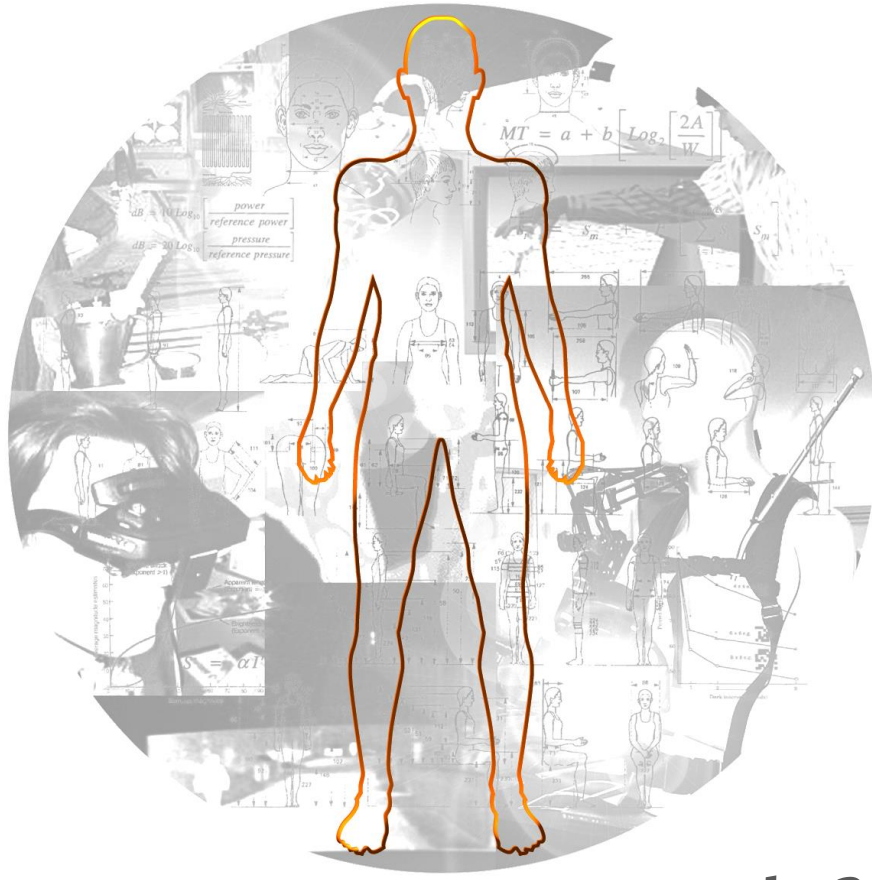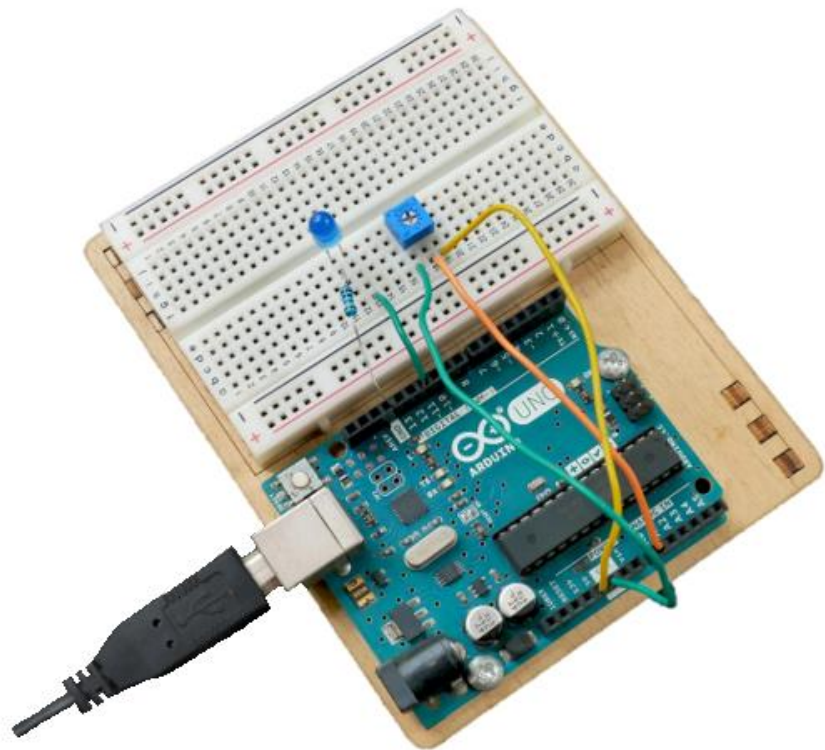# Designing The Near Future - Prototypes

