workers from reaching their work site and destroyed the work site itself killing or wounding workers.
- **Urgency:** Many projects needed to be delivered urgently because the changing situation might render a product obsolete if it was delayed.
- **Resources and supply disturbance:** The UK is a group of islands dependent to a large degree on imports of raw material (Edgerton, 2011). The Nazi occupation of Europe and the sinking of convoys caused a shortage of raw material.
- **Uncertainty:** During WW2, the citizens and industries in the UK were uncertain as to when a bombing raid would occur and the potential consequences of that raid. The designers of many projects were uncertain about final specifications because of the rapidly changing tactical situation.

Despite the impact of this crisis, the British aviation project could deliver many successful projects. The authors investigated a portfolio of case studies consisting of 24 projects shown in Table 4.

Table 4: Case studies in the first stage of this research

	Aircraft name		Aircraft name		Aircraft name
1	de Havilland Mosquito	9	Fairey Firefly	17	Bristol Brigand
2	Avro Lancaster	10	Hawker Tempest	18	Bristol Buckingham
3	Handley Page Halifax	11	Hawker Sea Fury	19	Westland Welkin
4	Bristol Beaufighter	12	Avro Lincoln	20	Supermarine Spitiful
5	Hawker Typhoon	13	Fairey Fulmar	21	Hawker Tornado
6	Fairey Barracuda	14	de Havilland Hornet	22	Vickers Windsor
7	Short Stirling	15	Avro Manchester	23	Miles M.20
8	Armstrong Whitworth Whitley	16	Blackburn Firebrand	24	Supermarine Type 322

The data on these cases studies was compiled from several resources such as original documents and recorded interviews with WW2 industry veterans. The data was obtained from sources such as the National Archives; The UK Government's official archive, the Imperial War Museum in London and the Royal Air Force Museum in London. Also, the video data was used as an innovative and effective way to understand the context of WW2 in general and the aviation industry then in particular (Howsawi *et al.*, 2014e).

The data was analysed using content analysis technique. The analysis revealed six strategies effective in delivering successful projects during a time of crisis. Table 5 summarizes these strategies and nine common success factors supported by these strategies. These factors are common success factors mentioned in the literature of project management. Each factor appeared in many studies; at least three references are mentioned here for each factor. There might be a little paraphrasing in the factors but the meaning is exactly the same as that intended by the original authors.



Table 5: Summary of the success strategies based on first set of case studies

Success strategies resulting from this study	Success factors considered in this study	References from which the success factors extracted
1. Obtaining Government support. A dedicated ministry for aircraft production. 2. Depending on nearby alternative material and workforce 3. Consolidating interagency collaboration 4. Applying a common platform strategy in new product development projects 5. Implementing the strategy of simultaneous development and testing of subsystems. 6. Incorporating versatility in the product design	Adequate material supply	(Pinto & Slevin, 1987); (Belassi & Tukel, 1996); (Nguyen, <i>et al.</i> , 2004) (Fortune & White, 2006)
	Adequate work force ( includes competent, committed, motivated project manager and team members as well as sufficient staff)	(Pinto & Slevin, 1987); (de Wit, 1988); (Belassi & Tukel, 1996) (Gemuenden & Lechler, 1997) (Chua & Kog, 1999); (Chan <i>et al.</i> , 2001);(Dvir, <i>et al.</i> , 2006);(Fortune & White, 2006);(Salleh, 2009);(Yong & Mustaffa, 2012);(Kwak <i>et al.</i> , 2014)
	Reduced bureaucracy	(Pinto & Slevin, 1987);(Pinto & Prescott, 1988);(Nguyen, <i>et al.</i> , 2004)
	Having priority and authority	(Pinto & Slevin, 1987);(Pinto & Prescott, 1988);(Belassi & Tukel, 1996);(Gemuenden & Lechler, 1997) (Nguyen, <i>et al.</i> , 2004);(Fortune & White, 2006);(Yong & Mustaffa, 2012);(Kwak, <i>et al.</i> , 2014)
	Short time for assessment and rework	(Pinto & Prescott, 1988);(Fortune & White, 2006);(Ika <i>et al.</i> , 2011) (Yong & Mustaffa, 2012)
	Adequate funding	(Chua & Kog, 1999);(Nguyen, <i>et al.</i> , 2004);(Dvir, <i>et al.</i> , 2006);(Fortune & White, 2006);(Kog & Loh, 2012) (Yong & Mustaffa, 2012);(Kwak, <i>et al.</i> , 2014)
	Having appropriate expertise, knowledge and equipment as needed	(Pinto & Prescott, 1988);(Nguyen, <i>et al.</i> , 2004);(Dvir, <i>et al.</i> , 2006);(Fortune & White, 2006);(Jo & Barry, 2008)
	No communication or transportation loss	(Pinto & Slevin, 1987);(Gemuenden & Lechler, 1997);(Nguyen, <i>et al.</i> , 2004) (Dvir, <i>et al.</i> , 2006);(Kwak, <i>et al.</i> , 2014)
	Having public support	(Nguyen, <i>et al.</i> , 2004); (Kennedy, 2005) ; (Jo & Barry, 2008) ; (Ika, <i>et al.</i> , 2011); (Yu & Kwon, 2011) (Yong & Mustaffa, 2012)

