

Lecture Notes for Lecture 9 of CS 5500
(Foundations of Software Engineering) for the
Spring 2021 session at the Northeastern
University San Francisco Bay Area Campuses.

Communication and Collaboration

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*Information and examples in this lecture are based on
recommended readings.*

<http://www.ccis.northeastern.edu/home/pgust/classes/cs5500/2021/Spring/index.html>

Communication and Collaboration

Review of lecture 8

- We learned that estimation is the process of predicting the most realistic amount of effort required to develop or maintain software based on incomplete, uncertain and noisy input.
- Estimation is difficult because it relies on the ability to make predictions based on forward-looking estimators such as models of the development process and past experience with similar work.
- Since estimation lays a foundation for all other project planning actions, and project planning provides the road map for successful software engineering, we saw why this step should not be omitted.

Communication and Collaboration

Review of lecture 8

- We also learned that it is possible to transform software estimation from a dark art to a set of systematic steps that provide estimates with acceptable risk.
- To achieve reliable cost and effort estimates, we went into detail about the following techniques available to development teams:
 - Delay estimation until as late as possible
 - Use estimations based on expert judgement
 - Estimate based on similar past projects
 - Use decomposition of functionality
 - Use empirical estimation models

Communication and Collaboration

Review of lecture 8

- We heard that many agile practitioners feel there's no value in estimation, since they are already working with smaller increments and sprints and grooming their backlogs.
- However, the founders of the Scrum movement discovered those who eschewed estimates had some of the slowest delivery times, while those employing estimation delivered the fastest results.
- Among the widely-used agile estimation techniques include
 - Decomposition based on historical data, an empirical model, or "experience."
 - Use of "planning poker" to help teams converge on a final estimate based on successive rounds of estimation
 - Use of "affinity groups" based on brainstorming techniques to group estimates into ranges to converge on a final estimate

Communication and Collaboration

Project communication

- Communication is key in a software project. For a successful project execution, effective communication to all stakeholders is essential.
- According to a Project Management Institute survey report, one in five project fail because of ineffective communications.
- In this lecture, we will study communication in software projects, look at ways to adopt effective communication methods and examine some tools for project communication.



Communication and Collaboration

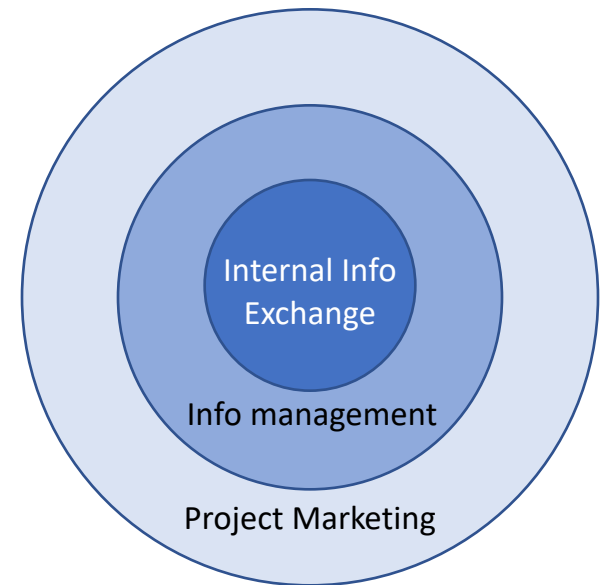
Project communication

- We will begin by characterizing project communication and looking at some aspects of communications within projects.
- Communication is the exchange of information and the expression of ideas, thoughts and feelings using words and other methods. In a project, it is the exchange of knowledge, skills and experience.
- Project communication ensures that the information needs of the project and its stakeholders are met through artifacts and activities designed to achieve effective information exchange.

Communication and Collaboration

Communication activities

- Three activities in a project communication process, correspond to the roles of those who are directly or indirectly involved:
 - **Internal information exchange:** decision-making process, conduction of meetings, daily scrums etc.
 - **Information management:** relevant project information is communicated to project stakeholders, changes to the project are communicated etc.
 - **Project marketing:** presentation and display to customers, end-users, and sponsors etc.



