Application of Project Management Principles in Telecommunications Restoration Projects in Earthquake-Affected Areas

By Kashif Basheer Khan PMP

Natural calamities such as earthquakes are characterized by destruction, mayhem, confusion, and, on top of all that, the emotional as well as physical trauma of its victims. With few exceptions, almost all regions of the world are susceptible to natural catastrophe and the phenomena can take any of several forms. Depending on the intensity and magnitude of the catastrophe, the disaster-stricken areas normally face similar kinds of problems, regardless of the nature of calamity. A few major challenges remain common to all: for example, destruction of infrastructure, stoppage of public and health services, shortage of food and supplies, inaccessibility to the affected areas, entrapment of the public in the troubled areas, and disruption of governance/administration in the area. The relief programs are usually initiated immediately after the disaster, and they have a variety of constituent projects aimed at restoring and rehabilitating the affected areas. The relief projects cover a wide range of application areas as well as industry.

As most relief and rehabilitation work in such cases begins as projects, the application of project management principles in these projects helps channelize the work into a systematic and coordinated effort having maximized output and expeditious delivery. In this article, we discuss telecommunication restoration projects in earthquake-affected areas.

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Affects of Earthquake on Telecommunication Infrastructure

The degree to which telecommunication (telecom) infrastructure is affected by an earthquake depends on the earthquake's magnitude. An earthquake that measures over 5.5 on the Richter scale has been known to have significant impacts on telecom infrastructure in the area of the quake. The damages caused to telecom infrastructure include, but are not limited to, the following:

- Disruption of optical Fiber backbone
- Disruption of main underground cables (arteries)
- Physical damages to Mobile Base Transceiver Station (BTS) towers, leading to blackout of mobile/microwave services
- Damages to the Public Switched Telephone Network (PSTN) exchanges, Integrated Switched Digital Network (ISDN) hubs, and other communication centers
- Destruction of satellite ground stations
- Disruption of main power supply in the area, affecting all communication facilities

Categorization of Restoration Projects

Depending on the extent of the destruction, normally the restoration work unfolds in two major phases, each having constituent restoration projects varying in nature as well as in quantum of work. The phases, however, may cross/overlap each other's boundaries. They can be considered as belonging to the immediate/transitory phase and the long-term consolidation phase, which may be described as follows.

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Immediate / Transitory Phase

This phase begins immediately after the disaster, and projects in this phase are focused on yielding restoration of basic essential facilities required to supplement relief operations in the area. These projects can be aimed to achieve the following objectives:

- Repair of artery cables and optical fiber (if previously laid) to link the troubled area with rest of the world
- Procurement of switches and terminal equipment required to replace damaged equipment in order to make communication centers and hubs operational
- Re-erection of BTS/communication towers and replacement of damaged antennas and other equipment
- Provision of mobile relay stations where repair/re-erection is cumbersome or time-intensive
- Repair of cabinet/curb–level telecom infrastructure
- Provision of emergency communication through portable satellite equipment (e.g., International Maritime Satellite–INMARSAT)
- Installation of Wireless Local Loop (WLL) equipment in the communication centers until the land-line subscriber services are restored.

Long-Term/Consolidation Phase

This phase begins when the situation in the area becomes relatively stable and the relief operations are linked to the normal routine of the area in a coordinated fashion. This happens when governmental/nongovernmental/International relief agencies establish their command and control networks and systematically undertake relief and rehabilitation work without any hindrance or interruption. At this stage, the telecom restoration projects can be aimed to achieve any or all of following objectives:

- Feasibility study of a complete telecom infrastructure makeover of the area
- Redeployment of the latest equipment in place of older versions
- Extraction of irreparably damaged equipment/ media lines from the area to create space for redeployments
- Selection of sites for new node centers catering to the revised requirements of the area
- Commissioning of civil works necessary to accommodate telecom infrastructure
- Laying of new media backbone and arteries/ subarteries based upon the requirement
- Procurement of latest switches and end-terminal equipment that satisfy requirements of the area.
- Construction/realignment of communication towers ensuring maximum illumination in the area
- Installation of new network media / end terminals
- Restoration of complete subscriber level services

Project Management and Telecom Relief Projects

Project management methodology has been found to enhance the chances of success of all kinds of projects, and these include the natural disaster relief projects. Application of project management principles effectively organizes the project work for an improved coordination and better yield, even in the chaotic conditions resulting from earthquakes.

Chartering of Projects

The projects are usually chartered immediately after the start of aid/relief work, and specialized technical teams are constituted as part of a larger relief program. Having clearly set objectives, the projects are usually formally chartered and teams are assigned with specific goals, which need to be accomplished within a specified time frame. The time frame is of crucial importance because in most cases projects are usually interdependent upon each other and they may have definite impact on other projects as well. The preliminary projects must be completed within an estimated (rough order of magnitude) time frame in order to allow sequel projects to be initiated in an appropriate time frame. The authorization

can be simultaneously approved for multiple projects pertaining to a single genre, or, conversely, each project can be authorized separately through any relevant project selection method. In each case, the authorizations and approvals must be prompt and must ensure inclusion of only those projects that are aligned with overall objectives.

