

CHAPTER 5

Core Competencies & Management Resources

This chapter identifies the core competencies behind value created by the JGC Group, as well as efforts to reinforce their underlying management resources.

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Core Competencies
Project Execution Capabilities

74 Management Resources

Human Capital
Social and Relationship Capital
Manufactured Capital



Core Competencies



Our organizational strengths derive from a broad, highly skilled workforce, which allows us to offer maximum performance.



An optimal balance of quality, cost, and delivery is achieved while responding appropriately to project risks.



Superior plants, facilities, and materials supplied by the Group draw on extensive, advanced technical expertise.



An array of issues faced by clients are addressed in the plants, facilities, and functional materials supplied by the Group.



Pioneering and innovative technologies, products, and services provided by the Group anticipate social trends and changes in market environments.



The open corporate culture in place encourages each employee to pursue professional fulfillment as they work.

Total Engineering

Engineering Technologies

Many plants and facilities in energy and infrastructure segments draw on our extensive and advanced design and construction technologies.

Ethylene



Ethylene plant for Chevron Phillips Chemical

Track record
42

Liquefied Natural Gas (LNG)



LNG plant for JSC Yamal

Track record
48

Functional Materials Manufacturing

Nanomaterial Control Technologies

Materials with unmatched performance can be supplied by leveraging the four core nanotechnologies of nanoparticle preparation, alignment, pore structure control, and macro structure control.



Ceramic Production/Processing Technologies

Ceramic materials with original properties can be supplied through integrated R&D and production from raw material mixing to firing and processing.



Core Competencies

Project Execution Capabilities

Project Risk Management System

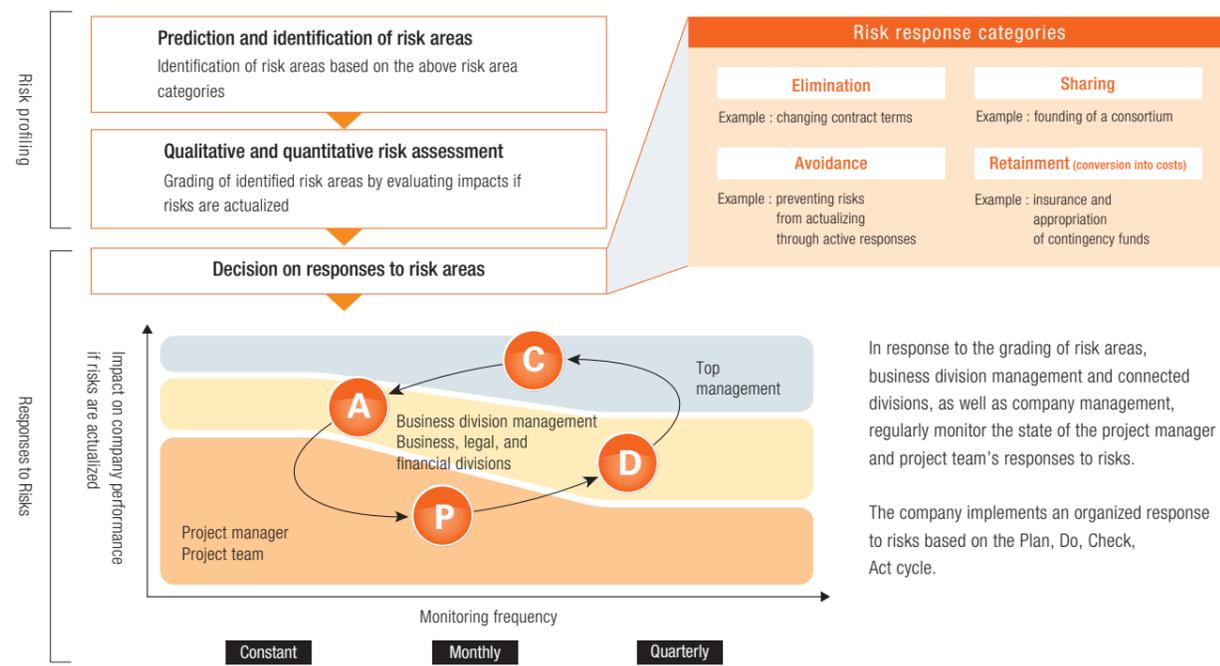
The company is facing circumstances in which the diminishing profits of individual projects, along with their increasing scale, could have a significant impact on the profitability of the entire company. At the JGC Group we have long fostered a project implementation culture that holds that large-scale projects overseas represent an aggregation of

many risks, an appropriate response to which is the essence of project management. With this understanding, all staff involved in a project, not just project and company management, always respond to risks based on a high risk sensitivity in all EPC functions and phases.

