Flexibility as a key construct in European training: experiences from the TeleScopia Project

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Abstract

Increasing the options available to the learner as to when, how, where, with what materials, and what he or she learns is becoming increasingly important, not only for personal and educational reasons but also for economic motivations. Increasing the flexibility of training for persons already in the work force is seen as particularly appropriate, and telematics applications are expected to have particular value in facilitating more-flexible course delivery in training and workplace contexts. In this analysis we consider the concept "flexibility of training" in more detail, decomposing it into a series of, sometimes incompatible, dimensions and presenting some propositions as to likelihood of the different flexibility dimensions becoming implemented in practice. The study of flexibility relative to trans-national tele-learning is illustrated through its central role in the research component of the TeleScopia Project, sponsored by the Commission of the European Community.

Introduction: toward more-flexible training and education

Although interest in "open and flexible learning" is by no means a new phenomenon, there are a number of new impulses stimulating a renewed cycle of interest. As an example, the concept of workplace-based, "just-in-time learning, when and where you need it" (Arnett, 1993) is being called a "paradigm shift for the Year 2000" by a major international corporation which is turning toward the concept as its standard in-house training model. Just-in-time learning, as a form of flexible training, is seen as access to integrated learning materials, information banks, communication channels, and tools, so that the learner, at his desktop and with varying degrees of coaching, can call up an appropriate amount, content and type of learning material when it is necessary and useful for his or her work performance (Barker and Banerji, 1993). The appropriate amount may be a full course or a short module; the appropriate content may be partly or completely determined by the learner; and the appropriate type of learning material may be the learner's choice of a simulation program, a tutorial program, a book

(retrievable in electronic form), a data base, a full-set of course materials, or a combination of resources. With this paradigm, the worker, perceiving a learning need in his or her personal situation, turns "just-in-time" to an integrated computer environment which offers a range of learning materials and tools for the appropriate selection and management of the chosen materials. The worker chooses, with support of the system (or a combination of system and human resources), the appropriate unit of learning material, thus learning, in theory at least, what is needed for the learning problem at hand.

Although such a paradigm shift is far from widespread realisation and offers immediate challenges when considering its implementation or even philosophy (for example, how does the learner know what is best for his or her needs?), movement toward this paradigm is already occurring in the training field and its underlying assumptions are implicitly accepted. In a special report from the Commission of the European Community, Directorate General XIII, the critical importance of flexible learning and training in Europe is assumed (Van den Brande, 1993). There must be more flexibility to meet the needs of the learner, through adaptability to different learner needs, learning patterns and settings, and media combinations (p. xxi). Flexibility is defined as:

... enabling learners to learn when they want (frequency, timing, duration), how they want (modes of learning), and what they want (that is, learners can define what constitutes learning to them). (Van den Brande, 1993, 2)

Reconceptualising training in terms of more flexibility

This paradigm shift could be seen as a movement away from a training model in which learning is offered in courses whose key characteristics such as content, time of delivery, location of delivery, method of delivery, instructional approach, and learner-support aspects are fixed by the course provider, to a model where the learner is the central decision maker and has a range of options from which to choose with respect to each of these and other key aspects of the learning experience. Diagrammed simply, this is a movement from:

Training Offer Fixed in its Key Aspects	→	Training Offer More Flexible in its Key Aspects
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Some ways to operationalise this are indicated in Table 1.

Arguments in support of more flexibility in training

From the economic perspective (macro and micro), it is supposed that the new methodologies—increasingly possible because of the availability of the new technologies—can lead to productivity gains at three levels: the individual learner, his or her employing organisation, and the society or region to which the learner belongs.