Putting these strategies and factors into the generic success model illustrated in Figure3 resulted in the specific model for the case of the British aviation industry during WW2 as shown in Figure 4.

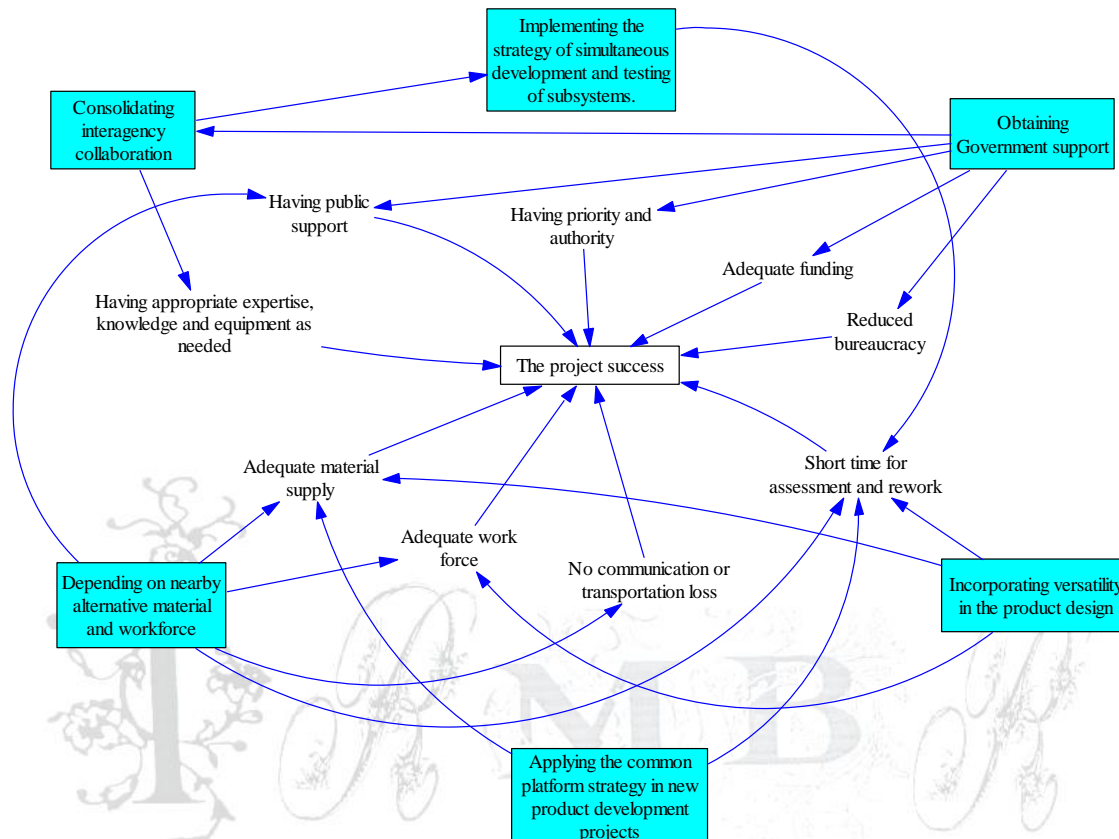


Figure 4: Specific success model for British aviation projects during WW2 (Howsawi, *et al.*, 2014d)

The following is a summary of the strategies implemented by the British aviation industry. A more detailed discussion is available in (Howsawi, *et al.*, 2014d).