Project Risk Areas

Technical Risks	Project Implementation Risks	Contract Terms and Other Consequent Risks
Risks that must be grasped from the perspective of technical specifications and scope of work. The project team and engineering sections cooperate to lead responses to these risks. E.g., disagreement with design requirements, new processes	Risks that must be understood from the perspective of project implementation. The project team and PM lead responses to these risks. E.g., securing of internal, vendor, and subcontractor resources	Risks that must be grasped from the perspective of contract terms and project backgrounds. The PM leads the response to these risks in cooperation with company management. E.g., exchange rates, taxations, political instability, excessive requirements of performance and delivery guarantee

Risk Management Flow



In response to the grading of risk areas, business division management and connected divisions, as well as company management, regularly monitor the state of the project manager and project team's responses to risks.

The company implements an organized response to risks based on the Plan, Do, Check, Act cycle.

Column

Compatibility of Appropriate Responses to Risks and Contracting Competitiveness

Appropriately predicting and identifying risk areas during the estimation and planning stage, based on past project experience and identification of corresponding project characteristics, is an essential prerequisite to securing revenue during the project execution stage. However, if responses to identified risks tend towards adding a risk

buffer to the bidding price for risk retainment (establishment of contingencies), this may jeopardize cost competitiveness. At JGC Group we strive to balance appropriate risk management with securing of cost competitiveness by utilizing our entire expertise to aim for proactive responses to risk, such as avoidance, prevention, and reduction.

Core Competencies

Project Execution Capabilities

Cultivating Project Management Staff

The quality and number of PMs is one of the most important elements in assessing an engineering firm's capability, and JGC works on PM training

in an organized fashion that also involves company management.

What Is a Project Manager (PM)?

Utilizing project management techniques and tools in cooperation with internal and external partners to protect established delivery times, budgets, and quality, secure profits, complete a project, and ensure the client's satisfaction are the ultimate tasks of a PM.

A PM is required to set short-term, mid-term, and long-term strategies for executing a project and to participate in all project phases ranging from design to procurement, construction, and commissioning.

Required Knowledge and Abilities

- Comprehensive knowledge of respective technical and commercial areas, management skills
- Ability to set a master schedule and manning plan
- Ability to grasp cost conditions
- Ability to establish an outline of equipment composition/scale, costs, work processes, and man-hours based on plant capability requirements, and to explain this outline internally and externally

Required Assets

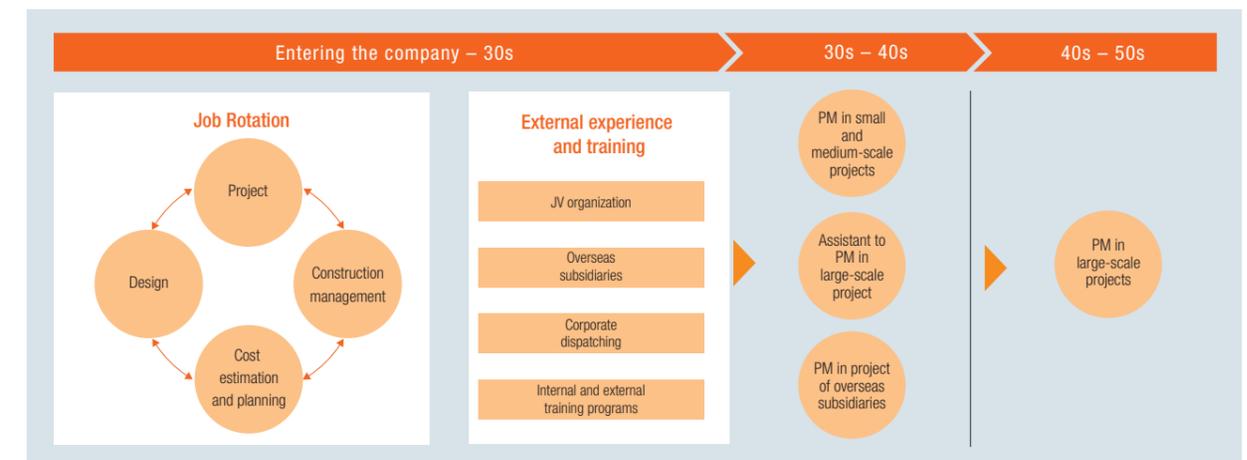
- Leadership, coordination and negotiation skills
- Strength of character and stress resistance
- Broad horizon and decision-making abilities
- Logicality, planning and scheduling abilities

