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Recursive Learning through Demos:
Using Public Demonstrations of Technology as Project Management Tools

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Abstract: This paper shows how public demonstrations of technology (‘demos’) are used within various institutions as tools for high-tech project management, and more particularly for recursive learning. My argument is based on the results of surveys I have carried out in recent years in several European and US institutions of the use of demos for the development of technological devices, such as computer software. Demos are not simply used as ways to promote or sell products in the vein of Steve Jobs’ famous Apple demos. In many cases I have studied, engineers, researchers and executives run demos of prototypes at various stages of their projects for learning purposes. They observe reactions to their demos in a methodical way, especially the ways in which their audience might appropriate the devices, and the adjustments required for the prototypes in order to improve their adoption. Demos allow demonstrators to collect what is often very detailed information on the practices of their future partners or clients, and also to glean propositions for the elaboration of new versions and uses of their devices. Demos thus help demonstrators to define or redefine successive stages of their projects in line with the comments and criticisms expressed by different audiences. These sometimes institutionalized uses of demonstration-trials contribute most notably to the structuring of projects around ‘versions’, and in some cases to a rapid irreversibility where content is concerned. They put demos at the heart of a set of almost invisible dynamics: dynamics that bind (rather than divide) the production and the promotion of science and technology in many institutions.

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The nature and management of many projects are characterised today – as they have been throughout numerous sociohistorical contexts – by practices that, while fundamental, have received little attention within social science research. In this paper I will discuss specifically public technology demonstrations, often called ‘demos’.

To illustrate the role of demos in the definition and development of numerous projects, I will refer to the results of surveys I have carried out in recent years of the use of demos for various high-tech devices\(^2\). In particular, I studied the management of a group of around 150 projects within the framework of a recent European Commission research and development (R&D) programme called Advanced Communications Technology and Services (ACTS). This programme set out to develop: a Europe-wide high-speed communication network; multimedia applications compatible with this network (such as high-quality image video-conference software); and remote working opportunities in big European companies and institutions. I also carried out surveys in the US of the production and use of demos within the framework of various projects led by engineers and artificial intelligence researchers. The latter were employed in large universities and research organisations based on the east and west coasts of the United States, including MIT, Stanford University and research institutions based in Silicon Valley in the San Francisco area.

These surveys highlight the vast diversity of demo practices, as well as their heterogeneous role according to the context of use. However, I wish to show here that, far from simply constituting a means of proof and persuasion, demos offer project managers a rich exchange tool, support in the development and promotion of a device, or an evaluation instrument for clients depending on the case. They sometimes provide a crucial resource in the management of groups of projects. The use of demos equally contributes to determining the development and the very content of projects in the framework of a recursive learning process. But we must first of all define what a demo is.

What is a Demo?

Bill Gates’s famous Microsoft software demos provide a first glimpse into this type of practice. The term ‘demo’ is an abbreviation of ‘demonstration’, but it in fact refers to a particular type of demonstration: a demo consists of showing how a technological device works. The demonstration may be given by one or more demonstrators before a chosen audience. The demonstrator(s) explain(s) how the device works. They can, by means of a carefully constructed scenario, link this to claims about various aspects: the quality of the product being presented; the value of a method adopted; the feasibility of a research project; or, for example, the significance of a theory that lies behind the prototype. Demos may also take the form of video recordings, or be transcribed in various ways. They may consist of combinations of text and multimedia documents, which are later integrated into software user guides or put online.

Although today’s public technology demonstrations have the common aim of showing how a technological device works, they are carried out by individuals as diverse as researchers, engineers, executives, consultants, project leaders, sales representatives and sales people, company directors or, for example, heads of marketing. They are as much the presentation of a device for pedagogical means as they are a sales demonstration, whether this be for a direct sale or a product launch in the vein of Steve Jobs’ famous Apple demos. Demos may take place during lab visits, in the offices of venture capitalists, at the stands of international conferences that attract academics, engineers and industry professionals, within the context of research seminars, at meetings held for the press and the general public, or at high-tech or entrepreneurial exhibitions aimed at engineers, business executives or the military. They may take place at any stage of a project, from its launch up to the final presentation phase by way of various prototype stages.