**Strategy No.1: Obtaining government support: a dedicated ministry for aircraft production.**

During times of crisis such as in the UK during WW2, businesses face difficulties in obtaining required resources, work permissions or special services. In such a situation, government support is an essential success ingredient. The aviation industry enjoyed the privilege of having a dedicated ministry called the Ministry of Aircraft Production to exclusively support aviation projects. The impact of this ministry was that the obstacles hindering aircraft projects were discussed at Cabinet level. Decisions made by the War Cabinet were translated into priority for aircraft projects in terms of resources. Also government support took the form of security services provision. This was essential because during national crises new types of threats emerged (such as sabotage) which exceeds the capacity of normal business firms to handle (Howsawi, *et al.*, 2014c). For example, national security agencies provided deception plans and camouflage to disguise projects sites and production facilities against air raids.

### **Strategy No. 2: Depending on nearby alternative material and workforce**

During national crises the disturbance of supplies, transportation loss and the shortage of skilled labour increases dramatically (Howsawi, *et al.*, 2014c) so that reliance on sources of materials and workforce that require long distance transportation to the project site, put the whole project at risk of running out of resources. Some projects avoided this condition and succeeded; for example, the de Havilland Mosquito project. This project succeeded because of the dependence on nearby alternative material and workforce. The project used wood instead of aluminium. The wood supply was plentiful and available within Britain (Edgerton, 2011) unlike aluminium, of which more than half was imported (Weir, 2009). Also, by using wood, the project benefited from the availability of skillful carpenters.

### **Strategy No. 3: Consolidating interagency collaboration**

In the course of managing a project, there might be phases that require information, knowledge or technologies that are not in-house; for example, the results of the research and development phase of a product component. In peacetime, companies usually retain their information, knowledge and technology especially the secrets of their R&D as competitive advantage, and may refuse to collaborate with rivals no matter what the immediate financial benefits might be.

In the UK during WW2, interagency collaboration was well-practiced, and that helped to reduce the development time. This collaboration was ordered and enforced by the government. There were many government orders to companies to share the results of their R&D or their facilities with other companies (peacetime rivals) to reduce development time.

### **Strategy No. 4: Applying the common platform strategy in new product development projects: the conservative approach.**

National crisis brings about greater uncertainty (Howsawi, *et al.*, 2014c) and there is need for uncertainty reduction strategy.

In the UK during WW2 when a project to develop an aircraft was initiated, the project design team followed one of two approaches:

1. Designing an airframe around an existing and fully operationally tested engine. The authors call this the conservative approach; or
2. Designing an airframe based on a perceived engine where the engine was at either the specification stage or factory test stage but was not in full operational use. The authors call this the pioneering approach.

All projects in this research which achieved more than 500 units of production were the result of projects that followed the conservative approach; that is 13 out of 24 projects. On the other hand, some of the unsuccessful aircraft which scored less than 250 units of production followed a pioneering approach; namely, the Avro Manchester and Hawker Tornado projects. For example, the Avro Manchester failed because the Vulture engine was under development when the aircraft was designed. The same design was later modified to accommodate the Merlin engine, which was fully operational, and the result was the Avro Lancaster, which was one of the most successful bombers in British aviation history.

Following a conservative approach reduces the uncertainty that might result from using new, untried complex components in a new product development project.

**Strategy No. 5: Implementing the strategy of simultaneous development and testing of subsystems**

During national crisis, time is among the top pressing factors (Howsawi, *et al.*, 2014c). Things need to be done quickly otherwise the rapidly changing circumstances may bring unwanted surprises. This was the case during WW2; the urgency to produce weapons was a pressing condition for British industries. To deal with this condition, the British aviation industry adopted a strategy of simultaneous development and testing of subsystems to reduce the overall development time. In applying this strategy, they developed and tested the subsystems of an intended aircraft on multiple experimental aircraft before assembling them all in the intended airframe.

