Graphical communication…

(a) having an idea, and using graphics to communicate it to someone else

or

(b) using graphics to create, discover, explore an idea; thus "Using vision to think"

Computers make (b) easier than in the past

External cognition

(behind visualization)

Internal representations: in the mind (cognitive)
External representations: outside the mind (physical)

External cognition: how these two representations "weave together in thought" (CMS,p1)

Using external artefacts thus enhances our power of thought
- multiplication tables
- UML or ER diagrams
- statistical charts
- maps

Insight

Simple graphical communication is straightforward

"Insight" is a more sophisticated goal:

discovery, decision making, explanation

Visualisation increases our ability to perform these activities…

… through the provision of external representations

External cognition	The use of the external world to accomplish cognition
Information design	Design of external representations to amplify cognition
Data **graphics**	Use of abstract, nonrepresentational visual representations of data to amplify cognition
Visualisation	Use of computer-based, interactive visual representations of data to amplify cognition
Scientific Visualisation	Use of computer-based, interactive visual representations of scientific data, physically based, to amplify cognition
Information Visualisation	Use of computer-based, interactive visual representations of abstract data, non-physically based, to amplify cognition

use perception and encoding to make external representations

Thus, the purpose of IV is to use the perception of external representations to amplify cognition

to gain insight (eg. amplify cognition)

How (and why) IV amplifies Cognition

Increased resources
- extension of short term memory (STM), parallel perception …

Reduced search
- e.g. by grouping of information

because (related to each other)

Enhanced recognition of patterns
- e.g. by abstraction or aggregation, recognition over recall

✓ higher level views of data

so

Perceptual inference
- some information is more obvious when presented visually

Perceptual monitoring
- simultaneous perception of large data sets (e.g. by animation)

see quickly than textual

Manipulable medium
- exploration of data space by parameter manipulation, interaction…