Communication and Collaboration

Communication activities

- *Internal information exchange* occurs among members of the project team who are involved in creating the software product.
- The goal of internal information exchange is to ensure that knowledge about the product and the process used to create it is shared among those directly involved in its creation.
- Timeliness and immediacy is of critical importance because of the inter-relatedness of the work being performed and the need to act quickly to minimize delays.
- Examples of internal information being exchanged include the decision-making process itself, conduct of team meetings, daily scrums, etc., and any issues that need to be addressed.



Communication and Collaboration

Communication activities

- *Information management* is related to the exchange of information about the project to stakeholders who have an interest in or can impact the project.
- The goal of information management activities is to ensure that the stakeholders have the information they need to provide meaningful input and feedback about the project.
- While timeliness is important, it is often less immediate than the project team requires. Instead, the information shared must have context for those who are not as deeply involved.
- Examples of managed information include changes to the project, its current status and schedule delivered to stakeholders, and discussions and feedback from the stakeholders.



Communication and Collaboration

Communication activities

- *Project marketing* is related to exchange of information about the project with those more interested in the result than the logistics of the software creation process.
- The goal of project marketing activities is to ensure that customers, users, and supporters have the information they need to make informed decisions and provide feedback on the product.
- While timeliness is important, the information exchanged is related to the purchase and use of the product, rather than the project creation process or the support required to deliver or support it.
- Examples of project marketing information includes features and functionality, availability, installation, training, and support of the delivered product.



Communication and Collaboration

Communication choices

- For each of these activities, the project team needs to consider the following choices:
 - How does the communication facilitate the goals and objectives?
 - Who is the target audience of the communication?
 - What communication channels should be used?



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Communication choices

- What goals and objects are being facilitated?
 - In any communication, it is important to determine what project goals and objects are being facilitated. This helps determine the type of information, the audience, the timing, the venue, etc.
 - The information must be relevant, timely, and appropriate to its intended audience, and must provide adequate context to be useful.
 - The type of information is also important. Is its purpose purely to communicate a fact or status, or is the purpose to elicit feedback on some issue? What response is expected from sharing it?
 - Is the information ephemeral, such as a code check-in notice, or is it of longer-lasting value? If so, is the communication the only source or is it available longer-term elsewhere, and how can it be found?

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Communication choices

- Who is the target audience?
 - It is also important in any communication to determine the target audience for a communication. The target audience can help to determine whether and how the information is presented.
 - Some information will be of no interest to certain audiences, even with sufficient context, while it will be of very high value to other audiences, even with no additional context.
 - The audience also determines the required timeliness, immediacy, and frequency of sharing. For certain audiences, timely, immediate delivery of information may be vital, but less important to others.
 - The target audience also helps determine the appropriate level of information to be shared. Too many details might overwhelm certain audiences, while the details are important to other.
 - Multiple messages may be required for different target audiences.

Communication and Collaboration

Communication choices

- What communications channel to use?
 - What communications channel to use also plays a critical factor in project communication. Audiences expect information to be delivered on an appropriate channel that they regularly monitor.
 - One type of channel may be most appropriate for sharing certain kinds of information. For example, a text alert may be best when a check-in occurs, or build fails because it is immediate and ephemeral.
 - Other channels such as email or a social media post may be most appropriate for messages with a high information content that do not require immediate attention and have longer-term value.
 - With multiple audience, it may be necessary to deliver information in different forms on multiple communication channels.

Communication and Collaboration

Project communication planning

- To ensure project success, the project team should plan how they will communicate within the team, with stakeholders, and with costumers and end-users at the outset of the project.
- Project communications planning covers various processes which ensure that the right project information is delivered to the right groups people and at the right time.
- Communication planning helps the project team establish a healthy relationship with stakeholders, customers, and end-users with diverse backgrounds, expertise levels, interests, and perspectives.

