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# A Comparative Approach of Japanese Project Management in Construction, Manufacturing and IT Industries

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**Abstract**

An effective project management approach is key to obtaining successful projects. In this study, a review of the three main industries that practise project management is conducted. This paper focusses on the application of Japanese project management (JPM) methods, namely Project and Program Management (P2M)/*Kaikaku* Project Management (KPM) in construction, manufacturing and information technology (IT) industries. KPM evolves from P2M, and KPM's 3K- *kakusin* (innovation), *kaihatsu* (development) and *kaizen* (improvement) are the essences applied when practicing JPM style. In conclusion, the nature of practice in these three industries is different, but the management methods and approaches are almost the same.



*Keywords: P2M/KPM; kakusin; kaihatsu; kaizen*

## 1. Introduction

Project and Program Management (P2M) is the first Japanese project and program management for enterprise innovation developed by Professor Shigenobu Ohara of the Nippon Institute of Technology in 2001, with the support of Ministry of Economy and Industry in Japan, and its standard is managed by Project Management Certification Center [1].

The P2M model aims to create a strategic framework of innovation in order to improve corporate values in project management methodologies [2] and to create a way for Japanese enterprises to develop more innovative approaches to ensure that their businesses can compete in the global business environment [3]. Innovations here include decisions to downsize or withdraw from unprofitable projects or further invest in potential ones, the restructuring of team members or projects, and an evaluation of employee performances. These enhancements and innovations will help ensure the success of certain projects or programs.

Project management has been applied in various kinds of industries such as construction, manufacturing, information technology (IT), engineering and defense industries. Construction industry

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is one of the pioneer fields that applied project management [4], and it was true in Japan as well [5]. IT industry was rapidly growing in the 1970s, and in the late 1980s, IT industry, too, started to adopt the practice of project management in its projects [6,7]. Projects are basically classified into four different general types, and the first three types are construction, manufacturing and IT [6]. Therefore, we have chosen the three main industries to study their project management methods in terms of Japanese styles. The objective is to identify the application of Japanese project management in construction, manufacturing and IT industries.

## 2. Japanese Project Management

Japanese has its own style of management since many years ago. P2M is the first published philosophy of Japanese project management in year 2001 by Professor Shigenobu Ohara, and it combines entry-level project management, program management, and 11 segment management frames [8]. The essence of P2M is focussed on the profiling ideas of complexity to implementation and finding solutions to complex issues [2]. Overall, the basic context of P2M defines program and program management as a practical capability to respond to external changes, allowing flexibility that copes with ambiguity, complexity, uncertainty and expandability [5].

Subsequently, Japanese companies experienced a deflationary depression in the 1990s. To survive and regain their global competitiveness, the Japanese looked for solutions in the *kaikaku* (reforms or innovative reforms) of business management, organization and technology. *Kaikaku* Project Management (KPM) is an advanced version of P2M. KPM consists of three significant Japanese elements for successful performance: 3K-*kakusin* (innovation), *kaihatsu* (development) and *kaizen* (improvement). In organizational models, 3S (scheme, system, service) project models in terms of lifecycle in value creation paradigm are proposed, and KPM is the core management for integration and innovation by 3S/3K combined methodology [8]. Companies that construct their organizations with the elements of KPM, namely *innovation*, *development* and *reform*, while being aware of the project models, will have a project management system that functions well, and often such a case leads to successful projects [9].

The KPM method explores the enhanced methodology of strategy implementation in the form of lateral and cross-functional collaborations as illustrated in Figure 1 [10]. In P2M, there was no classification according to *kakusin*, *kaihatsu* and *kaizen,* and the asterisks in Figure 1 indicate a newly included framework in the KPM version. However, the KPM method concentrates on the innovation, development and improvement of Japanese management methods using the foundations of P2M. Thus, it takes into account the whole lifecycle of the project from idea, planning, execution, investment and recuperation to creating value for the future. The KPM method promotes the creation of future value by implementing a number of reform projects linked to strategy, thus providing a body of knowledge to train core leaders, whose responsibility is to recoup the investment and propose a methodology for avoiding the risks of failure and resistance in an organization that solves complex issues [8]. [43]