Considering this scope of possible contexts, demos can play very different roles ranging from audience persuasion and triggering sales to facilitating the exchange of knowledge and heterogeneous resources, or else for example identifying audience expectations and alliance building, as I will endeavor to show. The different types of interaction and the choice, building and availability of the audience go hand in hand with the constraints and the variable possibilities
that influence the nature of each demo, its use and the relationships between participants that are formed by the experience.

In the types of demo that I have been able to study the development of, the demonstrator generally begins with a form of monologue before engaging in dialogue with members of their audience, sometimes getting them to try out the demonstration tools themselves. Audiences therefore appear to comprise what I could call ‘demonstratees’, in order to underline the fact that they are not in general passive spectators, and to take account of the formative character of demos in the very definition and behaviour of these audiences. For example, over the course of a demonstration of a software prototype at an MIT laboratory, I was able to observe how the ‘spectators’ were asked to give their reactions and ideas and become advisers or potential partners in the project, much more than silent observers or simply entertainment consumers. Similarly, I observed how demos of a NASA software project uploaded to the internet were used to generate an audience of supporters that had not existed before, and to gather feedback for the software’s further development. These objectives helped to build an audience that again was more than a group of passive spectators.

We can try to explain public technology demonstrations in terms of a ‘spectacle’, but it is then important to ask – as art historians do – what these spectacles are precisely, how they play out, and what exchange takes place at their close. As I will demonstrate, this can take the form of various material and symbolic exchanges – of information, advice, contacts, funding or recognition – for presentation or delivery of a device.

It is, for that matter, important to be aware of the fact that demos may or may not be conceived as *spectacular* events, and to appreciate the variations and the evolutions of what is and is not spectacular according to individuals, groups and sociohistorical contexts: a demonstration may be seen as spectacular by some audience members and not by others in the same room.

The ‘spectacles’ that I have studied often play multiple roles that go beyond those that have generally been attributed to them in history. Although since ancient Greece *apodeixis*
(proof) and *epideixis* (display – one of the forms of rhetoric) have constituted the two customary categories when considering the nature and effect of demonstrations in general\(^3\), – and now serve as a background to think about public technology demonstrations in particular – these notions seem limited as a general rule. We should not underestimate the importance of these notions when thinking about demonstrations, but rather take other dimensions into account that in no way exclude the former concepts. In many cases, public technology demonstrations do not simply represent proof (that a device works well, that the theory supporting the device is valid, or that a certain approach is valuable), or persuasion tools (relating to the feasibility of a research project, for example); nor even do they simply represent a combination of the two. They are far richer economic and anthropological exchange tools.

**Rich Exchange Tools**

For many of the Silicon Valley artificial intelligence researchers that I met, demos represented first and foremost a way of introducing oneself. 'Hello, nice to meet you, I can give you a quick demo if you’d like': this phrase was the habitual greeting in the field. More specifically, it was a greeting used between peers or between researchers and sponsors or potential sponsors in the interests of initiating various types of exchange relationships. It was an immediate transaction proposition, which, while not strictly speaking commercial, contained a social and anthropological dimension: demonstrators would reward their host with a demo for accepting to meet. This initial trading of gifts was generally followed by other exchanges, the first being of information.

Demos often allowed the demonstrators involved in the development of a project to introduce themselves to peers or potential sponsors without requiring too big a commitment from them. Compared with articles or presentation portfolios that require a significant amount of individual reading, demos had a number of advantages for attracting the attention of a busy target audience. In particular, they held the audience in place in interaction. The demonstrators could then attempt to generate interest in their project with the aim of gaining, for example, symbolic

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credit, funding, or an alliance in the form of a partnership. They were quite capable of modifying the definition of their project in a flexible and dialectic manner depending on the reactions generated by a demo, and at the same time of encouraging demonstratees to modify their own projects in order to enter into a collaboration. They attained cooperation agreements by using demonstratees’ fear of wasting the time devoted to such events and the reflections they had gained from the demo, whether this be by putting communal actions in place for the development of a project or, for example, by means of a research contract between a laboratory and a firm. Demonstrators also had the opportunity of converting demonstratees into, depending on the case, promotors of their project, first customers, or witnesses capable of attracting a clientele via the accounts they gave, and to build up a network of relationships and markets, no matter how modest these were.