Communication and Collaboration

Project communication planning

- Planning project communications can be an informal discussion about options among the project team for a small, self-contained project, or a more formal process with a written plan for a larger project.
- Whether the plan is just a couple of paragraphs or a more formal document, it is a good idea to write it down. This avoids future misunderstandings and is a valuable reference for new members.
- Keep this plan with your other important project documentation and be sure to review and revise it occasionally. Even if you have few project documents, it is a good idea to keep them up to date.

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Project communication planning

- A project communication plan is a tool that enables you to communicate effectively about a project with your team, and with stakeholders, customers, and end-users.
- The plan sets clear guidelines for how information will be shared, as well as who's responsible for and needs to be looped in on each project communication.
- For example, a communications plan helps answer the questions we asked earlier about communications goals and objectives, target audience, and what communications channels to use.

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Project communication planning

- A communication plan plays an important role in a project by:
 - Creating written documentation everyone can turn to
 - Setting clear expectations for how and when updates will be shared
 - Increasing visibility of the project and status
 - Providing opportunities for feedback to be shared
 - Boosting the productivity of team meetings
 - Ensuring the project continues to align with goals



Communication and Collaboration

Basic communication model

- The process of communication involves several steps. We will look at a basic communication model next.
 - The sender encodes the message and sends it to the receiver. The receiver should know how to decode the message.
 - The receiver in turn sends a response, which the sender should know how to decode.
 - Communication happens through a medium, and the message may be corrupted at any stage because of the noise.

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Basic communication model

- Here is an example to help understand this model.
 - A Japanese tourist calls up a hotel in Dubai to book a room. Encoding the message is happening in the Japanese language.
 - The telephone serves as a medium, but the message is not getting decoded, as the receptionist does not understand Japanese. This is also the case with the receptionist, who communicates in Arabic.
 - However, if both of them communicate in a common language, say English, communication can occur.
 - Sometimes, people communicate (encode) messages through body language. Communication only happens if the receiver knows how to interpret (decode) them.

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Basic communication model

- If a project has communication problems, you can analyze the communication to identify whether the problem is with encoding and decoding, or there is a problem with the medium itself.
- Here are the different elements of the communication model.
 - **Encode**: translate thoughts or ideas into a language that is understood by others.
 - **Decode**: translate the message back into meaningful thoughts or ideas.
 - **Message**: output of encoding.
 - **Medium**: communication method to convey the message.
 - **Noise**: anything that interferes with the transmission and understanding of the message. Examples include distance and unfamiliar technology.

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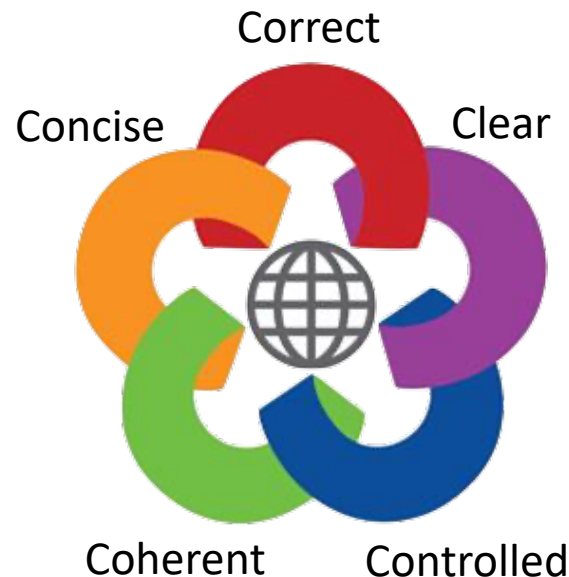
Communications management

- Communications management requires a set of skills for those responsible for implementing it, including:
 - Listening actively
 - Writing proficiently
 - Speaking fluently
 - Questioning and exploring ideas
 - Establishing and managing expectations
 - Motivating team to become and stay engaged
 - Guiding team to enhance performance
 - Resolving conflicts
 - Summarizing and reiterating
 - Identifying the next most efficient step