Project Manager Training System

In order to cultivate outstanding PMs, it is important for them to undergo diverse experiences from a young age. That is why JGC Group has created a human resources training plan that goes beyond the framework of company divisions and departments, based on a human resources vision looking towards the future. In order to prevent specific divisions from holding back outstanding

personnel and obstructing variation in their experiences, the talent and organization development department serves as an office that monitors the status of PM candidates and manages them from a mid- to long-term perspective to enable them to accumulate experience.

Project Manager Career Path



Creation and implementation of a human resources training plan that goes beyond the framework of company divisions and departments, based on a human resources vision looking towards the future

Holding company top management	Operating companies management
Project management development department	Group talent and organization development department (office)

Core Competencies

Project Execution Capabilities

Project Management Experts in the JGC Group

Meet the next generation of project managers in the JGC Group



EPC Contractors Prove Their Worth Their Risk Management Capabilities

Nobuyoshi Mizutani

Joined JGC in 1994 after studying electrical and information engineering. After a stint in instrument and control engineering and project control, moved to a project department. With past experience in multiple projects as a project manager, he currently takes on large refinery projects as a project director.



Always Committed to Successful Projects, and Inspiring the Same Commitment in Others

Hiroshi Komiyama

Joined JGC in 1998 after studying chemical system engineering. After working in process and instrumentation/control engineering, moved to a project department in 2004. Having served as an engineering and project manager in multiple projects, he currently focuses on LNG projects as a project director.

Share your thoughts on project management.

Amid greater stakeholder diversity and complexity in larger projects and a faster pace of change in the world, the areas where we must respond with what are called soft skills have become increasingly important. One such skill is building a shared awareness among the companies involved, including clients. Another is managing risk, and yet another is managing human resources to maintain high performance from members. The essence of project management is to anticipate potential issues as projects unfold, to prevent them through far-reaching insight and imagination building on past experience and internal expertise garnered by the company, and, as we also apply new technologies, to maximize performance in project execution.

What is the key to risk management?

Thorough risk profiling at the planning stage is clearly vital, but in the execution stage as well, we must refine our profiling in response to constantly changing conditions and deal with risk promptly as part of PDCA cycles. It is easy to have a system in place for risk management, but making countermeasures work organically takes commitment and the ability to get things done. Through open risk-sharing discussions with all stakeholders, we

must also choose the most effective risk response, as we focus on the success of the project instead of the interests of any particular organization.

Describe an ideal project manager.

Their presence in projects is central. Every last participant, including clients and external stakeholders, is glad to have been involved and would be pleased to work with the same members again. They drive a team with a genuine passion for the project, making the most of members' shared sentiments, determination, and sense of achievement. Earning the trust of clients and all other stakeholders also calls for charisma.

Episode

Describe an experience that proved to be a growth opportunity.

As I was gaining experience in design engineering and project control, I felt a strong desire to take on the responsibilities of a project manager and see projects through to completion. I wouldn't be who I am today without the chance to grow tremendously from my first experience as project manager, where I saw a refinery renovation project in Singapore through from estimation to completion.

Share your thoughts on project management.

The key to a successful project is initially defining with those involved what will constitute success, sharing a vision of the ultimate goal, setting targets for each function and stage with this goal in mind, and managing the process of achieving it. The broader environment of projects is constantly changing, which makes it important to adjust our trajectory as needed, but the ultimate goal we envision must remain steady.

Success in large projects is unattainable if we rely on the personal capabilities of a project manager. The role they must fulfill as project leaders is to create an organization that drives projects forward through the shared wisdom of many diverse members brought together from inside and outside of the company.