**Strategy No. 6: Incorporating versatility in product design**

During times of crisis, requirements change rapidly leading to many changes in the product specifications. The versatile product strategy helped some WW2 British aviation projects to neutralize the impact of changing requirements. For example, the de Havilland Mosquito and the Avro Lancaster were easy to modify to serve new roles. This feature considerably reduced the response time needed for changing requirements.

**An initial generic success model for project management during national crises**

The model presented Figure 4 is a particular model for the British aviation cases. Some re-writing is needed to make the model generic. The strategy *Obtaining government support* is general so that no need for re-writing. The strategies *Applying a common platform strategy in new product development*, *Incorporating versatility in the product design* and *Implementing the strategy of simultaneous development and testing of subsystems* are components of what is known now as “concurrent engineering”. For example the *Journal of Concurrent Engineering Research and Application* contains many article that address topics similar to these strategies. Also, concurrent engineering advocates for strong communication and information sharing (Pardessus, 2004) and multiple expertise or cross functional teams in projects (Smith, 1997).

Table 6: Re-writing the success factors

Success factors as mentioned above	Reworded success factors
Adequate material supply	Adequate material supply
Adequate work force ( includes competent, committed, motivated project manager and team members as well as sufficient staff)	Adequate work force
Reduced bureaucracy	Reduced bureaucracy
Having priority and authority	Having priority and authority
Short time for assessment and rework	Timely response to incidents and change
Adequate funding	Adequate funding
Having appropriate expertise, knowledge and equipment as needed	Availability of appropriate expertise, knowledge and equipment as needed
No communication or transportation loss	Efficient communication and transportation
Having public support	Sufficient public support

Because of that the authors combined these strategies under the title *Adopting concurrent engineering*. This will be more compatible with the terminology of modern research and also the readers will easily know

which literature they should review for more knowledge about this strategy. The strategy *Consolidating interagency collaboration* is actually a specific form of collaboration which is a subtype of national collaboration. This collaboration can be between agencies, professionals or the general public. It is a matter of having the nation interested in and committed to supporting the project. Thus, this strategy will be re-written as *Consolidating national interest and collaboration for the project*. The strategy *Depending on nearby and alternative material and workforce* is about making the best possible use of the material available in the area of the project and also about having the personnel either from the area or in the area of the project. The material may not necessarily be alternative; it could be the main type and yet be available nearby. Thus, this strategy will be re-written as *Depending on nearby material and workforce*. Also the success factors will be re-written as in Table 6 for the sake of better wording.

Figure 5 represents the generic success model for project management during national crises.