I was able to observe such phenomena, for example, in relation to a project, which I will refer to as ‘Alpha’. Alpha was launched by NASA and a network of American research organisations. Its aim was to develop planning and analysis software for the trajectories of spacecraft. Some Alpha demos consisted of showing researchers and engineers how the program allowed them to resolve astronomical observation problems using pre-selected examples, before asking the demonstratees to go on to try out the software on cases of their own choice. Analysis of the reactions incited by the demos and by the dialectic exchanges they generated proved an invaluable tool to guide the direction of the project for the demonstrators.

The relative strength of the demos that I studied in the United States as well as in Europe did not generally stem from the automatic capacity to strictly control viewpoints by means of 'end-demonstrations', that is to say demonstrations that were given once the project was complete\(^4\). I noticed instead that a number of demonstrators would methodically turn to demos to define or redefine successive stages of their project depending on the comments and criticisms expressed by different audiences. These reactions were sometimes the subject of reports circulating within demonstrators’ organisations. In the vein of beta versions of software put on the internet free of charge to test programs on users before putting them on sale, demos

\(^4\) For comparison, let us recall that the historiography of public demonstrations of technology has tended to underline demonstrations’ capacity to control viewpoints. See in particular Schaffer S., “Machine Philosophy: Demonstration Devices in Georgian Mechanics”, *Osiris*, vol. 9, 1994, p. 157–182.
constituted for demonstrators both a handy means of surveillance and a demonstratee data collection tool.

By observing reactions to their demos, demonstrators were able to identify the potential expectations of their audience: the ways in which the latter could appropriate the device, and adjustments required for the prototype in order to improve its adoption. In this way demonstrators did not have to resort to costly and often tricky-to-carry-out market research studies for sophisticated technologies designed for a small number of specialists. Demos allowed them to collect often very detailed information on the practices of their future partners or clients directly, and also to glean propositions for the elaboration of new versions and use of their device, as well as for the creation of new demos. This step was essential in order to incite demonstratees to participate in further developments of the project and to transform them into future users.

Regular use of demos thus represented a resource to construct a project, generate interest in it, and to sell it. In some cases it allowed an audience to be identified gradually for either an established or a still-evolving device, and for the technology to be adapted to future users just as much as the other way round. A project and its audience could become well targeted\(^5\) thanks to demos. These uses of demonstration-tests or demonstration-trials put demos at the heart of a set of almost invisible dynamics. I am referring here to dynamics that bind (rather than divide) the production and the promotion of science and technology.

**Project Evaluation and Monitoring Tools**

Although demos constitute useful tools for the facilitation of exchanges in general, their usefulness lies more specifically in the efficiency they offer in terms of project evaluation and monitoring. I have observed the way they allowed American and European researchers and engineers to display more tangible results in the evaluation of their projects than the most in-depth articles could do, and in a matter of a few minutes. The results could be understood by

busy and non-specialised managers, as well as, for example, political representatives from the most specific context of the ACTS programme. In fact, ACTS organised demos of the high-speed network and multimedia applications periodically over the course of their development, notably via video conference. These demos brought together executives and managers of European IT and telecommunications companies, engineers, researchers, European senior officials, lobbyists, journalists and European political representatives. The frequent organisation of demos allowed all these stakeholders to follow projects’ progress, which is often increasingly hard to do over the course of successive theoretical refinements. At the same time they offered demonstrators a resource for maintaining confidence in research programmes that often take place over several years, even though demos’ success was not guaranteed.