What is the key to risk management?

Eliminating, avoiding, and sharing risks should be prioritized as proactive responses to the risk factors we predict and extract. Only as a last resort should we also take the passive response of bearing risk by retaining risk factors as a cost. If risk emerges during a project, to avoid falling behind, I believe we must act decisively in implementing the response plans in place.

Describe an ideal project manager.

They always rise to challenges, and their leadership inspires team members to move ahead. Remaining aware of changes in conditions surrounding the project is also essential, as is the ability to make decisions flexibly and responsively. They also need unwavering faith that they will make their project a success in the end, regardless of the challenges, and this conviction inspires those around them.

Episode

Describe an experience that proved to be a growth opportunity.

After joining the project department, I was fortunate to have opportunities to work closely with project directors and project managers on several projects. It was an invaluable learning experience, seeing how specific policies and strategies informed project leaders' decision-making, and observing their relationship-building and negotiation with clients and joint-venture partners.

Core Competencies

Project Execution Capabilities

Project Management Experts in the JGC Group



Defining Needs and Proposing Ideal Solutions in Line with Client Conditions

Mayumi Kannan

Joined JGC in 2002 after studying architectural engineering. Began in a project department serving the healthcare sector. Through job rotation, also experienced overseas on-site assignment in oil & gas sector. Engaged as a project engineer and manager in many projects for hospitals and nursing care centers.

Describe the roles and capabilities expected of project managers serving the healthcare industry.

In my own area of healthcare (focused on hospitals and nursing care centers), JGC proposals often end up determining the specific requirements and functionality of the facilities planned. Building on an understanding of local healthcare and in line with client conditions, project managers must gain a clear vision of the medical care and nursing services that facilities should enable, and then put together proposals for suitable facilities. Design proposals are also an important factor. In the execution stage, each project manager must fulfill many roles, in part because we may have fewer project members than in other JGC business segments. This calls on me to gather information from far and wide, and to take the initiative and delve into any matters I feel should be investigated.

What is the key to risk management?

Close communication with internal and external stakeholders, a shared awareness of variables and concerns in project execution, and responsiveness. I try not to put off deciding how to deal with issues.

Describe an ideal project manager.

Although management capabilities are obviously necessary, perhaps the ideal project manager also possesses a good balance of technical expertise and skills for architecture, equipment, and electrical applications, and can apply these skills as needed. Having this flexibility in responding, though it may be subtle, is pivotal to smooth progress in projects. And ideally, project managers should be able to earn the trust of any client early on through a combination of good communication skills, persuasiveness grounded in an understanding of people and extensive experience, and other traits.

Episode

Describe an experience that proved to be a growth opportunity.

In my tenth year at JGC, job rotation gave me an opportunity to work on-site at an Indonesian LNG project. Not all construction companies' expertise and reliability is as consistent as we find in Japan, so my management duties took me on-site to see that relevant design and construction standards were met. Although I struggled to cope with some situations in this unfamiliar environment, I still draw on the experience in my current work.