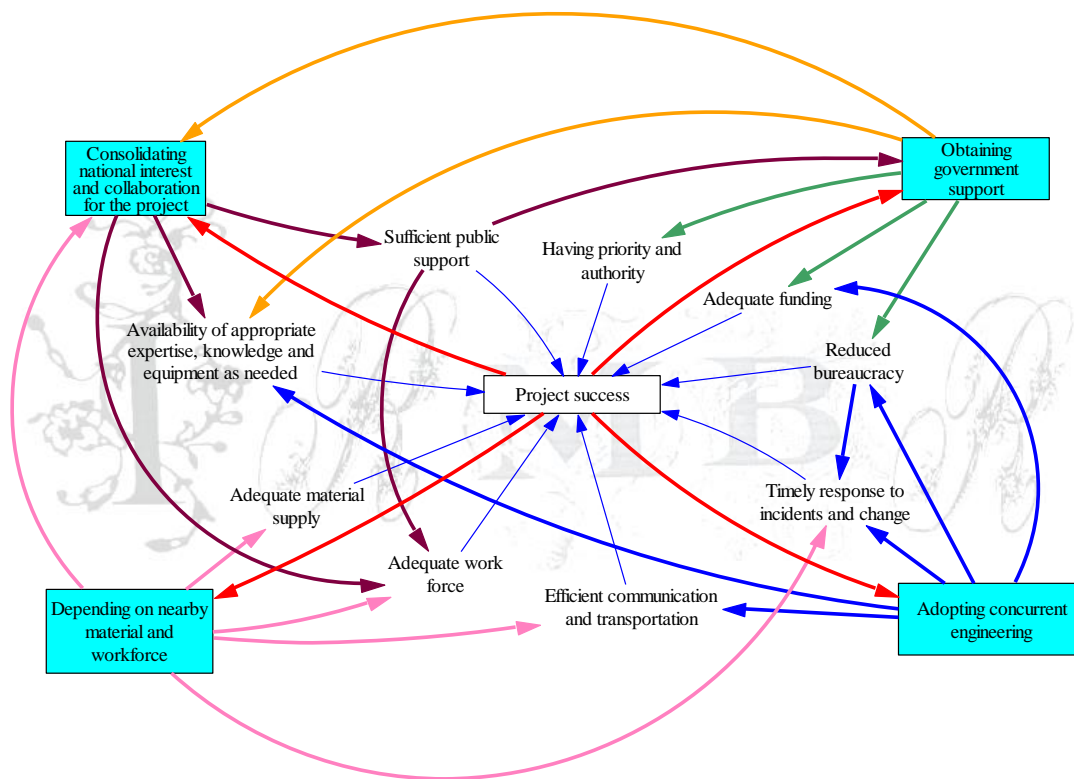


Figure 5: Generic success model for project management during national crises

### Effective strategies for successful project management during the 1960s crises in Egypt

The second stage of this research comprises an investigation of the success of the construction of the Aswan High Dam (AHD) in Egypt during a series of national crises in the 1960s (Howsawi, *et al.*, 2014a). That era involved many national crises such as the North Yemen civil war, the Six-Day War and the war of attrition.

This series of national crises impacted the AHD project and made it vulnerable to high probability, high impact risks. Those risks required government intervention to provide various types of support such as financial support. Also the project needed to be completed urgently and on time to meet the pressing

demand of uncontrolled population growth. Furthermore, due to the state of war in the country, the project and its logistics were at risk of sabotage or aerial bombing. Despite all these difficulties, the AHD construction project succeeded.

To ensure research rigor, data was compiled from various sources through data source triangulation. The authors conducted interviews with engineers who held key roles in the AHD project as well as contemporary Egyptian expert project managers. Also the author collected several recorded interviews with workers who worked in the AHD project. Additionally an extensive literature review about the AHD and other relevant topics necessary to understand the historical context of the AHD project was carried out.

The data was analyzed using content analysis technique. Four success strategies resulted from this analysis namely; consolidating national interest in the project, obtaining government support, co-locating all personnel and equipment at the project site and depending on local material and workforce. These strategies support similar factors as mentioned in Table 5 and 6 with negligible differences.

These strategies and factors formed the specific success model for the AHD project as shown in Figure 6.