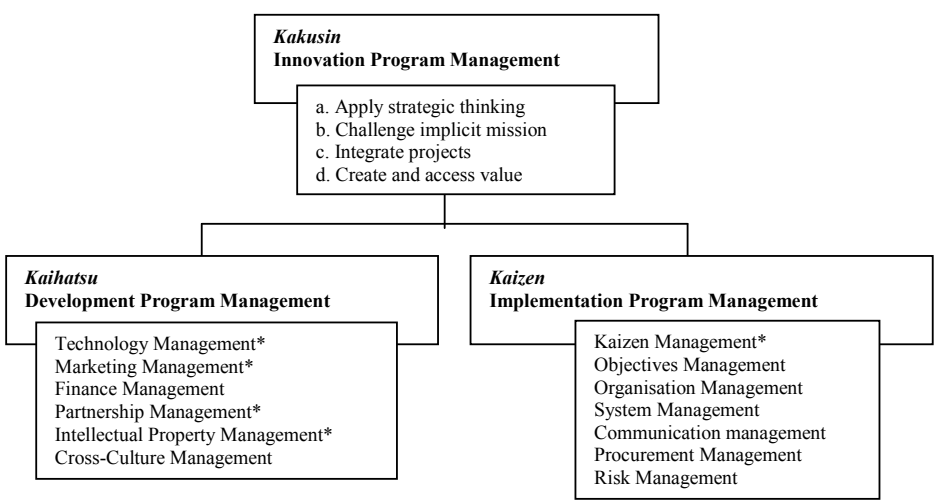


Fig. 1. KPM knowledge framework [9]

## 3. Methodology

An exploratory study in the form of critical review method was carried out to examine the project management theories in the main industries, namely construction, manufacturing and IT industry. Extraction of relevant information particularly from the Japanese project management guidebooks, also from other major journals, articles, conference proceedings and published books, was done. Two major processes were involved in this critical review. Firstly, the principles of Japanese Project Management, namely P2M and KPM, were briefly introduced. Subsequently, their essences that were featured in all three industries mentioned above were discussed.

## 4. Construction industry in general

Project management in the construction industry is project dominated as it involves constructing a unique architecture one at a time [11]. It involves planning, controlling and coordinating from tendering until handing over of the project, and at the same time, putting balanced weightage quality, time, scope and price.

The Japanese construction industry is unique in its approach, management system and objectives, with two distinctive characteristics, "design and built integrated system" and the "employee training approach," while putting emphasis on "consistent quality" and "quality before cost" [12]. Contractors in Japan strive to provide the highest quality for their clients because excellence is achieved through quality [13]. Nevertheless, there are several common problems that are ongoing issues in the Japanese construction industry, which include constructability, conflicts in structural designs, inadequate temporary work designs, improper construction methods and differing site conditions information [14]. Thus, it is obvious that these problems need to be solved, and it will involve appropriate project management skills.

### *4.1 P2M/KPM's principles for construction industry*

Construction projects nowadays are much more complicated; for example, the use of matrix-style organization that causes the "two boss problem" and confusion among team members [9]. It requires new management skills with integration of an overall management approach such as ideas of P2M/KPM's 3K- *kaihatsu, kaizen* and *kakusin* in construction industry [15]. For instance, the *kaikaku* project organization of KPM comes into the picture as a solution to this "two-boss problem"; whereby with this structure, project members are given missions or instructions directly from top management [9]. Meanwhile, *kakusin* has also been successfully performed in construction projects with the influence of the four key management elements in P2M/KPM, namely value creation, lifecycle, technology fusion and built environment management [16]. The innovation activities in the construction industry are illustrated in Figure 2, which is improved and modified from Ota [15]. 3K is the core concept used in managing construction projects.

*Kaihatsu* can be learned from experience through the five activities of projects: review, plan, design, construction and operation; corporate *kaizen* can be attained when a company develops several projects through work loop [15].

An addition to that, value creation (*kaizen*), built environment and lifecycle management are applied in Level 1 of construction, that is, the planning stage, which also includes other management frames of P2M such as strategic, finance and risk management; whereas technology fusion management is utilized in Level 2, called the construction stage, which also consists of organization, design, cost, quality, procurement, evaluation, schedule and construction process management, and finally, for Level 3, or the final stage known as the operation/maintenance stage, facility management takes place [16]. In a case study of constructing a green building in Singapore, innovation in constructing the building has been performed from the point of view of these four key elements (value creation, lifecycle, technology fusion and built environment management) in P2M/KPM [15, 17].