Prof. Joseph Giacomin

Prototype

In design settings a prototype is usually an early version of a product, system or service which is built to test and refine the concept.

It is usually incomplete or imperfect, not having all of the features and details of the final version.

It is usually used to gather feedback from stakeholders and to evaluate the feasibility, usability and effectiveness of the concept.

Giacomin, J. 2024, Future Autonomous Road Vehicles, Routledge, Abingdon, Oxon, UK.

Prototype

Prototypes reduce the pressures on human creative thought by removing the need to simultaneously maintain characteristics and interactions in the mind.

They fill imaginative gaps via real world detail, often revealing characteristics or implications which were not initially imagined.

And the closer they are to the intended final artefact the greater the number of matters which can be evaluated.

Giacomin, J. 2024, Future Autonomous Road Vehicles, Routledge, Abingdon, Oxon, UK.

IDEO

Prototypes

Thomas Edison is sometimes suggested to have said that "if a picture is worth a thousand words, a prototype is worth a thousand pictures".
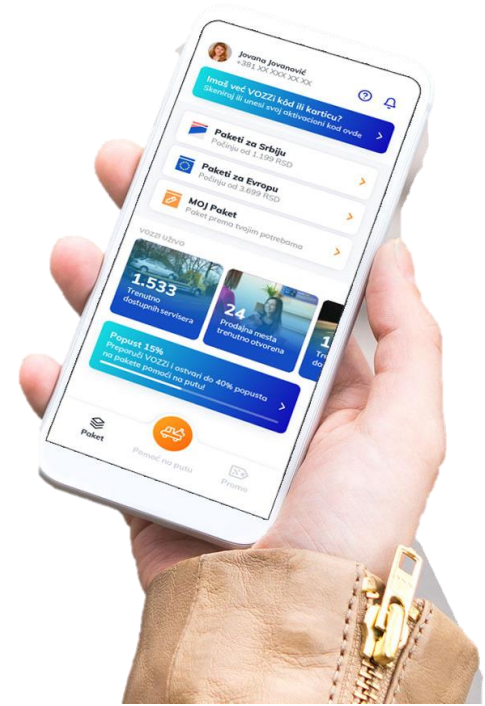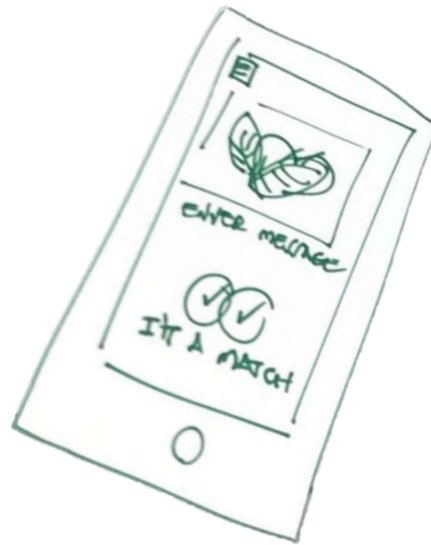
While Tom Kelley of IDEO in known to have said "A picture is worth a thousand words. Only, at IDEO, we've found that a good prototype is worth a thousand pictures".

And IDEO as an organisation frequently repeats the motto "If a picture is worth a thousand words, then a prototype is worth a thousand meetings".

Kelley, T. 2001, Prototyping is the shorthand of innovation, Design Management Journal, Vol. 12, no.3, pp.35-42.

Prototype Types

Aesthetic/Visual — Expresses the size and appearance but not the function.

Proof-Of-Principle — Expresses the key function but usually does not have all the intended functions.

User Experience — Expresses enough of both the appearance and the function to be used in user research.