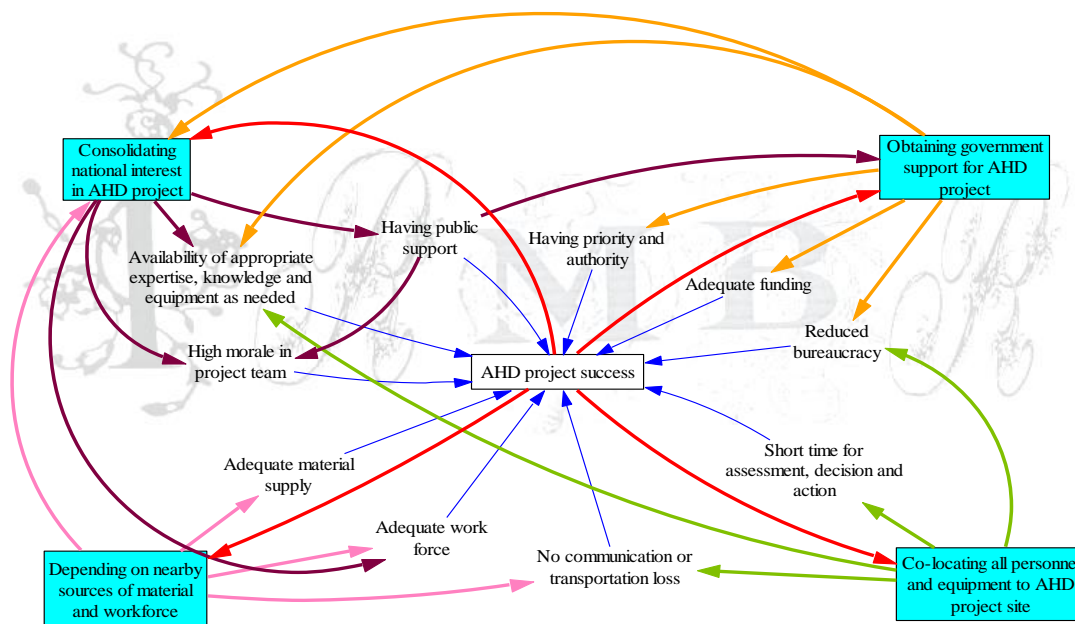


Figure 6: The specific success model for the AHD project

The following is a discussion of the strategies implemented by the AHD project. More details are available in (Howsawi, *et al.*, 2014a)

**Strategy No.1: Obtaining government support for the AHD - an exclusive ministry called the Ministry of High Dam**

During times of national crisis there is a keen need for a strong sponsor who can obtain the required resources or permissions or special services for the project. The AHD project, unlike any other major endeavor at that time, had a dedicated ministry called the Ministry of High Dam. This ministry was



established exclusively to oversee all aspects of the AHD project. This ministry was authorized to take any necessary executive, financial or political decisions in relation to the project and reported directly to the President. This gave the project unprecedented priority all over the country. Also, the government provided security services to that project. For example, national security agencies participated in deception plans to protect the shipment of vital project components such as the turbines and generators against possible sabotage by the enemy.

### **Strategy No.2: Co-locating all personnel and equipment to the AHD project site**

The AHD project was a monumental project, yet it was completed on time despite all the difficulties. The strategy that helped to facilitate this was the relocation of all personnel and equipment to the site. Prior to applying this strategy, the project's top management was located in Cairo, some 1000 km away, and relied on casual visits to the project site and reports sent to keep abreast of progress. As a result, the project slipped more than one year behind schedule. By applying this strategy, all personnel, including the Minister of High Dam, were housed adjacent to the project site. Consequently, the response time to any incident was reduced to the minimum possible. Also, having all responsible personnel on site kept bureaucratic correspondence to a minimum, which in turn supported faster reaction.

### **Strategy No.3: Consolidating national interest in the AHD project**

One of the effects of the stress accompanying a national crisis is that it draws people closer to each other (von Dawans *et al.*, 2012). The Egyptian Government (as the AHD project owner) brilliantly exploited this phenomenon and used the national crisis of the 1956 war to create a national interest in the AHD project through the use of massive propaganda. This generated enormous public support, making most of the citizens keen to help. Many bright minds in the country wanted to work on the project. At first glance, this strategy does not look like a project management strategy. However, when the authors investigated the reasons for the high morale of that project's workers, they found that everyone believed in the AHD as his own family project.

### **Strategy No.4: Depending on nearby sources of material and workforce**

In managing projects during a national crisis, reliance on the transportation of materials and workforce over long distances to the project site puts the provision of resources at risk if transportation is lost. Also the people who are not indigenous to the place may face more problems in coping with the environment or the social system.

In the AHD project, most of the workforce and the materials used in the construction were from Aswan area. This reduced the risk of transportation loss and also guaranteed an adequate supply of workers and of materials such as concrete and sand. Transporting the workforce or importing materials from far away can be cheaper, but the risk will be very high and during national crisis. Mitigating the risk of failure has a higher priority than reducing the cost of the project.

### **Does the generic model accommodate the validation case?**

As mentioned above, the model in Figure 5 is a generic model based on the case studies from the British aviation industry during WW2. The next step is to validate this model on a case sufficiently different from those used to create it. The model in Figure 6 is a specific success model for the AHD project. The differences between the aviation cases and AHD case are mentioned Table 2.

The first strategy in the AHD success model is *Obtaining government support for the AHD*. This is exactly the same strategy in the generic model in Figure 5 and also the same strategy in the aviation projects in Figure 4. Furthermore, the application of the strategy is identical; creating a dedicated ministry to supervise particular endeavour for limited time bounded by the life cycle of such endeavour. Nevertheless, government support is not limited to the creation of particular ministry but it can be in many forms such as financial and legislative support.

