



Phased Project Approach Description

Overview

The Belcan Engineering Automation Group is committed to excellence in engineering and project execution as judged by our customers. It has been our experience that one of the best methods to guarantee that a client's expectations are fully realized is to use a phased approach whenever possible for new automation programs. The typical phased program has the following major execution steps:

Phase	Description
I	Requirements Definition – KepnerTregoe (KT) Method
II	Concept Development and Selection
III	Proof of Concept
IV	System Design and Build
V	Implementation at Client Site

This approach allows risks and unknowns to be identified as early as possible in the program, thus allowing them to be dealt with in a pragmatic and efficient manner.

Why the Phased Approach?

When considering a new automation project it is typical to find that not all of the information pertaining to it has been gathered, reviewed, or understood by all of the key stakeholders in an organization. It is vital that all of the interested parties (customer and equipment supplier) have a solid understanding of the elements that will make the project successful and agree on the expectations going forward.

The phased approach that Belcan recommends specifically starts with a thorough requirements definition component to set the stage for the ensuing activities. Also provided are specific decision points in the program to make important determinations relative to direction and financial commitment.

Benefits

The following are basic benefits when executing a phased project and incorporating a rigorous requirements definition into a project kick off.

- Input by key client stakeholders is identified, documented, and organized – a historical record is created
- Risks (technical and commercial) are identified as soon as possible to create mitigation solutions
- Establishment and communication of expectations early in program
- Comprehensive program plan developed with decision points identified
- Increases chances of success for complex programs
- Limits investments in capital until a high degree of confidence is realized
- Consensuses on project goals are reached

**Phase I:
Requirements
Definition**

The ideal first phase for new special machine programs is a requirements definition phase utilizing KepnerTregoe (KT) principles. This is a method of identifying the requirements by placing them into one of two categories.

- Musts – Items that are absolutely critical for the project to succeed.
- Wants – Items that are not absolute for success, but are enhancements.

Once the above items have been identified and organized, the “wants” are ranked by the stakeholders. This ranking helps to prioritize the real value of these items relative to project success and is used to “score” competing concepts in Phase II if competing concepts are generated.

An essential requirement for this phase is the active participation of the key stakeholders in client’s organization so that all needs are identified and a consensus is reached. Examples of such stakeholders are representatives from:

- Product Development
- Product Design
- Manufacturing
- Maintenance
- Operations
- Finance
- Purchasing
- Management
- Marketing

**Phase I:
Typical
Meeting
Agenda**

The following is a typical agenda for a KT Analysis session. Such a meeting may be several days in duration, depending on the complexity of the program and the number of participants, among other factors.

Step	Action
1	Review Goals for System
2	Review KT Decision Analysis Concept
3	Develop a Decision Statement to define the Scope
4	From each stakeholder – expectations, needs, ideas, system requirements
5	Clarify and Document Information
6	Classify Items into Categories: Musts, Wants, Information, Ideas
7	Assign Rankings to Wants
8	Start High Level Concept Generation
9	Review and Plan Path Forward

**Phase I:
Sample
Topics**

The list below provides an insight of the types of topics that will be addressed during the Phase I sessions. These are generic topics intended to be a starting point only. Other topics unique to the particular project must also be considered. Prior to the meeting, the Belcan coordinator for the session will be in contact with the client representatives to gather initial information about the program in order to be properly prepared.

- Product specifications
- Cost targets and expectations
- Production goals
- Quality requirements
- Product range
- Product characteristics
- Flexibility requirements
- Processing environment
- Material requirements
- Documentation requirements
- Service requirements
- Process parameters
- Cleanliness requirements
- Safety
- Ergonomics
- Utilities
- Space and footprint restrictions
- Control system requirements
- Monitoring and data capture
- Upstream and downstream processes
- Loading and unloading conditions

- Delivery targets and expectations
 - Facilities requirements
 - Testing requirements
 - Inspection requirements
 - Reliability – consistency
 - Previous equipment issues
 - Current process knowledge
 - Engineering design standards
 - Scrap handling
 - Changeover time between products
 - Maintenance expectations
 - Manufacturing environment
 - System location
 - International standards
 - Technical capability of target facility
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Phase II: Concept Development

Once the scope and requirements for a system have been thoroughly detailed, concepts will be generated and evaluated based on the results of the KT Analysis. This process involves the customer as much as practical, keeping in mind the overall vision the customer has for the machinery and any preferences or standards the customer may already have.

