# Research Methodologies

* Most important tools to identify problems and reach one main’s objective and product
* Need to be compatible with research problems to get accurate and realistic result
* 2 categories
  + Qualitative
  + Quantitative
* Identifying and clarifying main key of research aims.
* Babbie (2012) [[6](http://www.scirp.org/journal/PaperInformation.aspx?PaperID=71775#ref6)] , identified research approach as: “systematic and orderly approach taken towards the collection and analysis of data so that information can be obtained from those data”.
* Qualitative
  + Interpretive or critical paradigm within social sciences to study social phenomena
  + Get rich, important, meaningful data
* Quantitative
  + Interpretation of numeric data
  + Using tools of analysis
  + In the analysis of data depends on statistical principles
* Research Strategy
  + “the general plan of how research will go about answering the research questions.” Sunder et al. [16]
  + according to Weduawatta et al. [[1](http://www.scirp.org/journal/PaperInformation.aspx?PaperID=71775#ref1)] , “provides the overall direction of the research including the process by which the research is conducted”.
  + Case Study
    - Yin [[18](http://www.scirp.org/journal/PaperInformation.aspx?PaperID=71775#ref18)] , defined case study as?”A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”.
    - Depends on qualitative approach
    - Enables researcher to study information system in its natural settings and generate theories from practice
    - Enables researcher to gain more explicit information
    - Enables researcher to the nature and complexity of the process taking place.
  + Single-Multiple Case Studies
* Data Collection Method
  + Interviews
  + Documentation
  + Questionnaire
* Validity and Reliability
  + The validity and reliability can be achieved when there is a clear explanation of the techniques used to collect needed data and enabling the interviewee to assemble documentation that can support interview. He also added that the validity and reliability can be increased depending on: careful design of individual questions; clear and pleasing layout of the questionnaire; lucid explanation of the purpose of the questionnaire; pilot testing; carefully planned and executed administration [[20](http://www.scirp.org/journal/PaperInformation.aspx?PaperID=71775#ref20)] [[28](http://www.scirp.org/journal/PaperInformation.aspx?PaperID=71775#ref28)] .
* Research Design
  + Aims to give a picture of structure of research and used data collection
  + Method of inquiry
  + Action plan to move from methodology to next stage
* AGILE VS SCRUM VS WATERFALL VS KANBAN
  + Agile
    - Incremental, iterative approach
    - Open to changing requirements
    - Ecourages constant feedback
    - Goal of each iteration is a working product
    - Face to face communication as well as accountability
    - 12 principles of agile methodology
    - Advantages
      * Change is embraced
      * Unknown end goal
      * Faster, high quality delivery
      * Strong team interaction
      * Customers are heard
      * Continuous improvement
    - Disadvantages
      * Planning less concrete
      * Team must be knowledgeable
      * Time commitment from developers
      * Documentation neglected
      * Different final product
    - Agile Development
      * 1) Requirements
      * 2) Plan
      * 3) Design
      * 4) Develop
      * 5) Release
      * 6) Track and Monitor
    - Methodologies used to Implement Agile
      * Extreme Programming
      * Feature-driven development
      * Adaptive System development
      * Dynamic Systems Development Method
      * Lean Software Development
      * Kanban
      * Crystal Clear
      * Scrum
  + Scrum
    - Subset of agile
    - Iterative model
    - Fixed length iterations = sprints
    - Sprint planning, daily stand-up, sprint demo, sprint retrospective
    - Advantages
      * More transparency and project visibility
      * Increased team accountability
      * Easy to accommodate changes
      * Increased cost savings
    - Disadvantages
      * Risk of scope creep
      * Team requires experience and commitment
      * The wrong scrum master can ruin everything
      * Poorly defined tasks can lead to inaccuracies
    - Roles in scrum
      * Product owner
      * Scrum master
      * Scrum team
    - Steps in scrum process
      * Product backlog
      * Sprint planning
      * Sprint Backlog
      * Daily Scrum meetings
      * Sprint review meeting
      * Sprint retrospective meeting
  + Waterfall
    - Sequential, linear process
    - System development life cycle
    - Gantt chart
      * Start and end of a task
    - Cannot go back to a previous stage
    - Advantages
      * Easy to use and manage
      * Discipline is enforced
      * Requires a well-documented approach
    - Disadvantage
      * Changes can’t be easily accommodated
      * Software is not delivered until late
      * Gathering accurate requirements can be challenging
    - Stages
      * Conception
      * Initiation
      * Requirement Gathering and Analysis
      * Design
      * Implementation/Coding
      * Testing
      * Maintenance
    - Iterative Waterfall Development
      * A lot of upfront planning
      * Plan in place, team follows same pattern as traditional waterfall
    - How waterfall deals with software requirements
      * Need to be defined from before
      * Through questionnaires, face to face, interviews, white boards and modelling tools
  + Kanban
    - Visual framework
    - Implement Agile that shows what to produce, when to produce it and how much to produce
    - Encourages small incremental changes
    - Not set up or procedure required
    - To-Do , Doing, Done
    - Physical board = useful tool
    - Advantages
      * Increase flexibility
      * Reduces waste
      * Easy to understand
      * Improves delivery flow
      * Minimizes cycle time
    - Disadvantages
      * Outdated board can lead to issues
      * Teams can overcomplicate board
      * Lack of timing
    - Core practices and principles
      * Visualize the workflow
      * Limit work in progress
      * Manage and enhance the flow
      * Make process policies explicit
      * Continuously improve
  + When to use Scrum
    - Project requirements will change and evolve
    - Continuous feedback required
    - You have to do a large part of the work because you haven’t done it before
    - Need to commit fixed release date
    - Project team wants autonomy
    - Need to deliver software on a regular basis
    - Works well for unknowns that evolve over time
    - Easily accommodate new info/ features throughout the process
  + When to use Agile
    - Final product not clearly defined
    - Clients/ stakeholders need to be able to change the scope
    - Changes need to be implemented during the entire process
    - Devs are adaptable and can think independently
    - Need to optimize for rapid development
* My preference is to use Agile method
  + The properties of agile fit exactly what I need, the only difference is that I will not be working in a team of developers.

# The Current State of the Art

The current state of Augmented Reality when applied to the world of industry to train employees is still in its infancy. Prototypes have been built and tested, several of these prototypes have been mentioned in the papers read. The prototypes built vary in functionality, for example assisting mechanical interns in fixing a wind turbine, giving information regarding specific medical equipment, using AR in food industry. Something which has interested me in continuing to develop as little contribution has been made, is creating an augmented reality intelligent tutoring system.

Most researches followed a specific trend. They normally started by finding out what Augmented Reality is and its origin, then a decision was made on how to acquire qualitative and quantitative data. Normally the quantitative one was done through interviews and questionnaires. Then they moved on to designing and building the prototyping according to the users (people who took part in the data collection phase) requirements. The testing of the prototype was then performed on the same people who took part in the data collection phase. This was to evaluate and improve the prototype and make it as perfect as possible.