The second strategy in the AHD success model is *Co-locating all personnel and equipment to the AHD project site*. This strategy is comparable to the strategy *Depending on nearby material and workforce* in the generic model and in the aviation projects. As explained above, this strategy is about having all required personnel, equipment and material nearby the project to enhance several success factors such as the availability of material and response time to incidents.

The third strategy in the AHD success model is *Consolidating national interest in the AHD project*. This is comparable to the strategy *consolidating national interest and collaboration for the project* which includes the strategy *consolidating interagency collaboration* from the aviation projects. The national interest and collaboration took different forms in the AHD and the aviation projects. At AHD the national interest was obvious in the form of the individuals being eager to collaborate in the project. Workers in that project endured and withstood the harsh work conditions - such as temperatures above 50 C° and poor safety for the national pride.

The workers often exceeded their shifts without overtime pay. Despite that, the number of workers exceeded 30 thousand and more were waiting to join the workforce. In the British aviation projects national collaboration was obvious in the form of collaboration between companies who were rivals in peacetime. For example, Vickers and Avro were heavy bomber manufacturers who competed during peacetime but turned to full cooperation during the crisis of WW2. In both cases, the AHD and the aviation projects, the governments supported and encouraged this national collaboration and this is the reason why the strategy *consolidating national interest and collaboration for the project* is supported by the strategy *Obtaining government support*.

All the four strategies of the AHD model are included in the generic model but the generic model still has one strategy that does not appear in the specific model of AHD; that is *adopting concurrent engineering*. The data available for the research did not show concrete evidence of such an approach in the AHD project. Also, AHD is a dam project. The dam is unique so that it cannot be versatile and the major component which is the dam's body, cannot be shared. Importantly, however, the generic model accommodates the AHD case and other cases. It is not necessary that all the strategies of the generic model appear together in every cases. While there are 9 success factors in the generic model, there are 10 in the AHD model. This is a negligible difference because the extra factor in the AHD model which is *High morale in the project team* is included in the factor *adequate workforce* in the generic model. This factor means competent, committed, motivated project manager and team members as well as sufficient staff. While the generic success model in Figure 5 accommodates the initial case studies of the British aviation industry and the validation case of the AHD project, will it be able to interpret the success of other cases? This will be addressed in the discussion to come.

## Discussion

The generic success model for project management during national crises presented in Figure 5 can interpret the success of many cases other than those used to create it. For example, the great depression in the United States in the 1930s was a typical example of a national crisis. During that crisis the Hoover Dam construction project was completed successfully (Kwak, *et al.*, 2014). Kwak *et al.* (2014) reported that “the

concept of the project was well understood by both public and private agencies leaving no doubt about approving the project idea” and this is comparable to *Consolidating national interest and collaboration for the project* in this study’s success model. Furthermore, the authors asserted that the collaboration can take several forms including interagency collaboration.

Interestingly, Kwak *et al.* (2014) reported that “Cooperation between Six Companies’ project personnel and the resident construction engineer assigned by the Bureau of Reclamation helped the project team overcome various technical and operational difficulties of the project”. Also they reported that “The Bureau of Reclamation, as the government agency in charge of the project helped the entire project team to overcome serious challenges, such as debates and critics during review of the legislation in Congress, labour strikes during the construction phase, lobbying to secure the adequate annual funds” and “the Hoover Dam project team enjoyed a supportive relationship with the federal government during the course of the project from the initiation phase to the final stages of the construction.”. This is exactly what is meant by the strategy *obtaining government support* in this study’s success model. Moreover, the authors in this study proposed the strategy of *Adopting concurrent engineering* and interestingly, Kwak *et al.* (2014) reported that “the contractor worked on the four diversion tunnels at the same time during winter 1931–1932 and finished the job before spring, this strategy contributed to the project completion two years ahead of the schedule”. The success model proposed in this study could almost completely interpret the success of the Hoover Dam project.