In this respect, it is important to note that the success or failure of a demo should be considered relative and, above all, considered in terms of the labels applied by demonstrators and members of the public in a sometimes contradictory manner to qualify how well a demonstration went, as there is no single, agreed-upon measure of success. Thus a demo that goes as planned and is expected to be met enthusiastically can leave an audience unmoved, or produce mixed or contrasting reactions. On the other hand, a bug encountered during a tech demo may be handled with humour by a demonstrator; be used to highlight the revolutionary (and therefore rather unpredictable) character of a new technique; or be considered as a lesson for the next demo, and therefore constitute a semi-success/failure.

In the European and American cases studied, demos allowed easier evaluation of projects than could be achieved via periodic analysis of a volume of academic publications. They also completed presentations of research results in the form of voluminous reports or summaries that required motivation to read that was not always present in research managers. They incited

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6 The organisation of exchanges between these different participants was thus marked by the use of spectacular demonstrations, which are in part comparable to (if we prescind associated forms of civility in particular) those that served as the basis for relationships between scholars, entrepreneurs and political and religious powers in France and England in the 17th century. See Licoppe C., *La Formation de la pratique scientifique. Le discours de l'expérience en France et en Angleterre (1630-1820)*, Paris, La Découverte, 1996. Furthermore, it should be noted that investigations into the use of demos in project management should not be limited to the contemporary period. Work carried out into the history of science and technology suggests fruitful research can be done into various periods as far back as antiquity. The history of magic lantern and hot-air balloon demos are good examples. See Hankins T.L. and Silverman R.J., *Instruments and the Imagination*, Princeton (NJ), Princeton University Press, 1995, p. 37-71. Thébaud-Sorger M., *L'Aérostation au temps des Lumières*, Rennes, Presses Universitaires de Rennes, 2009.
stronger and more diverse emotions than text generally does – whether it is in the form of prose or tables of figures or indicators – sometimes generating attachments to and enthusiasm for projects beyond a reasonable level of interest.

The demos studied also allowed executives and managers to judge projects not only according to the opinion of third parties summoned for the occasion to act as ‘experts’, but also on technological achievements of which they themselves could be the judge. The short time required to attend a demo – all the more dramatic if staged well in terms of timing – provided evaluators with a unique opportunity to learn about (or feel that they had grasped) a project presented to them, independently of the opinion of specialists. In other words, demos offered managers relative independence compared with the 'guarantor' model in the process of technological evaluation and decision-making.

This explains why demos were as useful for exchanges between participants in interdisciplinary projects such as Alpha as they are for Big Science projects (in particle physics, for example), which require many specialist teams\(^7\). Considering the heterogeneous skills of participants and problems of mutual understanding, demos provided precious resources for coordinating action and for the construction of boundary objects in a short space of time\(^8\). They in fact offered an audiovisual perspective on approaches and progress that specialised language and know-how tend to render opaque to non-experts.

In the majority of the projects that I studied, demos constituted the ideal vehicle to facilitate the shift from the world of the laboratory, which is marked by uncertainties that define the research process, and that of ‘decision-makers’ who seek the most certain scenarios and guarantees that projects will be completed. This shift relies heavily on demonstrators adopting a self-assured attitude in response to these expectations when performing their demos, and omitting certain doubts and difficulties. Claims of success and the quest for dramatic performances were sometimes only tempered by the legal risks associated with putting people


and possessions in potential danger by the technology, or by over-promotional speech – risks reinforced in the US by the significant role that lawyers play in large high-tech firms and their frequent intervention in partnership deals.

I also observed that demos constituted useful tools for the evaluation of projects while ensuring the protection of secrets. A device would act like a black box at a demo – showing how the technology worked without revealing the device’s principles or processes. For example, I observed this taking place on a project that I will call Mediannotation, which was carried out by MIT’s Media Lab. Its aim was the development of annotation and research software for multimedia documents using artificial intelligence techniques. Mediannotation demos showed how the software worked without giving away its content.