Management Resources

Human Capital

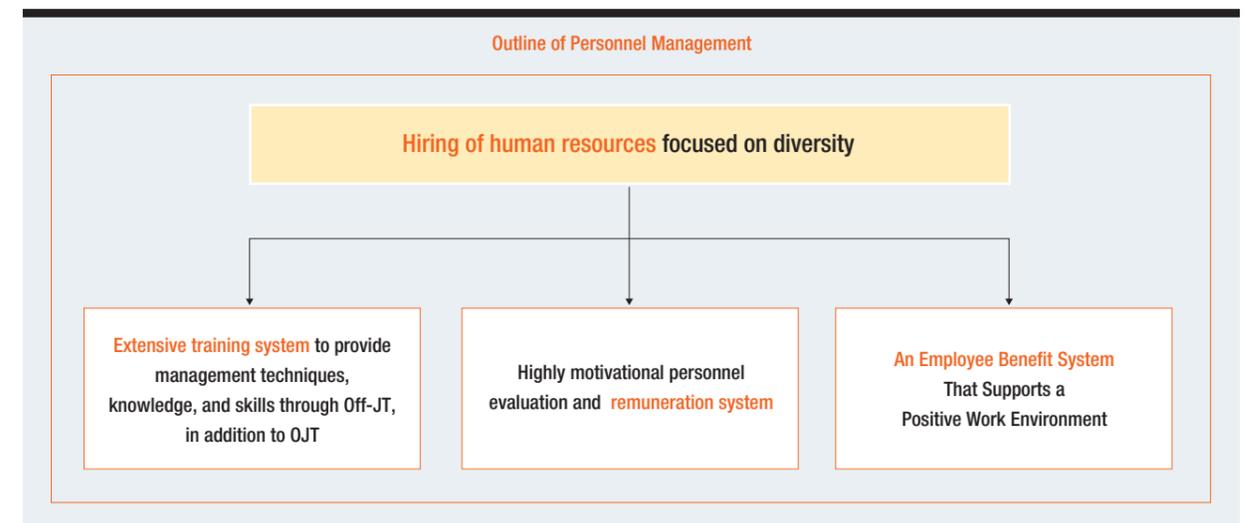
Human capital is the Group's most important management resource, whether in total engineering, functional materials manufacturing, or consulting. We are actively working to create a supportive work environment, establish training systems for our diverse workforce, and expand our human resources evaluation and remuneration systems to enhance employee motivation.

Human Resources Sought and Overview of Personnel Management

JGC Group employees are required to possess advanced technical capabilities and expertise, appreciate different cultures and diversity in order to work with others of many nationalities, and a mental attitude that helps us make the most of our organizational strengths. The Group seeks out the qualified workforce we envision through

well-rounded personnel policies centered on training, evaluation/remuneration, and employee benefits. Outstanding and ambitious members who share our respect for the social significance of Group business join us through a variety of ways, whether they are new graduates in Japan, recent graduates, mid-career, or individuals with disabilities.

Achieving Our Human Resources Vision Through Well-rounded HR Policies



Management Resources

Human Capital

Human Resources with a Wide Range of Expertise

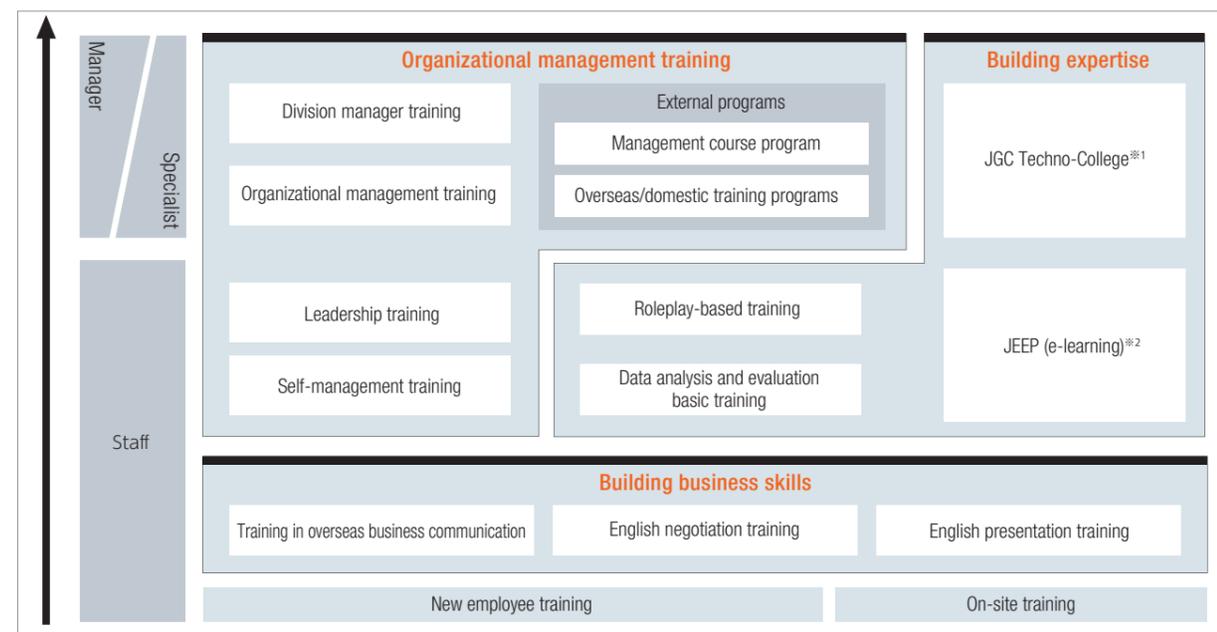
<p>Total Engineering</p> <p>about 6,000 members</p> <p>A workforce of experts with diverse expertise. Technical capabilities spanning all engineering fields: such as chemical, architectural, mechanical, electrical, control, safety, and IT Engineering. Project management skills to ensure an optimal balance of cost, scheduling, and quality control. Knowledgeable in commercial areas such as legal/contracts or accounting/tax.</p>	<p>Functional Materials Manufacturing</p> <p>about 900 members</p> <p>Members with a command of nanomaterial control technologies in the catalysts/fine chemicals field or ceramics production and processing technology in the fine ceramics field, who respond quickly and flexibly to client needs.</p>	<p>Consulting</p> <p>about 200 members</p> <p>Members with academic knowledge in a variety of fields such as engineering, science, and agriculture who offer research and analysis to solve client challenges.</p>
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Training System