Communication and Collaboration

Communications management

- Those responsible for implementing a project management should also keep in mind the 5 **C**'s of communication, which will help to create systematic communication throughout the project:
 - **C**orrect
 - **C**oncise
 - **C**lear
 - **C**oherent
 - **C**ontrolled



Communication and Collaboration

Communications management

- Communication can be of various types:
 - **Written Communication:** It is one of the most precise forms of communication that is transmitted via a correspondence medium. It can be further segregated into two forms:
 - *Written Formal:* Project charter, scope statement, project plan, work breakdown structures, project status, complex issues, contract related communications, memos etc.
 - *Written Informal:* email, notes, letters, regular communication with team members etc.

Communication and Collaboration

Communications management

- Communication can be of various types:
 - **Oral Communication:** This type of communication has a high degree of flexibility is done through the medium of personal contact, the team meets, telephonic etc. It can be further categorized into two forms:
 - *Oral Formal:* Presentations, speeches, negotiations etc.
 - *Oral Informal:* Conversation with team members, project meetings, break-room or war-room conversations etc.

Communication and Collaboration

Communications management

- Communication can be of various types:
 - **Non-Verbal Communication:** This is the most basic form of communication.
 - Approximately 55% of communication is in this form.
 - General examples of this type of communication are facial expressions, hand movements, the tone of voice while speaking, etc.

Communication and Collaboration

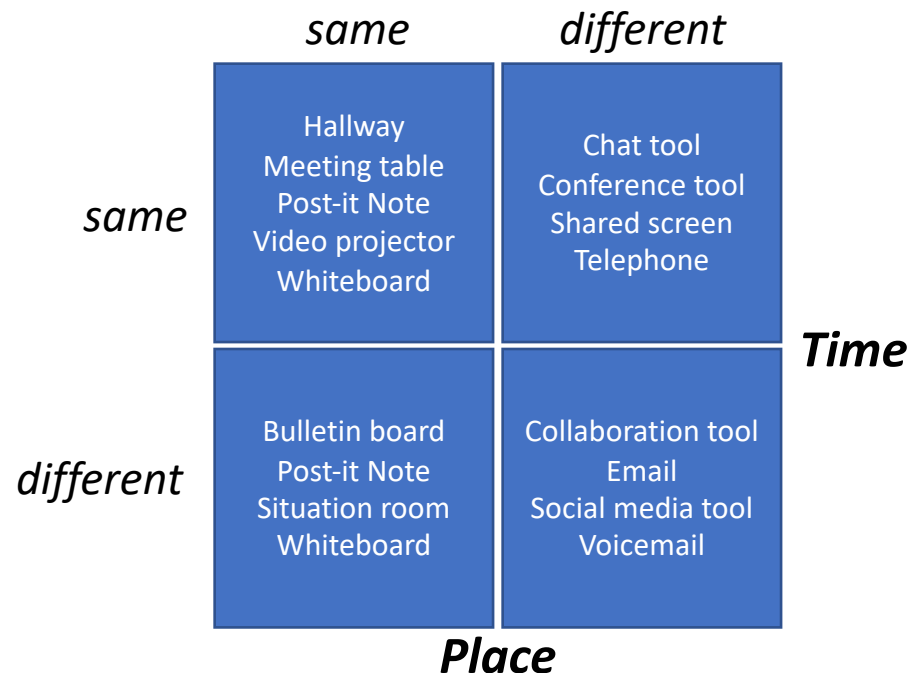
Communications management

- Several communication tools are available to assist team members to keep track of and mediate communications.
 - Email
 - Meetings (in-person, phone, or video chat)
 - Discussion boards
 - Status reports
 - Collaboration apps
 - To-do lists
 - Surveys
- How do you know what works? Review past projects to see what worked—and what didn't. Then talk to your team, customers, and other stakeholders A weekly email is no good if no one reads it!

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Communications management

- The choice of tools must take place and time into account. The kinds of communication that occur must consider both dimensions, This diagram shows the four *venues of interaction* and some tools.