Working — Expresses nearly all of the intended functions.

Functional — Expresses all of the intended functions but is not an exact representation of the design in terms of sizes, materials or manufacturing methods.

Wikipedia Contributors 2023, Prototype, Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/wiki/Prototype

Digital Prototype Types

Low-fidelity prototypes are generally limited function, limited interaction prototyping efforts. They are constructed to depict concepts, design alternatives, and screen layouts, rather than to model the user interaction with a system.

Whereas high fidelity prototypes are fully interactive. Users can enter data in entry fields, respond to messages, select icons to open windows and, in general, interact with the user interface as though it were a real product.

Rudd, J., Stern, K. and Isensee, S. 1996, Low vs. high-fidelity
prototyping debate, Interactions, Vol. 3, No.1, January, pp.76-85.

Digital Prototype types

Type	Advantages	Disadvantages
Low-Fidelity Prototype	Lower development cost. Evaluate multiple design concepts. Useful communication device. Address screen layout issues. Useful for identifying market requirements. Proof-of-concept.	Limited error checking. Poor detailed specification to code to. Facilitator-driven. Limited utility after requirements established. Limited usefulness for usability tests. Navigational and flow limitations.
High-Fidelity Prototype	Complete functionality. Fully interactive. User-driven. Clearly defines navigational scheme. Use for exploration and test. Look and feel of final product. Serves as a living specification. Marketing and sales tool.	More expensive to develop Time-consuming to create. Inefficient for proof-of-concept designs. Not effective for requirements gathering.

Rudd, J., Stern, K. and Isensee, S. 1996, Low vs. high-fidelity prototyping debate, Interactions, Vol. 3, No.1, January, pp.76-85.
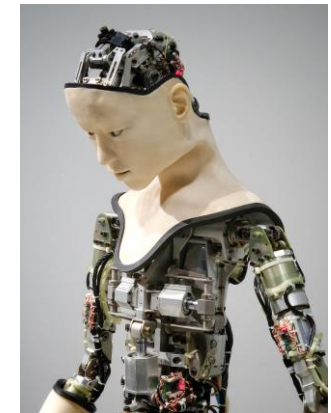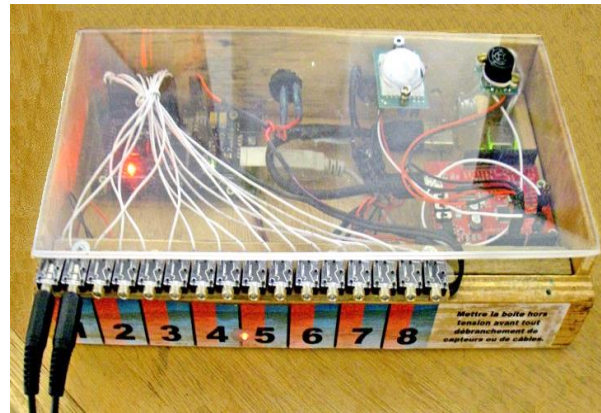
Prototyping Principles

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Anatomy Of Prototypes	Prototypes are filters that traverse a design space.
Fundamental Principle	Prototyping is an activity with the purpose of creating a manifestation that, in its simplest form, filters the qualities in which designers are interested, without distorting the understanding of the whole.
Economic Principle	The best prototype is one that, in the simplest and the most efficient way, makes the possibilities and limitations of a design idea visible and measurable.