This way of working was particularly useful for projects of interest to the defence sector and industry: demos were thus in keeping with the traditions of spectacular demonstrations and the demonstrations of strength that typically characterise military displays. But they did not amount to a parade. Like theoretical articles, demos constituted resources with which to display results while keeping certain aspects of projects covered up.

Finally, demos followed the logic of exemplarity that characterises consultants’ presentations of projects and, in particular, their success stories, since they generally presented cases that were apparently exemplary and which were put forward as great successes. This form of demonstration suited the world of high-tech research in Silicon Valley very well, where subcontracting in terms of services is widespread, and many stakeholders hold consultant positions and must report back on a number of contracts.9

Considering the ways in which demos were used as I have just described, they contributed to the formation of unrealistic representations of research and technological production. The doubts and the more sensitive aspects that define the research process and project execution having been largely put to one side, facts tended to harden, assertions were transformed into unproblematic statements, and the route to progress appeared certain.

9 Rosental C., Les capitalistes de la science, op. cit.
Demonstrative Campaigns

I also observed within the context of several European and American projects demonstrators' extensive use of demos in various seminars, meetings, conferences, research institutes and companies to obtain contracts, identify new resources, inspire collaborations or establish a clientele. We were thereby dealing with an authentic demonstrative conquest tool. Regular exploratory work was carried out. It was key to cover enough venues in order to create a mass effect to circulate information about a project. Demonstratees therefore constituted witnesses who could be relied on to spread their experience of a project to wider circles than the technology's exhibition sites, and it was not unusual for an investment decision to be made based on an indirect representation of how a prototype worked, driven by accounts of a demo given in meetings or discussions in the corridor.

These demonstrative campaigns were not generally the work of isolated individuals. Rather they originated in attempts to orchestrate action and formed part of a coordinated operation between demonstrators. The latter would carry out demos at different venues at the same time; or, equally, they attended venues together to present complementary aspects of a project (detailing, for example, the nature of their theoretical investigations and technological research carried out in different domains). This formula reinforced the dramatic aspect of demos. The number of participants, just as much as their experience and the quality of the demo, contributed to impress an audience. Thus demonstrators met and interacted with demonstratees at various institutions through displays of strength\(^\text{10}\), highlighting the power of a device and the notable abilities of its creators. In other words, while demonstrating is generally perceived as being an individual activity, demos were far from being isolated one-offs. They were often carried out within the framework of campaigns to cover a number of venues in a reasonable amount of time.

Tools for R&D Organisations

Preparation of demos was generally very costly in terms of time and energy for the demonstrators I encountered. Like good science capitalists, some were keen to make their investment profitable. They would therefore reuse their demos in different demonstrative arenas. But this recycling industry did not only work at an individual level. It worked in exactly the same way for institutions which employed demonstrators. They would use demos produced on their premises for various means, in particular to ensure the continuation of their funding and promotion.

Such was the case, for example, at MIT’s Media-Lab, where the Mediannotation project was developed. Media-Lab founder Nicholas Negroponte strongly encouraged his collaborators to constantly make demos, and made his slogan 'demo or die'. These demos were, in particular, aimed at sponsors of the centre, and took place on frequent lab tours that were put on. Likewise, large institutions that finance those projects studied, such as NASA and the European Commission, would often go on to reuse demos on a large scale as a promotion medium to various economic and political authorities, journalists and the general public.

Demos equally constituted important management tools for these organisations. For example, I observed the way that ACTS officials asked programme participants to make demos and keep a regular and systematic account of them. These accounts served in particular as the basis for reports listing all the demos carried out by participants, whether these were in Brussels or a completely different arena, and the reactions of different audiences. These demos and reports were commissioned by ACTS officials for monitoring and administration of projects within the programme, and to display 'concrete' research results, with the aim of demonstrating effective management of the European budget. They proved invaluable tools for Commission members, firms and economic interest groups involved to justify funding and carry weight in negotiations relating to the development of R&D policies, and in particular for any necessary arbitration between the projects of large telecoms operators and those of tech SMEs.
These dynamics help to explain why senior officials in charge of the management of European Commission R&D programmes, who are responsible for their running when faced with industry competitors, suspicious national opinions and distrustful European parliament figures, have favoured and exploited the creation of demos to such an extent in recent years in projects financed by Europe\textsuperscript{11}. It is in turn evident why 'demonstration activities' have been placed at the heart of the chapter dedicated to science and technology in the recent European constitution project\textsuperscript{12}. This expression regards the provision of evidence to support the feasibility of research projects. The concept opposes the launch of dead-end R&D activities. In this way demonstrations hold the key to allowing European science and technology into the constitution.