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Communications management benefits

- **Expectations:** Communication management helps in setting standards for how and when communication should take place. This helps ensure that stakeholders receive required information.
- **Consistency:** Managing communications offers consistent handling of project activities and gives team members a direction to follow and communicate to others.
- **Productivity:** Efficient communications management keeps team members well informed about the project happenings. They are always equipped with the information that they need.

Communication and Collaboration

Communications management benefits

- **Outcome:** Establishing a clear communication channel between the team and stakeholders ensures that the team knows exactly what the stakeholders want, need and expect from the project output.
- **Controlled Communication:** Communication management ensures that the right information is delivered to the right people and at the right time and provides a smooth flow of communication.
- **Project Team Collaboration:** Good communication often results in better collaboration among the team members and enhances focus overall.

Communication and Collaboration

Communications management benefits

- **Effective Kickoff:** A communication management plan gives a good kickoff to a project. It ensures that the project and methodologies are discussed and reviewed at a high-level.
- Once this is ensured, further communication processes are expressed and agreed upon by team members which gives them a clear picture of what happens next and their role in the project.

Communication and Collaboration

Communications management process

- A complete communications management process is comprised of three parts We will look at each in more detail next.
 1. **Planning communication management** is done during the planning step
 2. **Managing communications** is done during the executing step
 3. **Monitoring communications** is done during the monitoring and controlling step



Communication and Collaboration

Communications management process

1. Planning communication management

- *Plan Communication Management* analyzes and categorizes the communication requirements of each stakeholders to find how many of them need similar information, which can be grouped together.
- In this process, a systematic and effective plan is developed for the activities involved in project communication.
- It mainly uses information like the requirement of each stakeholder, organizational assets available, project needs, and available communications technologies.
- Plan communication management process is performed at periodic intervals throughout the project life cycle.
- This primarily helps in the timely presentation of the relevant data through a documented approach that keeps the stakeholders engaged in an efficient manner.

Communication and Collaboration

Communications management process

1. Planning communication management

- Planning communication management involves various inputs, tools & techniques, and outputs:

Inputs	Tools & Techniques	Outputs
<ol style="list-style-type: none">Project CharterProject Management Plan<ul style="list-style-type: none">Resource management planStakeholder engagement planProject Documents<ul style="list-style-type: none">Requirements docsStakeholder registerEnterprise Environmental FactorsOrganizational Process Assets	<ol style="list-style-type: none">Expert JudgementCommunications Requirements AnalysisCommunications TechnologyCommunication ModelsCommunication MethodsInterpersonal & Team Skills<ul style="list-style-type: none">Requirements docsStakeholder registerData Representation<ul style="list-style-type: none">Requirements docsStakeholder registerMeetings	<ol style="list-style-type: none">Communications Management PlanProject Management Plan Updates<ul style="list-style-type: none">Stakeholder engagement planData Representation<ul style="list-style-type: none">Project scheduleStakeholder register

Communication and Collaboration

Communications management process

2. Managing communications

- *Manage Communications* aims to collect, create, distribute, store, retrieve, manage, monitor and finally dispose of project information in an appropriate and timely manner.
- It is performed throughout the project lifecycle in order to provide an effortless and efficient flow of information from the project team to stakeholders and vice-versa.
- This process also helps in identifying different aspects of effective communication along with the most suitable methodologies, technologies, and techniques.
- It allows provides more flexibility by providing space for adjustments in techniques. It helps accommodate changing demands and needs of stakeholders without disrupting the communication flow.