Last but not least, flexibility and being able to adapt to the environmental changes is another feature of P2M/KPM. Japanese construction companies adopted this philosophy in order to maintain their businesses during economic crises. The Taisei Corporation, a renowned construction company in Japan, demonstrates the importance of understanding knowledge management when attempting to carry out *kaihatsu* or *kaizen* projects in the construction sector [18].

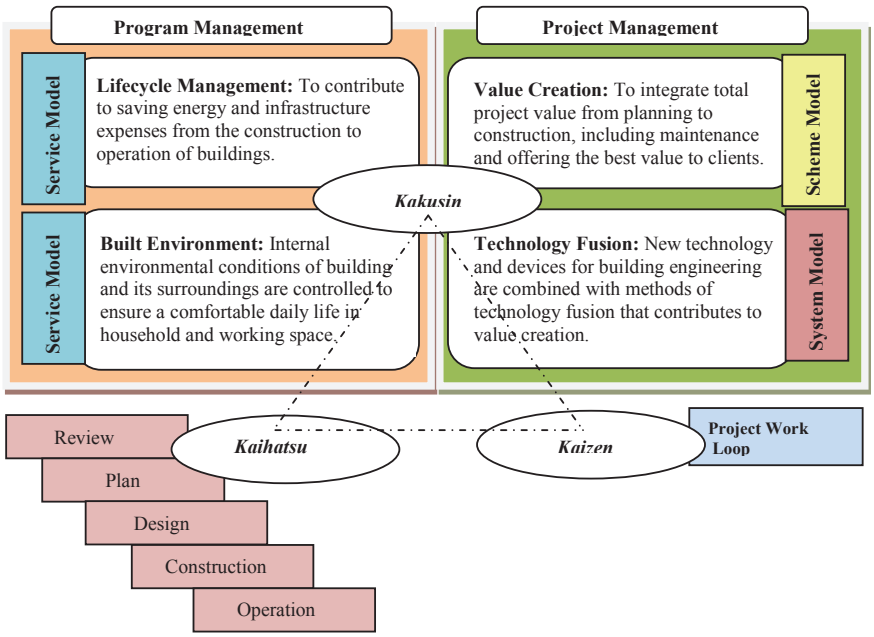


Fig. 2. Innovation activities in construction industry with 3K in P2M/KPM

## 5. Manufacturing industry in general

Project management is applied in innovation of manufacturing systems such as artificial intelligence application system, automation and computer-aided manufacturing [5]. Manufacturing can be classified as process-dominated, and it executes the project by making the same product over and over again [11]. Quality and productivity improvement aiming to gain competitive advantage has been a major issue for most manufacturing industry leaders [19], who target cost reduction and efficiency/effectiveness improvement that are major factors in determining the success of the project [20,21]. Therefore, it is always a challenge to manufacturers to capture the correct management skills in order to alleviate the level of efficiency and effectiveness to producing profitable products in the long run.

### *5.1 P2M/KPM's principles for manufacturing industry*

Manufacturers, namely automobile manufacturers, also face the two-boss problem. Therefore, *kaihatsu* project organisation was adopted to highlight the roles of the team members in a project. The functional division will still maintain its responsibility in assuring its quality, but the project manager will have to cover the overall quality of the project as well, apart from cost/budget or delivery/schedule, because the quality of certain techniques often influences the success of the project [9].

Then, to improve success rates in the manufacturing industry, *kaikaku* program emphasizes a knowledge base that comprehends a new combination of knowledge, challenge and identification of new useable knowledge, acquiring of new knowledge, practical use of the new knowledge and access rights of intellectual properties [10]. KPM permits project managers access to intellectual issues, and Sharp Company is renowned for using this type of experience via *kinkyu* (urgent) project, where the special feature of the *kinkyu* project is the development of a prospective technology to the application of a proven technology to the merchandising of the product, which all takes place in a very limited time [22].

The KPM method emphasizes two unique areas: its thorough responsibility for quality control in the art of making things, and its backwards operation process planning system with a focus on securing delivery [9]. Organizations adopting the KPM method have well-designed systems and well-equipped devices to accommodate these two areas. Adjustments are made not only in office devices but also the manufacturing and production systems in factories.