**Project Versions and Irreversibility**

While the use of demos appeared to play an important part in the management of groups of projects as well as individual ones, I also observed the extent to which it had a strong impact on projects’ development and on their results. The use of demos contributed most notably to the structuring of projects around ‘versions’, and to a rapid irreversibility where content was concerned.

In research into high-tech domains above all, demo devices are currently used as versions of products. The speed of the corresponding industrial sectors is such that those involved are plunged into a state of permanent flux, in which it is not uncommon for demonstrators to prefer to talk about versions of a product for which the functionality is still in development rather than talking about experimental models, or even prototypes. Industrial sponsors would view the future of an ‘experimental model’ as pretty uncertain. Use of the different terms ‘experimental model’, ‘prototype’ and ‘final product’ are in fact applied according to the circumstances in which demos are performed.


What is more, the stakes involved with demos are so high that the demonstrators I met were often keen to have mastered the functioning of their device before showing it to the public. They generally preferred to present a device that they were very familiar with the faults of to a model improved a few days before the performance. In the latter case, the technology's functioning would be less certain. Considering the time it takes to learn the behaviour of a sophisticated device, it was common for tools used for demo campaigns to feature in versions. Demo tools could therefore be protected by law, be the object of commercial transactions and be made into products. In the case of the Alpha project, for example, demonstrators stabilised the design in successive versions, which benefited from further improved functionality. Proceeding this way helped demonstrators suggest that further research would bring even more ‘concrete’ results within a ‘reasonable’ period of time.

The need within certain domains to produce demos in a short space of time constitutes an important but often unperceived cause of irreversibility. The history of Qwerty typewriter keyboards offers a good illustration. Qwerty keyboards have been used on nearly all typewriters in the English-speaking world since the end of the 19th century. However, many keyboards designed for quicker typing have since been introduced, without much success. This paradox makes this long episode a beacon for the history of technology and economic history. It in fact presents the more general problem of the quick and sometimes surprising irreversibility of an innovation’s success.

The inventors of the Qwerty keyboard sought to address two distinct types of problem: the quest to find a layout of letters that allowed the user to type as quickly as possible; and certain constraints imposed by the mechanisms of typewriters of the day. It was a fact that two adjacent letters on a keyboard had a tendency to jam if used in quick succession. The inventors therefore had to be sure to separate letters that followed one another most often in common words.

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Historiography sheds some light here, but does not fully address a consideration that had just as big an influence on this development. In order to ensure the commercial success of typewriters, seller-demonstrators needed to be able to type a word in a flash in front of their potential clients. The chosen word was ‘typewriter’. To carry out such a spectacular demonstration, it was essential that all the letters needed for this word be found on a single row of keys. The layout of the Qwerty keyboard duly took this constraint into consideration. All the necessary letters could be found on the top row of keys.

The prospect of needing to carry out demos of the device had thereby determined the considerations and the very design of the product in the work of its inventors. This case illustrates the significance that paying careful attention to demos can have for fully understanding the emergence of a world of objects and the uses that derived from them. It calls for the study of particular types of path dependencies in a product’s development. To understand why various devices have taken certain forms, we must consider the fact that their inventors have had to carry out demos at some point, whether this be on completion or throughout the conception process, and that this journey has determined the content of the products.

Demos, whether carried out by inventors and sales representatives of the late 19th century, NASA researchers, or even for example medical representatives in the pharmaceutical industry, are in no way an insignificant practice. They deserve to be analysed systematically within social science to form an in-depth picture of the practice’s many ins and outs.

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