Communication and Collaboration

Communications management process

2. Managing communications

Inputs	Tools & Techniques	Outputs
<ol style="list-style-type: none">1. Project Management Plan<ul style="list-style-type: none">• Resource management plan• Communications management plan2. Project Documents<ul style="list-style-type: none">• Change log• Issue log• Lessons learned register• Quality report• Risk report• Stakeholder register3. Work Performance Reports4. Enterprise Environ. Factors5. Organizational Process Assets	<ol style="list-style-type: none">1. Communication Technology2. Communications Methods3. Communications Skills4. Project Mgmt. Info System5. Project Reporting6. Interpersonal & Team Skills<ul style="list-style-type: none">• Active listening• Conflict management• Cultural awareness• Meeting management• Networking• Political awareness7. Meetings	<ol style="list-style-type: none">1. Project Communications2. Project Management Plan Updates<ul style="list-style-type: none">• Communications management plans• Stakeholder engagement plan3. Project Document Updates<ul style="list-style-type: none">• Issue log• Lessons learned register• Project schedule• Risk register• Stakeholder register4. Organizational Process Assets Updates

Communication and Collaboration

Communications management process

3. Monitoring communications

- *Monitor Communications* is the final process of the communication management knowledge area.
- This process ensures that all the information needs and requirements of the project and the involved stakeholders are met by its completion.
- It is performed throughout the project lifecycle and helps in optimizing the flow of the information as per the communication management and stakeholder engagement plan.

Communication and Collaboration

Communications management process

3. Monitoring communications

Inputs	Tools & Techniques	Outputs
<ol style="list-style-type: none">Project Management Plan<ul style="list-style-type: none">Resource management planCommunications management planStakeholder engagement. planProject Documents<ul style="list-style-type: none">Issue logLessons learned registerProject communicationsWork Performance ReportsEnterprise Environ. FactorsOrganizational Process Assets	<ol style="list-style-type: none">Expert JudgementProject Mgmt. Info. SystemData Analysis<ul style="list-style-type: none">Stakeholder engagement. assessment matrixInterpersonal & Team Skills<ol style="list-style-type: none">Observation, conversationMeetings	<ol style="list-style-type: none">Work Performance InformationChange RequestsProject Management Plan Updates<ul style="list-style-type: none">Communications management plansStakeholder engagement planProject Document Updates<ul style="list-style-type: none">Issue logLessons learned registerProject scheduleStakeholder register

Communication and Collaboration

Writing a communication plan

- Once your team has decided on how it will communicate with itself, its stakeholders, and its customer and end-users, it is time to write the plan.
- A typical project communication plan covers five topics:
 1. the project's communication needs
 2. the goals and objectives of communications
 3. the communications methods and tools
 4. the cadence of communication
 5. stakeholders, customers, and end-users

Communication and Collaboration

Writing a communication plan

1. Project communication needs

- Every project is different, so take the size of the project, the nature of work being done into account
- Also consider the stakeholders', customers', and end-user's unique preferences into account as you determine type style and types of communication this project needs to succeed.

Communication and Collaboration

Writing a communication plan

2. Goals and objectives of communications

- Bombarding people with too many emails or unnecessary meetings can interfere with their ability to get work done and cause them to overlook important updates.
- Be purposeful in your plan and ensure every communication you include has a reason for being.
- If you are feeling ambitious, go ahead and outline a basic agenda for the topics that will be covered in each meeting or report.

Communication and Collaboration

Writing a communication plan

3. Communications methods and tools

- Do you really need a meeting to share weekly updates, or is your project discussion board enough?
- Think through how your team works best, so they can stay in the loop while still being productive.
- If your stakeholders, customers, or end-users prefer the personal touch of a phone call, build that into your plan too.
- Consider the kinds of tools you will need to support communications, taking the needs of our team as well as those of your stakeholders, customers, and end-users into account.

Communication and Collaboration

Writing a communication plan

4. Cadence of communication

- Establishing a regular frequency for communication streamlines the process by setting clear expectations from the get-go.
- This not only frees you from fielding random requests for status updates. It also enables project members to carve out space for important meetings and reports ahead of time.
- In choosing the cadence, consider the three kinds of people with whom you need to communicate and adjust your cadence accordingly.