To the *kaizen* approach, it is enforced to improve the performance of manufactures in terms of quality and productivity improvement of manufacturers [19,23]. It is about continuous improvement in routine manufacturing activities for value creation at the work-floor level. An essence of *kaizen* is the

famous 5S system, consisting of *Seiri* (tidiness), *Seiketsu* (standardization), *Seiton* (orderliness), *Seiso* (cleanliness), and *Shitsuke* (discipline), where a clean and well-ordered environment is preferred [23,24]. Therefore, in order to offer total services in manufacturing industries, continuous improvement of products, achieving highly flexible approaches to rapid and frequent changes and learning from accumulated knowledge in the Japanese manufacturing industry are essential [5].

Besides, manufacturing also focusses on flexibility by proposing how organizations can achieve total optimization rather than focussing on mere partial optimization. When economic crises occurred in the 1980s and 1990s, Toyota maintained its market share by using the flexible *kaizen* philosophy. Other manufacturing companies such as Honda, Canon and Sharp also survived, as they adapted to changing times by continuing to invest in people [25]. Many companies implemented flexible manufacturing cells or flexible manufacturing systems to link enabling technology with their manufacturing processes [19], which not only increases the quality and productivity but also encourages time-reduction.

*Kakusin* also plays an important role in creating new production materials to secure the company's competitiveness and to increase the value of intellectual property rights [26]. This method is used by Japanese manufacturing firms, and that clearly explains why large funds are invested in one company's R&D and technologies know-how progressions. Aiming to reduce inventory to minimal or in ideal cases to zero is another innovative approach to regain profits, and this method is renowned in Toyota's lean production system that includes the *kanban* system [26,27].

## 6. Information Technology (IT) industry in general

IT is now used in organizations, projects and processes in resources management and in information-sharing platforms that enhance corporate values and improve strategic systems of an enterprise [28]. It deals with anything from acquisition, processing, storage of data and dissemination of information by a microelectronics-based combination of computing and telecommunications [29]. Banking firms, medical and hotel facilities and even government offices utilize IT to cope with the current trend. With its wide application in most industries, the quality of IT is very much of importance. Quality management or quality assurance of a software development, for instance, is quite subjective and difficult to evaluate because unlike manufacturing products, software itself is kind of abstract as well as its quality level [28].

### *6.1 P2M/KPM's principles for IT industry*

A knowledge base platform proposed by KPM in IT projects drives the "visualization" of projects and practices the "circulation of knowledge," and is significant for managing IT projects together with features of KPM such as innovation, development and improvement to implement reduction of delivery dates, costs and risks in IT projects [30]. Furthermore, IT projects have short delivery dates, and delay found out a few weeks later can lead to fatal problems. Thus, accumulation of experience from past projects into a knowledge base and compilation of each project's know-how is important [30,28]. This is a major difference between the IT industry and the manufacturing industry. The former needs to keep project management information as a form of knowledge-based project information sharing to solve problems in real time, while the latter deals much with assembly of special hardware to build production lines [30].

In the case of introducing IT systems in projects of business activities, business and project risk management and also assessment of the effect on investment need to be excuted, and this can be done with KPM by sharing information on the outcomes and risks among IT system stakeholders, such as the project owner, system planner, contractor and system user [31]. With a systematic *kakusin* system in information sharing, accumulated know-how from a certain project can be used as future reference that eventually helps not only stakeholders in an IT project to efficiently use the system, but also to reduce project and business risks.

*Kaihatsu* is also adopted in IT projects, and an example of the application of this essence is utilizing IT in projection technology, or "visualization," in project management [32]. The application range of IT systems is developed and widens to cater for its needs in market demand. With projection technology, computer graphics are used to make proposed construction visible or to support other software developments such as disaster prevention software, where the probability of earthquake reoccurrence may be analysed [32]. IT is always changing and advancing. Its technology and know-how has to be progressive and always on par with the latest market trend. Therefore, *kaizen* or

continuous improvement in IT is a necessity for coping with IT advancement, and at the same time maintaining its cost and securing its time schedule. For a project to be successful, apart from having motivation and good communication among project members, the work and organizational breakdown structures are also vital, as these breakdown structures serve as useful means of visualization [33]. So, *kaizen* is practised not only in terms of technology advancement but also in work and organizational structures, where workload, job tasks and responsibility among team members or project managers are distributed accordingly. When human resources are organized systematically, and with the ability to "visualize," IT quality can be managed and assured eventually.