Some examples illustrate how more-flexible, problem-induced, just-in-time learning could benefit the individual learner:

- less time needed and lower expenditures for a particular training event
- better quality of results achieved, in that only the necessary content, in the most up-to-date versions, is chosen

Table 1: Dimensions of course participation in which learners could be offered a flexible choice of options

<i>Current situation (fixed): Course provider decides in advance how the dimension will be offered in the course</i>	<i>Future, desired situation (more-flexible): Recommended options to offer the learner</i>
1. Course provider determines the approach to the social organisation of the course, either class or group oriented ("remote classroom"), or individually oriented ("correspondence type distance education")	1. Offer a choice: (a) Does the learner prefer being part of a group, participating together in the course? Or (b) Does he prefer working individually, without a sense of having "classmates"?
2. Course provider determines the selection of content, content sequencing, and learning activities	2. Offer a choice: (a) Does the learner wish the course provider to specify the content, content sequencing, and learning activities? Or (b) Would he prefer making his own choices as to content, content sequencing and learning activities?
3. Course provider determines the set of learning materials provided for the course	3. Offer a choice: Options include educational software, distributed resources via the World Wide Web, video-library resources, multimedia databases
4. Course provider determines the major way or ways in which learner interactivity is to occur in a course	4. Offer a choice: (a) Does the learner prefer real-time, realistic human-to-human interaction? (b) Does the learner prefer text-based human-to-human interaction, asynchronously, so that time is available to reflect on one's comment and to answer when one wants? (c) Does the learner prefer to interact cognitively with an appropriately designed computer program or other learning materials instead of via communication with a person?
5. Course provider decides on the technical platform for the course	5. Offer the learner a choice among three major platform variations (or their combination): (a) A "home" platform, with television, telephone, video recorder and player, and perhaps a stand-alone computer; (b) A computer-network platform, with access to email, perhaps computer conferencing, and perhaps the World Wide Web via the Internet; (c) An interactive video platform, perhaps via ISDN or ATM, allowing two-way audio-video, perhaps also allowing application sharing

Table 1: Continued

<i>Current situation (fixed): Course provider decides in advance how the dimension will be offered in the course</i>	<i>Future, desired situation (more-flexible): Recommended options to offer the learner</i>
6. Course provider decides on the language(s) to be used in the course	6. Offer the learner a choice on the language to be used in: (a) Lesson materials, (b) Asynchronous communication, (c) Real-time two-way video or audio interaction, and (d) Face-to-face contacts
7. Course provider decides if course is to be experienced entirely at a distance, or as a mix of distance and face-to-face	7. Offer the learner a choice: (a) Does he wish to experience the entire course "at a distance"? Or (b) Does he want to combine distance and self-study aspects with some face-to-face sessions?

(from: Collis, 1996)

- higher professional satisfaction, through less constraints relative to training deficiencies and more-adequate handling of professional tasks

There can also be gains in productivity for the learner's employer:

- less direct costs:
 - for training
 - for services contracted from outside for maintenance or consulting
 - for investments (if the same equipment can be used more times, if only necessary updates of equipment and resources are ordered)
- less opportunity costs (foregone earnings) by:
 - less idle time for workplace equipment
 - less time away from the workplace (Clar, 1995)

The accumulation of such gains in productivity, from a macro-economic perspective, is expected to yield additional gains in productivity, not only for the training-output component of an overall system after new technologies have been extensively spread in a region. After a threshold number of employees have been trained according to the new concepts, and consciousness is raised with respect to the underlying paradigm shift, transformation is facilitated toward less resource-intensive organisational patterns at the company level and toward more-flexible learning organisations (see Clar, 1995). Further gains can be reached through new types of networks conceivable in organisations restructured adequately. Furthermore, a critical mass of those organisations and networks in different parts of a society or region (production sector, administration, R&D sector) can lead to efficiency gains at the societal level: a less-natural

capital-intensive society, more knowledge intensive, more innovative society with more and more adequate occupational opportunities (in a broad sense). These conclusions are taken from work conducted within the TeleScopia Project which is described below. Responsible for a work package on macro-economic aspects within this project was the Centre for Technology Assessment in Baden-Württemberg, Germany, in cooperation with TechNet Finland, a Finnish national information broker and a member of COMNET, TII, SATELLITE, SATURN, E.C.L.O., and IACEE. In particular, the above conclusions come from Clar (1995).