JGC Group cultivates human resources with high technical proficiency and expertise, awareness of other cultures and diversity, and the mentality required for teamwork through our training system consisting of three main pillars: on-the-job training (OJT), which includes an onsite training system and a job rotation system; off-the-job training (Off-JT),

which comprises various training programs; and support for self-improvement, such as acquiring certifications or improving language skills. In our Off-JT, we cultivate personnel through stepwise implementation of differing types of training in response to the skills required of differing types of employees, as shown in the graphic below.

Overview of Diverse Off-the-job Training System



※1 Specialty lectures conducted by employee volunteers with the aim of passing on techniques, skills, and experience from senior to junior staff
 ※2 Various technical courses on process design, detailed design, project management, IT, and other topics

Management Resources

Social and Relationship Capital

Since the 1950s, the Group has provided plant and facility design and construction and maintenance services to clients in diverse energy infrastructure fields in Japan and overseas. In functional materials manufacturing, we supply a variety of products and materials with original properties, responding rapidly and flexibly to the needs of a broad range of clients from energy and chemical companies to semiconductor and

electronic material companies. In consulting, we provide research and analysis services to utilities and government agencies through a collaborative network of experts and authorities in Japan and overseas. Through these operations, we have gained client trust and built a solid customer base.

Primary Clients by Segment

Total Engineering Business		
<p>Overseas Oil and Gas</p> <ul style="list-style-type: none"> Oil majors National oil companies in oil- and gas-producing countries Petrochemical and chemical companies, others 	<p>Overseas Infrastructure</p> <ul style="list-style-type: none"> Power producers Oil and gas producers Nonferrous metal companies, others 	<p>Domestic</p> <ul style="list-style-type: none"> Oil and gas companies Petrochemical and chemical companies Electric power companies, power producers Pharmaceutical companies, hospitals, others
Featured Projects		
<p>LNG plant (Russia)</p>	<p>Solar power plant (Vietnam)</p>	<p>Pharmaceutical plant (Toyama Prefecture)</p>

Functional Materials Manufacturing Business	Consulting Business
<p>Catalysts and Fine Chemicals</p> <ul style="list-style-type: none"> Oil companies Petrochemical and chemical companies Electronic materials companies Optical device materials companies Cosmetics companies, others 	<ul style="list-style-type: none"> Utilities, gas companies Research institutes Government, municipalities, others
<p>Fine Ceramics</p> <ul style="list-style-type: none"> Semiconductor materials/fabrication companies Electronic device materials/fabrication companies Optical device materials/fabrication companies Medical device materials/fabrication companies Manufacturing/fabrication companies, others 	