Communication and Collaboration

Writing a communication plan

5. Identify the stakeholders, customers, and end-users

- Assigning ownership creates accountability so your carefully crafted plan can reach its full potential.
- A subset of project team members may be responsible for most communications, but other team members may also need to occasionally communicate .
- While you're naming names, list the audience for each communication type too (e.g., staff, stakeholders, customers and end-users).
- By doing this, key players come prepared to provide feedback and updates when needed.

Communication and Collaboration

Writing a communication plan

- There are different ways to represent the information in a project communication plan.
 - As a standard formatted text in a desktop or online document format, including MSWord, Office 365, OpenOffice Write, or GoogleDoc. Ensure all team members can access and work with the format
 - As a spreadsheet with tabs that represent different views of the information in the communication plan. Again, use a format that team members can access and work with.
 - Using an online project management tool that provides special entry forms for the information in the communication plan. All team members will need access to the tool.

Communication and Collaboration

Writing a communication plan

- Several project and stakeholder communication templates in MSWord format are available online for free or at a low cost.
- For example, the website Project Management Docs offers a downloadable template in MSWord format. The site also includes a discussion about using the template:
 - <https://www.projectmanagementdocs.com/template/project-planning/communications-management-plan/>
- This template can be used to create a communication plan document that can be shared by checking it into GitHub or other repository, shared in Office 365 or imported into GoogleDocs.

Communication and Collaboration

Writing a communication plan

- “Communications Management Plan Template” title page.



PROJECT
MANAGEMENT
DOCS

ProjectManagementDocs.com

COMMUNICATIONS MANAGEMENT PLAN TEMPLATE

This Communications Management Plan Template is free for you to copy and use on your project and within your organization. We hope that you find this template useful and welcome your comments. Public distribution of this document is only permitted from the Project Management Docs official website at: ProjectManagementDocs.com

COMMUNICATION MANAGEMENT PLAN
<PROJECT NAME>

COMPANY NAME
STREET ADDRESS
CITY, STATE ZIP CODE

DATE

Communication and Collaboration

Writing a communication plan

- “Communications Management Plan Template” table of contents.



PROJECT
MANAGEMENT
DOCS

ProjectManagementDocs.com

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Communication and Collaboration

Writing a communication plan

- Several companies who also sell project management software make project communications spreadsheet templates available at no cost.
- For example, the company TeamGantt offers a downloadable template in MSEXcel format. The site also includes a discussion of communications plans and using the template:
 - <https://www.teamgantt.com/blog/project-management-communication-plan>
- This template has tabs for three types of template spreadsheets, shown on the following slides.
- The template shared by checking it into GitHub or other repository or uploaded to Office 365 and imported into the TeamGantt product.

Communication and Collaboration

Writing a communication plan

- TeamGantt “Communications Plan Template” simple matrix communication plan example.

Communication	Method	Frequency	Goal	Owner	Audience
Project status report	Email	Weekly	Review project status and discuss potential issues or delays	Project manager	Project team + project sponsor
Team standup	Meeting	Daily	Discuss what each team member did yesterday, what they'll do today, and any blockers	Project manager	Project team
Project review	Meeting	At milestones	Present project deliverables, gather feedback, and discuss next steps	Project manager	Project team + project sponsor
Post-mortem meeting	Meeting	At end of project	Assess what worked and what did not work and discuss actionable takeaways	Project manager	Project team
Task progress updates	TeamGantt	Daily	Share daily progress made on project tasks	Project manager	Project team

Communication and Collaboration

Writing a communication plan

- TeamGantt “Communications Plan Template” communication plan example by method example.

Communication	Frequency	Goal	Owner	Audience
Email				
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager	Project team + project sponsor
Meetings				
Team standup	Daily	Discuss what each team member did yesterday, what they'll do today, and any blockers	Project manager	Project team
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TeamGantt				
Task progress updates	Daily	Share daily progress made on project tasks	Project manager	Project team

Communication and Collaboration

Writing a communication plan

- TeamGantt “Communications Plan Template” communication plan example by audience example.