In addition, from a psychological perspective, more-flexible learning situations can be related to the desirability of situating learning in meaningful problems and giving the learner control over his learning choices (Jonassen *et al.*, 1994). A constructivist approach to learning is anchored in these propositions (Cooper, 1993). From an educational perspective, theories and experience with adult education show such education to be effective to the extent that it is relevant to the adult learner, closely related to his own learning history, has transfer value to his work, and is efficient in terms of demands on his time and energy (Enckevort *et al.*, 1986). All of these require individualisation of training experiences, and thus call for increased flexibility in training alternatives.

The flexibility hypothesis is itself based on the assumption that more productivity in training output is a desirable, and necessary, goal (see, for example, Schoenmaker, 1993). This assumption, that more productivity in training output is desirable for society, is generally taken as axiomatic. The hypothesis that increased flexibility leads to increased productivity, however, should be seen as just that—an hypothesis, for which an eventual validation will be needed.

Preparing for a test of the More Flexibility → More Productivity Hypothesis

Even though theoretical rationales can be elaborated to support the reasonableness of the Flexibility-Productivity Hypothesis, it is nonetheless still a hypothesis which will eventually need a systematic examination. The methodology for such a test from the macro-economic perspective is currently under investigation and debate at many levels and will require extensive longitudinal data at the system and cross-system levels, beyond the scope of a short-term European project.

However, preliminary steps need to be taken to help prepare for an eventual validation of the More Flexibility → More Productivity Hypothesis. One of these is closer examination of the concept “more flexible”, particularly in terms of new opportunities for educational delivery that are being made available by advances in communication technologies. It is possible that such technologies allow new possibilities for training flexibility that were not feasible during earlier waves of discussion about “open and flexible” learning (see, for example, materials of the UK Training Agency, 1988). For example, developments in networking technology allow the simultaneous delivery of sound, video, graphics, and data; document and application sharing through desktop computers; and the combination of satellite broadcast technologies with various

forms of synchronous and asynchronous two-way interactivity. Many questions, both practical and conceptual, can be addressed in a close consideration of flexibility, including:

- How can we use communication technologies to make training more flexible?
- What problems and issues will confront the learner, the instructor, the course developer, the learning-material developer, the training manager, the employer, the traditional training sector, those providing local support to the learner, those involved with training as a commercial market, and different levels of government related to the increase of flexibility in various aspects of training offer?
- In the context of these problems and issues, what are the cost implications of increasing flexibility in training?

Studying training-offer flexibility through telematics demonstrator projects

The above issues and questions relating to increasing flexibility in training, particularly in the context of advances in communication technologies, are being studied throughout the world, at a variety of levels of systematic analysis and with varying degrees of opportunity for the integration of theory with telematics-based demonstration projects and field trials. The Commission of the European Community has recently (1994–5) supported an ambitious project attempting to optimise the opportunity for this systematic analysis and integration of theory and demonstration (Köhler and Collis, 1995). This project, TeleScopia, is described in the next section of the paper and its focus on flexibility is elaborated. The relationship of the research component in TeleScopia to the broader long-term investigation of the “More Flexibility → More Productivity Hypothesis” is also described.

The TeleScopia Project

The TeleScopia Project was a one-year special joint project of DGXII, DGXIII, and TFHRETY (Task Force Human Resources, Education, Training and Youth) of the Commission of the European Community, one of four successful consortia in a 1994 European-wide competition for a special initiative spanning the transition between the previous research and developments in open, distance, and flexible learning stimulated by the Commission and the activities that were to emerge in the upcoming Fourth Framework Programme (for which proposals for involvement were submitted in March 1995). (The other successful projects were HUMANITIES (Historic Universities Multimedia Network for Innovation in Education System) coordinated by the COIMBRA Group, EOUN (European Open University Network) coordinated by the European Association of Distance Teaching Universities (or EADTU), and LOGOS (focusing on transnational adaptation of open and distance courseware for demonstration actions aimed at small enterprises) coordinated by SILOGIA.)