Management Resources

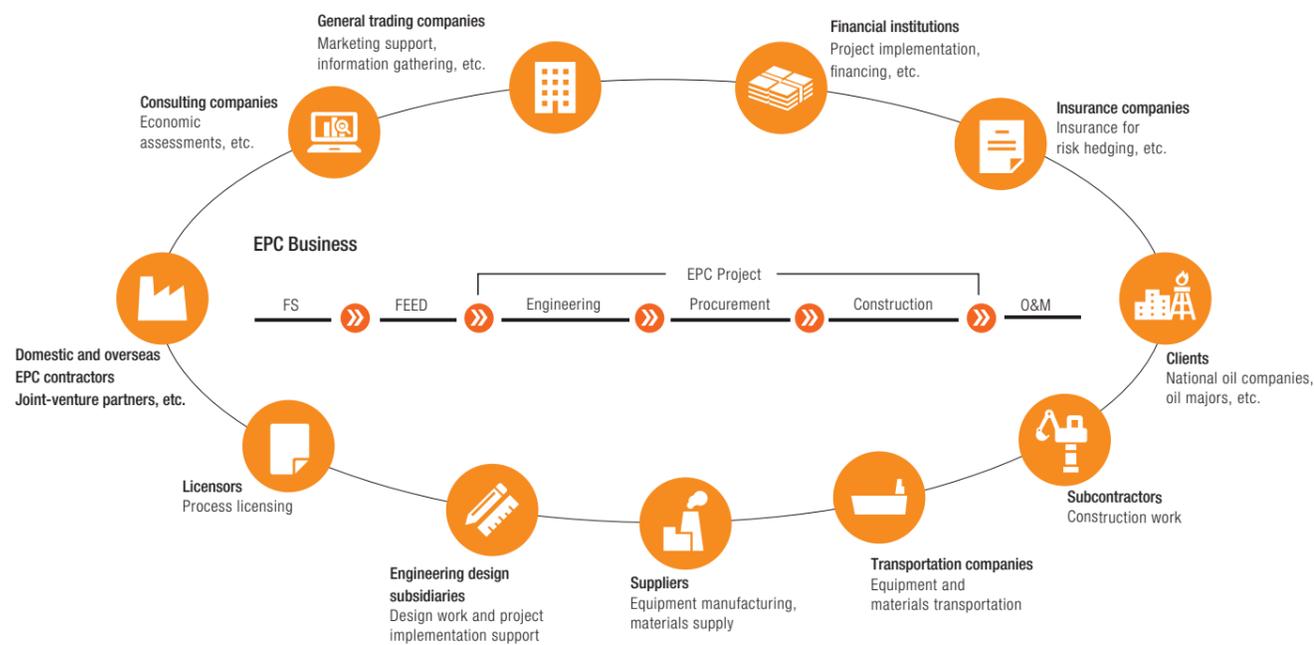
Social and Relationship Capital

JGC Group treats suppliers as partners in value creation, working with them to ensure mutual competitiveness and success through optimum quality, cost, and delivery. We select suppliers based on a fair and comprehensive assessment of factors such as quality, price, delivery, and technical capabilities, while also fully taking into account environmental considerations, human rights, health and safety, and information security during this process.

Global Supply Chain

Emphasizing the Importance of Suppliers as Partners in Value Creation

Cooperation with partner companies in countries around the world is essential for plant construction. JGC Group has created a global supply chain for plant construction, thanks to more than half a century of implementing numerous projects overseas. JGC Group treats suppliers as partners in value creation, working with them to ensure success through optimum quality, cost and delivery.



Topics

Vendor Technical Support Group Activities

In the Train 9 LNG plant construction project for Petronas that was completed in 2017, we stationed engineers from JGC vendor technical support group at four manufacturers in Malaysia from the start of the project to provide production support for a total of 140 units of equipment weighing 3,000 tons, including towers, vessels, and heat exchangers.

Thanks to the technical assistance provided based on comprehensive judgments made regarding the capabilities of each manufacturer and the difficulty of the specified equipment, these relatively inexperienced manufacturers succeeded in manufacturing equipment that fulfilled the quality requirements, on schedule. The new track record established through this project will help these manufacturers to obtain equipment orders for other projects. The company views the positive relationships with suppliers that have been achieved as a result of these efforts as valuable business partner assets, and for this reason, actively provides technical assistance to manufacturers.



Training for welders

Management Resources

Manufactured Capital

JGC Group maintains a network of production sites in Kitakyushu, Niigata, Sendai, Aichi, and Iwate, Japan that provide a stable supply of superior functional materials in conjunction with the technological innovation of adjacent R&D centers.

Production Network for Superior Functional Materials

