Technical Aspects

E. Describe how a user interacts with the innovation.

Users interact with email through email clients[7]. Email clients can be apps on the user's computing device such as Outlook Express [8], Apple's mobile email app [9]; or an email client can be a web site, such as GMail [10] or Yahoo Mail [11]. Sending users type text into the body of the email, and with some email clients can embed media such as hyperlinks and pictures. The sender also specifies a subject for the message and one or more recipients. Recipient email addresses are of a standard form of a username, @ sign, and the host name of the recipients email server [11]. Email addresses can be typed in by the users or obtained from contact lists stored by the sender's email client or through email lists [12]. Senders can also attach electronic documents[13] to the message. The email client then transparently performs all of the steps mandated by the SMTP protocol [2] to fully fill out the email and deliver it to the recipients. Recipients use their email client, which parses the SMTP protocol in the message, to read the message.

F. Describe in detail how the innovation's technology incorporates at least ONE of the Big Ideas of abstraction, algorithms, programming, and/or the Internet to accomplish its purpose.

Email incorporates several of the Big Ideas:

- **Algorithms** - Email is delivered by the SMTP protocol, which is an algorithm.
- **Programming** - Email clients are apps or web pages, both of which are programmed to provide a good user interface and to deliver email.
- **The Internet** - Email is an Internet application and uses an Application Layer network protocol (SMTP).
The Big Idea that I chose to describe in detail is *Abstraction*. The SMTP protocol [2] is complex requiring information to route email to web servers, encode messages in binary, interaction with lower-level protocols such as the Internet Protocol [14], etc. However, email itself is very easy to use for just about any user. This is because the programming of email clients has abstracted away the complexity of the computing systems and protocols used to deliver it. This abstraction allows the user to do things with which they are comfortable and things that are directly relevant to the communication: compose a message, add a subject, and specify recipients - without exposure to the underlying complexity. Email addresses themselves are human-friendly abstractions hiding details such as the recipient's IP address.