For the TeleScopia Project (the name “TeleScopia” is derived from the phrase “Trans-European Learning System for Crossborder Open and Interactive Applications”), the project leader Deutsche Telekom managed a consortium of 13 project partners in 8 different countries. These partners were: Deutsche Bundespost Telekom, University

of Twente, Technet Finland, France Telecom/SNE, ENIC (Ecole Nouvelle d'Ingénieurs en Communication), I.E.T. Ltd., Berlitz European Projects, Consorzio Nettuno, Centre of Technology Assessment, La Sept/Arte, UETP Macedonia/Aristotle University of Thessaloniki, Institut für Wirtschaftsberatung Berlin, and UETP-EEE. In addition, there were many other institutions associated with the project, as field sites and as contributing partners. The project endeavoured to bring together the elements which are needed to add a variety of more-flexible aspects to existing courses so that they can be offered in trans-European telelearning variants, and to conduct telematics-supported learning events that allow more-flexible aspects of training to be offered in actual learner-site environments, distributed throughout Europe.

The unique contribution of the TeleScopia Project was that it provided within a single framework of co-operating partners representing telecommunications providers, course providers, and researchers, and with access to the most powerful telematics channels feasible for training delivery in today's practice, a rich diversity of trans-European experiences that were systematically and strategically synthesised.

To realise this, the TeleScopia Project was organised around three components: Component 1 (dealing with research within the project; Collis and Vingerhoets, 1996; Köhler and Collis, 1996); Component 2 (dealing with technology within the project; France Telecom, 1995); and Component 3 (relating to the course adaptation taking place within the project; Collis *et al.*, 1996). Appendix 1 gives an overview of these components. Here we highlight aspects of the project related to flexibility.

TeleScopia and the investigation of flexibility in training

Because of its limited time span, the TeleScopia Project could not directly test the hypothesis that if European training moves toward a new training paradigm, one characterised by appropriate and feasible flexibility instead of fixedness in terms of key organisational, instructional, and delivery conditions, then improved productivity will result. Instead, TeleScopia studied some initial conditions of such an hypothesis: Given access to a wide range of communication technologies and support for their use, how will course providers respond? In what ways will these technologies allow or stimulate more flexibility in the training options available to the learner? And as an accompanying task, how can flexibility be modelled? Referring to research that has already been done about increasing flexibility options in training (for work done in the framework of the DELTA-MTS Project, see Vingerhoets, 1994), Component 1 identified an initial set of flexibility dimensions for investigation during the project. A description of these dimensions and a sample of ways in which flexibility in training offer can be increased relative to those dimensions follows.

Flexibility dimensions

When flexible education or training is discussed, most of the time the primary reference is to flexibility in the time and place of participating in a course. These are two of the dimensions of flexibility for which the learner is generally offered some choice of options in traditional distance education. However, even within traditional distance education,

many variations exist that can limit these core flexibilities. Learners may be occasionally required to attend residential sessions on specific days or go to local study centres or may have to complete their work by specified days or participate, via technologies, in distributed group discussions or sessions, all of which impinge on the learner's freedom in choosing when and where he or she will learn.

But besides time and location, it is also possible to identify many more aspects of courses which could be more flexible, including the idea that learning is not something that has been organised by someone into a course, but instead is the act of giving the learner the choice of a course, or modules, or self-selected self-study materials (an idea that is being implemented in just-in-time learning systems such as described earlier, see Barker and Banerji, 1993). Table 1 identified seven such dimensions. The following set of dimension categories was used for studying the movement from FIXED → FLEXIBLE training within the TeleScopia Project:

I. Flexibility related to time

Among the ways that learners can have flexibility with respect to time is to offer them the possibility to choose their own dates and times of learning. Some current options are:

1. study at periods of released time during the regular workday
2. study during evenings and weekends
3. study during a block of released time, away from the regular job entirely

When only one of these course options is available to the learner, the course could be seen as fixed in the time dimension. However, when more of these options are offered to the learner, the course is more-flexible in the time dimension.