Lim, Y.K., Stolterman, E. and Tenenberg, J. 2008, The Anatomy Of Prototypes: prototypes as filters, prototypes as manifestations of design ideas, ACM Transactions On Computer-Human Interaction (TOCHI), Vol 15, No. 2, pp.1-27.
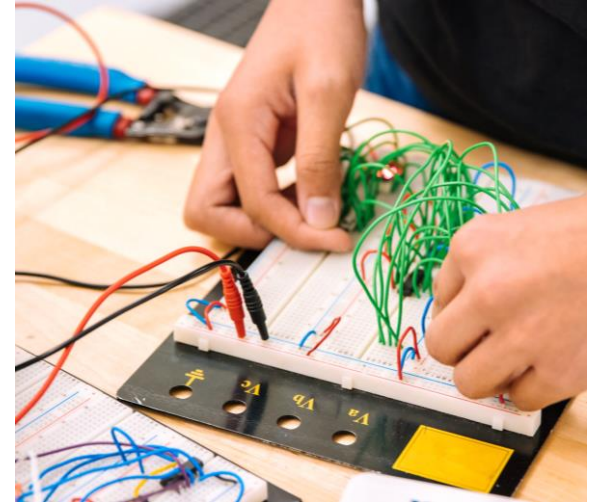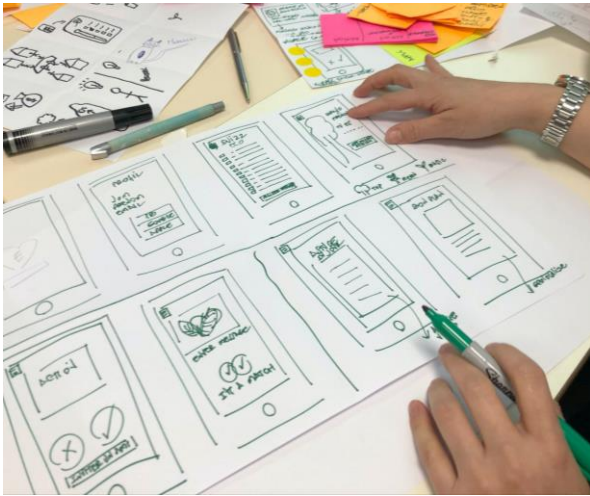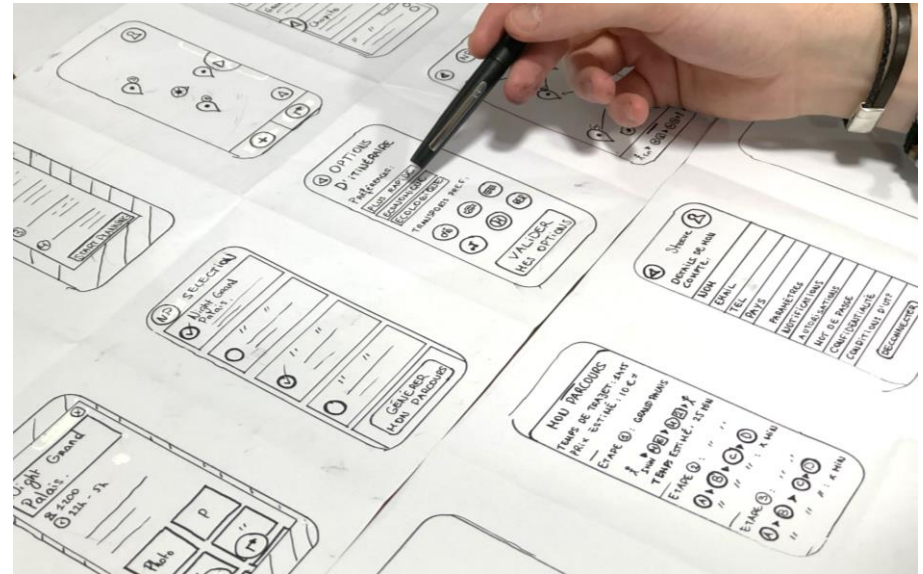
Materials And Processes

Commonalties in prototyping can be found due to the convenience of certain materials and processes, such as the use of paper, wood, plastic and software code.

Nevertheless, there are near infinite ways to test out a hypothesis.

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Materials and Processes

The choice of the best prototype is complicated by the fact that different prototypes with different characteristics often produce roughly the same conclusions.

For example, Sefelin, Tscheligi and Giller reported that in their study of computer interfaces the use of paper prototypes or instead of low fidelity computer implementations led to almost the same quantity and quality of critical user statements and to the same overall conclusions.