The first filter for a concept is to compare it against the “musts” that have been established. If a concept fails to meet any “must” criteria, it is eliminated from further consideration, unless it can be modified to a point that it can meet all of the “musts”.

The surviving concepts are then ranked based on how they match up with the “wants”. Each concept receives a score relative to how it meets each “want”. The concepts that have the highest scores are the ones that best meet the criteria that the stakeholders have established.

An important aspect of this phase is the identification of technical risk. For example, if a concept involves new processes or technologies that have not been applied previously it may be prudent to test certain theories prior to proceeding on to a complete production system.

Along with the development of initial concepts, the deliverables for this phase will include a proposal for the next phase of the project (Proof of Concept or Design and Build).

Phase III:

If it is determined that proof of concept activity is required to gain a higher

Proof of Concept

confidence level in the ideas that were generated in Phase II, a Proof of Concept phase is recommended.

Reasons to conduct Proof of Concept phases include:

- Determine the best of competing concepts developed in Phase II
- Gain a higher confidence level in the selected concept prior to committing additional funds
- Validate or refine a technical approach
- Fully define the system functionality
- Provide a test bed for process development tasks

If the tests go as planned, it is quite common to be able to use some or all of the proof of principle apparatus on the final machine, saving time later in the project and spreading component costs over several phases.

Phase IV: Equipment Design & Build

At this point in the program the system specifications have been fully established, communicated, and understood by the client's team and Belcan's team. Technical and commercial risks have been reduced or eliminated so the program can proceed with a high level of confidence.

An efficient working relationship has been developed between the organizations.

With the knowledge gained from the previous phases, a comprehensive proposal for the production system will be generated and presented to the client. This document will include the system description, deliverables, acceptance protocol, and schedule.

Phase IV:

Once the client agrees to proceed, the engineering design team will be established

Typical Design & Build Project Activities

to start this phase. The typical project approach involves the following activities, in conjunction with Belcan's ISO 9001 Quality Management System:

Activity	Typical Project Activities
1	Project Manager Assignment – Single Point of Contact
2	Contract Review
3	Project Quality Plan Development and Review
4	Assign Project Team Based on Skills Required
5	Project Kick Off with Client & Belcan Teams
6	Preliminary Design Reviews with Client
7	Internal Design Reviews with Project Team
8	Monthly Project Status Updates to Client
9	Final Design Review with Client
10	Release of Parts for Procurement
11	Shop Build Team Assignments
12	Equipment Build with subsequent inspection / quality checks
13	System Start Up & Testing
14	Equipment Acceptance at Belcan
15	System Installation / Start Up / Acceptance at Client Site
16	Project Close Out
17	Client Feedback

Phase V: System Implementation

After the equipment has been accepted at Belcan's facility, the role that the Belcan team plays is dependent on the needs of the client. In most cases the Belcan team is asked to participate in the installation and commissioning of new equipment at the client site.

In addition to the basic commissioning assistance, Belcan can also provide operator and maintenance technical training. A spare parts program can also be implemented if desired.

Summary

Executing a project with a well thought out phased approach provides a logical format that will reduce both technical and financial risk. Expectations are identified and communicated early in the process. This sets the stage to create a working relationship between the participating organizations that will result in a program to best meet the client's objectives.

28999 Aurora Road • Solon, OH 44139 • Office: (440) 349-5200

www.BelcanAutomation.com

 BelcanEngineeringAutomation