II. Flexibility related to content

There are many ways in which learners can have options with regard to content. For example, level flexibility refers to the possibility for the learner to choose his or her own level of the topic to study during a course. Some current options are, for example:

1. study a topic at the basic level
2. study a topic at the intermediate level
3. study a topic at the advanced level

When only one of these course options is available to the learner, the course could be seen as fixed in the content-level dimension. However, when the learner can select among these content-level options, the course can be described as more-flexible in the level dimension.

III. Flexibility related to entry requirements

Conditions-for-participation flexibility refers to the possibility for the learner to choose his own conditions for participating in a course. Some current options are:

1. starting a course only when a pretest is passed
2. starting a course only when the learner possesses some predetermined certificates

3. starting a course when the learner decides it is useful regardless of the learner's formal study background

When only one of these options is available to the learner, the course could be seen as fixed in the conditions-for-participation dimension. However, when more of these options are offered to the learner, the course is more-flexible in this dimension.

IV. Flexibility related to instructional approach and resources

There are many possibilities for learner options with regard to instructional approach and resources. For example, instructional-organisation-of-learning flexibility refers to the possibility for the learner to choose how the learning-process should be organised. One of the most important distinctions that could be made with regard to the choice between independent learning (or self-learning) and cooperative learning. Flexibility in relation to these options is further explained in Fuchs *et al.* (1995).

Language flexibility refers to the possibility for the learner to choose his or her own preference with regard to language of learning and learning resources. Some current options for offering such flexibility to the learner are described in Collis *et al.* (1995).

V. Flexibility related to course delivery and logistics

This category includes a broad range of aspects relating to how the learner can receive course materials, can study and participate in the course, and be supported locally in his or her study needs. For example, the learner can be offered support via a helpdesk, by being able to contact the tutor face-to-face, by being able to contact the tutor at any time (via electronic mail), by being offered group help sessions, etc. In a fixed system, the learner has no choice among these support options; in a more-flexible system, the learner has a variety of options for support from which he or she can choose.

To consolidate focus on these and other initial candidates for key flexibility dimensions, we generated the diagram shown in Figure 1.

This schematic representation is overly simplistic; for each of the dimensions the meaning of a movement from fixed to more-flexible needs further elaboration. For example, moving from fixed to more-flexible offer with respect to the social organisation of learning within a course can be seen as offering the learner more options with respect to organisational structures. Thus in a fixed-option course, the learner would have no choice as to if he is to carry out course requirements by working individually or by participating in group activities; the instructor would make this choice and inform the learners accordingly. In a more-flexible course, the learner would be offered the choice of the social organisation of learning—by him or herself, or with a group—and would make this choice based on individual needs and preferences. Similarly, the dimension relating to learning resources can be described as “fixed” if the instructor decides what media mix and materials will be used in the course, and as “flexible” if the learner can choose among various different types of learning media and materials, based on his or her own learning-style preferences and situations.

Figure 1: Dimensions of training flexibility, from the perspective of options available to the learner

Initial propositions about flexibility

It can be predicted that moving from fixed to flexible will be more difficult to implement in practice for some of the dimensions than for others. In TeleScopia we predicted:

- Time- and place-flexibility will be easiest to implement in the TeleScopia courses, but it will be increasingly difficult to offer flexibility on other dimensions
- In practice, the costs of realising flexibility are high
- The attempt to offer increased flexibility on a number of dimensions will lead to conflicts for the instructor, the learner, the learner's employer, and the organisation providing the instruction.