Sefelin, R., Tscheligi, M. and Giller, V. 2003, Paper Prototyping - What Is It Good For? a comparison of paper and computer based low-fidelity prototyping, In CHI'03 Extended Abstracts On Human Factors In Computing Systems, Fort Lauderdale, Florida, USA, April 5th to 10th, pp 778-779.
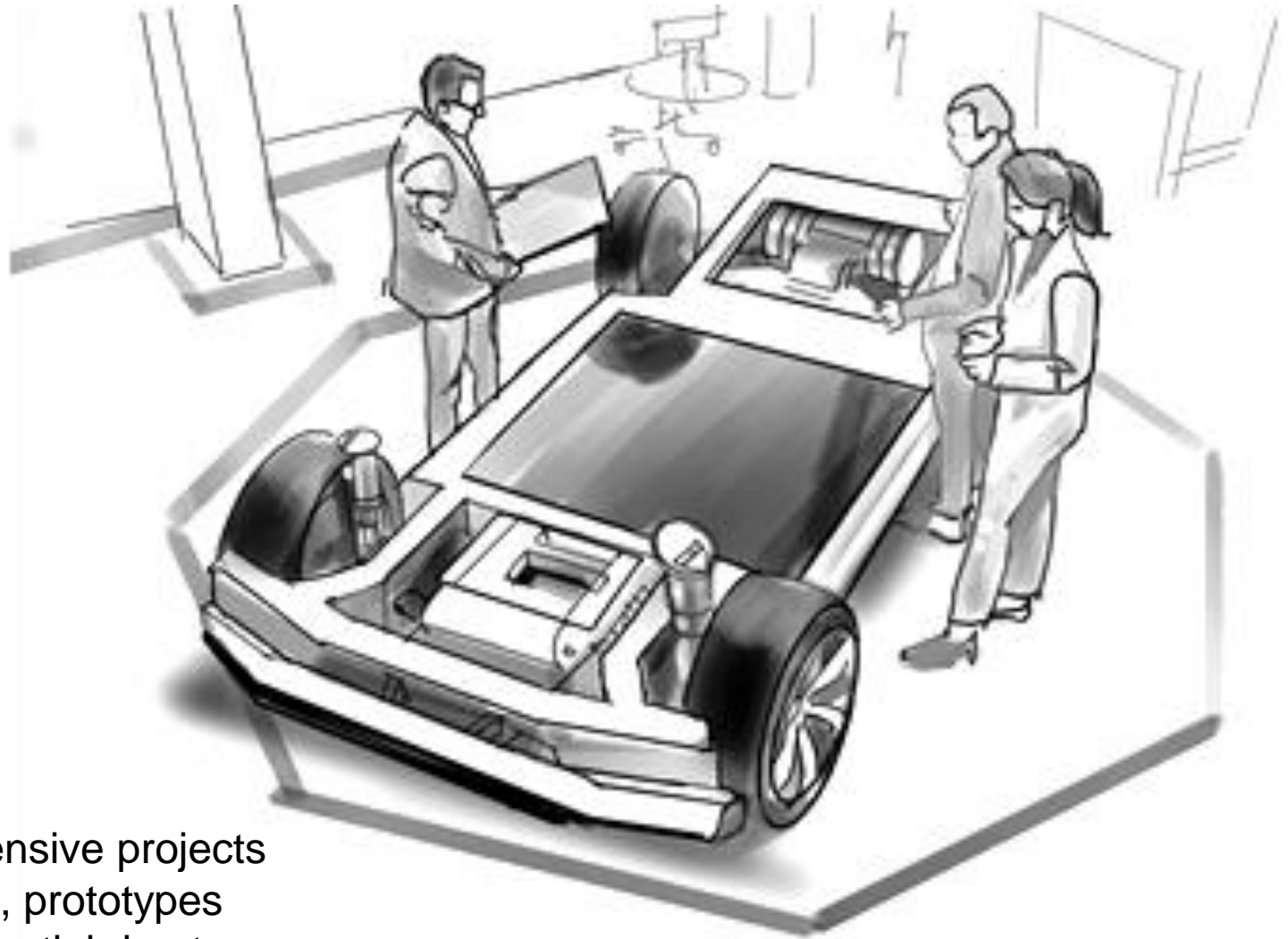
Costs

While often expensive projects in their own right, prototypes are deemed essential due to the need to detect and rectify errors as early as possible in the design process, avoiding costly later interventions.

Thank You