Planning Considerations

In addition to all of the requirements and requisites customary in planning other projects, certain specialized considerations in the case of telecom relief projects should be addressed:

- The first step in planning these projects is to divide the affected area into sectors and subsectors, keeping in mind the dictates of terrain and the unaffected communication infrastructure. Care must be exercised while subdividing the area, as the division must be neither too large in comparison with allocated resources nor too small to complicate the coordination of effort through a centralized core. The scope of work is estimated for each sector/subsector.
- Keeping in mind the extent of the damage and the nature of the project, the next step is to ascertain the requirement of resources for each sector/subsector.
- The resources are then allocated to each subdivision, with a clear assignment of responsibility and grant of authority within prespecified sector/subsector boundaries.
- It is advisable that in human resource planning, hierarchical subdivisions in manpower correspond to territorial subdivisions—for example, the smallest unit in manpower hierarchy (technical team, etc.) may be made responsible within the smallest subdivision of the area (i.e., subsector, etc.). It must be ensured, however, that the integrity of the smallest unit of manpower is maintained throughout a project or a project phase.
- Procurements and logistics must be planned centrally for each subdivision.
- Communication channels for the project must be planned, keeping these subdivisions in cognizance.

Execution

The following assume additional emphasis during the execution of these projects:

- The project work is normally classified under two broad categories:
  - Repair/re-erection involving more reliance on the technical expertise of human resources as compared to procurement of fresh equipment
  - Replacement/realignment involving primary reliance on procurements
- In both cases, the project work is executed by responsible teams within the confines of their territorial subdivisions in coordination with a centralized core that is responsible for the direction and management of the entire project effort.
- A centralized core performs the following functions during the execution of these projects (albeit this list only serves as a guideline and is not all-inclusive):
  - Direction, management, and coordination of scope of work for all subdivisions
  - Delineation of responsibilities
  - Communications, both internal and external.
  - Maintenance/appraisal of status
  - Dissemination of approved changes in scope as well as methodology
  - Coordination of procurements and logistics
  - Inventory management
  - Problem solving and creation of work-arounds
- The successful execution of these projects normally depends more on mental/physical robustness and flexibility of team members than on their displayed technical acumen under normal conditions, as very little support from existing infrastructure will be offered to the team in a post-earthquake scenario.
  - While executing the project work, care must be exercised in achieving long-term and stable installations in a continuously changing environment. The project work must take into account the ongoing and projected relief efforts and civil works that can interfere and disrupt project work. Solutions must always be flexible and strong to sustain changes resulting from all such efforts, especially those involving heavy machinery and major civil works (e.g., rubble clearance, route clearance, and restoration of public services such as sewerage, etc.).
  - A Geographical Information System (GIS) with updated telecom infrastructure layers serves as a valuable aid in both status maintenance and direction of effort. This can also be linked with online integrated project management software having other interfaces as well.

Monitoring and Controlling

Monitoring and controlling project work is increasingly challenging in such projects, owing to the constraints of

working in an earthquake-stricken area having limited facilitation for teams. The following can assume extra importance during monitoring and controlling:

- Sector/subsector–wise status and progress reports shall be consolidated and reviewed at a centralized core.
- Graphical user interface (GUI) on a GIS can help in graphically plotting the progress, and an overlay can be made to display the fact. All such interfaces will be most helpful if integrated with online project management software.
- The indices (e.g., SPI, CPI) and forecasts have to be formulated sector/subdivision–wise, contributing to a wholesome index and forecast maintained at the central core.
- Changes can be better controlled and coordinated if dealt with sector-wise.
- At each kill point or phase gate, an independent survey/audit team must verify all of the parameters at each sector/subsector through physical contact.

Conclusion

The relief and restoration projects aimed to rehabilitate communication in earthquake-affected areas are aligned with a noble humanitarian cause. All such projects not only have integral amenity value, but also practically support and facilitate the successful undertaking of all relief work in the area. Such projects valuably contribute towards the professional growth of project teams, complimented with a strong sense of accomplishment and self-fulfillment emanating from the cause and inspiration attached with these projects.

About the Author

Mr. Kashif Basheer Khan, PE, PMP, is a Telecommunication Engineering graduate from National University of Science and Technology (NUST), Islamabad (Pakistan). He has worked on a variety of projects, primarily in the government sector. The author has held managerial positions in government sector since 2002 and has worked on telecommunication-related projects in all of the provinces of Pakistan. He has had the honor of serving the earthquake-stricken population of Kashmir and Northern Pakistan through telecommunication restoration projects, following the massive October 2005 earthquake which resulted in the destruction of complete civil infrastructure. The author attained project management professional (PMP)[SM] certification on 12 January 2009. His other significant projects include the development of prototype of high frequency (HF) spread spectrum transceiver at Military College of Signals (R&D), and the laying of optical fiber access network in Murree, Pakistan.