Other broad cases which can be explained by the success model of this study are post-disaster reconstruction projects. The post-disaster context (e.g. post-war, post-flood, and post-earthquake) is another typical example of a national crisis which contains conditions mentioned by Howsawi *et al.* (2014c) such as “emerging threats and opportunities” and “resources and supply disturbance”. In such contexts, community empowerment and participation are critical to the success of the reconstruction project (Sadiqi *et al.*, 2013). From a post-war reconstruction case study it is concluded that developmental approaches to reconstruction must be culturally rooted and dependent to a large extent on the empowerment of local communities (El-Masri & Kellett, 2001). This is exactly comparable to the strategy *consolidating national interest and collaboration for the project* in the success model of this study. Also it is reported that “local government support” Sidiqi *et al.*(2013) and “Government response and intervention” (Chang *et al.*, 2012) are essential for reconstruction project success. This is identical to the strategy *obtaining government support* presented by the authors in the success model.

The scattered distribution of the material is reported as a major problem for post-disaster reconstruction projects (Baradan, 2006). Also, transportation is a major concern in the post-disaster context because of the loss of the means of transportation or roads due to the disaster (Chang, *et al.*, 2012). The strategy *Depending on nearby material and workforce* in the model of this study is a remedy for such a problem. In a post-disaster reconstruction project it is reported that effective communication and coordination among stakeholders would result in enhanced project performance (Kim & Choi, 2013). Also, Sidiqi *et al.* (2013) reported that “communication and information dissemination” is an important factor for the success of reconstruction projects. In fact these conditions are essential parts in the concurrent engineering strategy which the authors presented in the success model.

Another case that can be interpreted using the success model of this study is the Chilean miners rescue project in 2010. The context of rescue endeavor is an example of a crisis that has an international as well as national impact. The characteristics of national crisis mentioned by Howsawi *et al.* (2014c) appeared in this short-term, high-impact project. The government intervened and took over the rescue operation, the operation was urgent and uncertain and the 33 lives trapped more than 2000 feet below ground were at great threat. Nevertheless, the rescue endeavor lasted for 69 days and was a great success; all the 33 lives were saved. In that project, the country’s president was the topmost responsible person in the rescue

endeavor. This brought total government support to the project. The mining minister was on site 24 hours a day, seven days a week and this is comparable to the strategy *Depending on nearby material and workforce*. By the support of the government and the relocation of the minister to the site, all the required authorities and priorities were brought directly to the project. Also this project enjoyed the collaboration of more than 20 companies which volunteered their equipment, personnel and expertise. This was a practical application of the strategy *Consolidating national interest and collaboration for the project* mentioned in the success model. Furthermore, the mining minister formed a top crisis management team with diverse expertise and specialties (e.g. mining engineering and psychology) from different companies and government departments to oversee the rescue effort. This action is in the heart of the concurrent engineering strategy mentioned in the success model. These actions strongly supported the success of that project (Crenshaw, 2010; Useem *et al.*, 2011).

As shown above, the generic project success model can interpret the success of cases other than those used to create it. It can interpret particular cases such as the Hoover dam project or a broad type of cases such as post disaster reconstruction. This gives the model better generalizability.

## Conclusion

The authors in this study provided a number of contributions to the project management literature. First, they provided a new theoretical explanation of the relationship between project strategy and project success factors; that is, the strategy is a higher-level driver that enhances or diminishes a success factor or a set of success factors. This implies that the formulation of suitable strategies for particular project should be preceded by defining the required success factors for that particular project. As the success factors can be common or project-specific, the strategies can also be common or project-specific.

Second, based on this theoretical foundation and the concept of project management during national crisis, the authors provided a generic success model for project management during national crisis. This model links four strategies to nine common success factors that contribute to the success of projects. The model was based on a portfolio of 24 case studies then refined and validated on another sufficiently different case. The validated model interpreted cases other than those used in the creation and refinement of the model.

The model works as a guiding tool for action to achieve the success in the context of a national crisis. Also, it can be used as a diagnostic tool to evaluate cases of projects implemented during national crises and to extract lessons. In practice, this model can improve the immunity of projects against the impacts of national crises. Nevertheless, there is no single model that can perfectly fit all projects, so this model is not the ultimate answer to the success question for all projects during all types of crises. Rather, it is an important and well-evaluated addition to the literature of project management. This work draws its importance from the fact that national crises are increasing in frequency and severity yet the literature of project management is lagging in providing applicable models for successful project management in such a context. When a national crisis occurs there is no time for learning from trial and error. The costs and consequences of trial and error in such context are very high, so that, there is a need for having a proven success model and presenting it for the benefit of current and future projects in similar context.

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