Communication	Frequency	Goal	Owner
Project team			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Team standup	Daily	Discuss what each team member did yesterday, what they'll do today, and any blockers	Project manager
Task progress updates	Daily	Share daily progress made on project tasks	Project manager
Project review	At milestones	Present project deliverables, gather feedback, and discuss next steps	Project manager
Post-mortem meeting	At end of project	Assess what worked and what did not work and discuss actionable takeaways	Project manager
Project sponsor			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Project review	At milestones	Present project deliverables, gather feedback, and discuss next steps	Project manager

Communication and Collaboration

Communications summary

- Here is a summary of project communication
 - Communication is a two-way process of transferring information from one entity to another.
 - The four commonly used communication methods are formal written, formal verbal, informal written, and informal verbal. Non-verbal communication is also important.
 - By analyzing the communication model, problems in project communication can be identified.
 - Members of the project team are responsible for the timely availability of information to all the stakeholders.
 - The three project communications management processes are plan communication management, manage communications, and monitor communications.
 - A project communication plan can be a document or in tables.

Communication and Collaboration

Project collaboration

- Collaboration stems from the process of sharing knowledge, skills, and experience, with the intention of achieving a common goal. In that sense, communication and collaboration are closely linked.
- In the context of a software project collaboration, it is the process of a project team working together with stakeholders to produce software that meets the needs of customers and end-users

Communication and Collaboration

Project collaboration

- The collaboration process can take place in the absence of tools that facilitate communication, collaboration, and sharing, but the software development process is more productive using them.
- We will study the role of collaboration in managing the software development process. For now, we will briefly look at several tools that facilitate collaboration and communication.

Communication and Collaboration

Project collaboration

- Git and GitHub (Microsoft)
 - Git is a full-featured software repository and revision control system that has grown in the last five years to be one of the most widely used product in its class for software engineering.
 - The biggest factor for the popularity of Git was the release of GitHub server, along with several related software collaboration servers that interoperate with it.
 - GitHub includes advanced collaboration features such as issues, pull requests with threaded discussions.
 - More recently GitHub introduced Project Boards to track work on software artifacts stored in GitHub repositories.
 - NEU Khoury College provides access to an Enterprise GitHub server:
 - <https://github.ccs.neu.edu/>

Communication and Collaboration

Project collaboration

- Jira (Atlassian)
 - Jira began as a full-featured issue management system for tracking defects and other issues that arise during software development, testing, and support.
 - Over time, the platform has grown into an extensible platform for related functions like software project management. There are a number of 3rd party plugins for Jira.
 - Jira also integrates with other Atlassian products like GitHub and Confluence, as well as 3rd party applications like the Slack collaborative discussion platform
 - NEU Khoury College provides access to an Enterprise Jira server:
 - <https://jira.ccs.neu.edu/>

Communication and Collaboration

Project collaboration

- Confluence (Atlassian)
 - Confluence is a full-featured content management system that can be used to store and manage a wide variety of content.
 - The platform is in the same space as DropBox, GoogleDrive and Microsoft OneDrive.
 - It is also an extensible platform with a number of 3rd part plugins
 - Confluence also integrates with other Atlassian products like GitHub and Jira, as well as 3rd part applications like the Slack collaborative discussion platform
 - NEU Khoury College provides access to an Enterprise Confluence server:
 - <https://confluence.ccs.neu.edu/>

Communication and Collaboration

Project collaboration

- Slack (Salesforce)
 - Slack offers many IRC-style features, including persistent chat rooms (channels) organized by topic, private groups, and direct messaging.
 - Content, including files, conversations, and people, is all searchable within Slack. Users can add emoji buttons to their messages, on which other users can then click to express their reactions.
 - Slack teams allow communities, groups, or teams to join a "workspace" via a specific URL or invitation sent by a team admin or owner.
 - Although Slack was developed for organizational communication, it has been adopted as a community platform, replacing message boards or social media groups on Facebook or LinkedIn.
 - Slack integrates with many third-party services and also supports community-built integrations. Major integrations include services such as Google Drive, Trello, Dropbox, Box, Heroku, and GitHub.
 - <http://www.slack.com>