IT vendors also applied the 3S-scheme, system and service project model in their projects to promote value creation activities, such as improvements in corporate software, service systems and achieving total innovation [34]. For example, in the initial scheme stage of a project lifecycle, justification of the project investment, risks, costs, budget or considering the feasibility or value of the project are done, followed by the system stage. In this stage, a check is done on whether those members or organizations who were selected to manage the projects are doing their job according to original plan or whether they will bring it to completion; and finally, at the last service stage, a confirmation will be done to see whether the business is maintained and operated smoothly or if expected results are attained [35].

## 7. Discussion

KPM promotes the expectation of realising a future vision by utilizing a number of reform projects linked to strategy [36]. It is the culture of Japanese organizations to be mission-driven [37,38], and this mindset is practised in all the above-mentioned three industries. In order to accomplish a mission, P2M takes into account not only each process that comes along the way but also the detailed content of each process. It uses clear and measureable success measures for each project. Success measures as well as problem solving skills can be referred to the continuous improvement or *kaizen* activities as highlighted above. Timelines and specific targets are set for each milestone, and once they have been achieved, work on larger targets will commence. This cycle will be repeated until the end target is successfully actualised. Several studies suggested that mission could be beneficial to organizations in terms of various performance outcomes [39,40].

In the construction industry, there is a need to go through certain stages, such as design, planning, construction, commissioning and maintenance. With a mission-driven mindset, each stage is of equal importance. One Japanese manufacturing company that practices this concept is Sharp. In producing its electronic goods, it breaks down the process into a few smaller processes to manufacture certain electronic parts, where in the end the parts are assembled to form the final product. Time can be saved by doing this, and quality is assured, because the process is more specialised in only one task. Sharp knew this idea would work perfectly. It established an efficient system in which new products are made in project teams, and thus it has created several successful products [25].

Another approach is the *kaihatsu*-style project. Construction, manufacturing and IT industries do practise this method. With *kaihatsu*-style, a time limit for each milestone is set, and by counting backwards from the deadline, the commencement date is fixed. By doing this, the downstream process needs to be executed even if the upstream process is not completed, and this method, which is called parallel development system, can shorten the duration of the whole project [9]. *Kaihatsu* is not limited to project management system alone, but also covers technology, business, products, process and even marketing as well [41].

The *kakusin* concept is extremely valuable to provide important insights into intra-market competition and strategy [42]. Innovation refers to breakthrough by application and combination of new knowledge [41]. *Kakusin* project management are adopted by all three industries mentioned, where strategic and innovation thinking are applied to enhance the quality of the project.

Human resources are assets to a company, and intensive trainings are frequently provided to ensure employees are aware of up-to-date design skills, and construction engineers are well trained with both design and architecture knowledge. This is also true in manufacturing and IT industry, too. In P2M/KPM, focus is placed on human resource education, mentoring, on-the-job training and other training courses, because Japanese companies consider training and development to be a prime responsibility [13].

## 8. Conclusion

Projects in construction, manufacturing and IT can be very complicated, and effective new project management skills are essential to ensure the success of the project. The strategies and methodologies of Japanese project management methods, namely P2M/KPM, are practiced and have proven to be effective and successful. The 3S/3K combined methodology were used in KPM, which is the core management for integration and innovation. The process requires *kakusin*: breakthrough and modification of new knowledge, *kaihatsu*: enhancement and expansion of knowledge and information, and *kaizen*: continuous effort in proactive work life. 3S – scheme, system and service project models, are blended together with 3K ideology, and the combination of these two project models are practiced in construction, manufacturing and IT industries today. Extracting the features of P2M/KPM and identifying their application in the above-mentioned three industries were the main objectives of this study. We can conclude that construction, manufacturing and IT industries practice the similar nature of project management style, but each with a different and unique approach; adjusting and fitting each idea nicely into their own industries based on relevancy, necessity and effectivity.

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