These and other propositions were studied in the TeleScopia Project, and a discussion of results can be found in a variety of sources, including the full final report (Köhler and Collis, 1995), and also Moonen, 1995; Collis *et al.*, 1996; and Collis, 1996. Here some main reflections relative to flexibility will be summarised and briefly discussed.

Results and reflections

Were learners offered more flexibility in their learning choices?

In general, the TeleScopia courses primarily increased the options for communication that were available to the learners. Learners could communicate more flexibly with tutors and other learners through use of email and computer conferencing. In one of the courses, learners could arrange the time for a real-time desktop-conferencing session between themselves and a distant tutor. In a number of the courses, real-time video-conferencing events were included, but not in the sense of offering the learner the option of participating or not. The event was planned, and it was expected that all learners would participate. Thus, communication technologies increased the range of possibilities for communication within the TeleScopia courses, but were not presented as options among which the student him or herself could make the choice. Learner choice related to how often and when email and conferencing would be used, but within definite limits set by the course.

The majority of the TeleScopia courses were already being offered at a distance to students before their TeleScopia variations. Thus these courses already demonstrated various degrees of time- and place-flexibility. However, the communication technologies themselves limited the time- and place-flexibility considerably. Learners had difficulty accessing the equipment needed to communicate, and tended to have to do this from special locations available to them only at certain times. This is especially true with video-conferencing and interactive television, but also so even for the WWW and computer conferencing and email. Most learners were not set up to work at their desks or from their homes in a flexible way with communication technologies.

With regard to other dimensions in which increased flexibility could have been possible (see Figure 1), there were only two of the TeleScopia courses which emphasised flexibility related to content. In one of these courses, offered through the WWW, the

technology made flexible access to resources and communication easy for the learners (once they could access the WWW itself); in another of the courses, the technology allowed a personal tutoring session to take place, with content based on the learner's needs, via desktop conferencing. In the other courses, there was little deliberate attention given to offering the learners a choice in content, or in study resources or media form. With regard to learner flexibility with respect to instructional organisation, none of the courses explicitly offered learners a choice of individual or group-orientation. The courses were generally meant to be experienced by all learners in the same way, with the same resources, and covering the same content. More flexibility was seen in terms of support for the learners, with local tutors and on-line tutors (via email) available for most of the courses and available to the learners in a variety of ways. (For a fuller analysis, see Collis, 1996.)

In summary, what we saw in TeleScopia was enrichment of the communication aspects of course experiences, rather than flexibility in instructional design. Many innovative activities occurred in the courses, with generally very positive learner response. However, in terms of using technology to offer the learner a wide range of choices with respect to what, how, when and with whom he or she studies, we cannot say that increased learner flexibility occurred relative to most of the dimensions shown in Figure 1. The course providers planned and offered innovative and exciting courses, but they were still intact courses; the learners were offered little explicit opportunity to tailor the courses to their own needs and interests. The transition between offering a well-designed and well-supported course, and offering more of a "cafeteria" of options will require conceptual changes not only for course providers but also for the broader society.

Costs

With regard to the cost aspects of increased flexibility, the TeleScopia experience yielded interesting results (Moonen, 1995). Increasing the opportunities and ways of communicating may well enrich the course experience, but it is expensive, both in terms of technical aspects and in terms of human costs. Interestingly, the different technologies involved in the various TeleScopia courses did not lead to much variation in the overall costs of the courses. Moonen calculated the break-even costs for the courses and the numbers of students needed to reach cost-recovery in the courses, and pointed out that to reach these levels in practice, instructional models that do not emphasise human communication need to be considered.

Conflicts in flexibility provision

It is clear that it will be a complex task to implement some aspects of increased flexibility, while other aspects may be more easy to implement. Depending on the aspect of flexibility that has to be implemented, there will be higher or lower costs connected to the implementation. Main conflicts and constraints that will accompany attempts to offer the learner more flexibility also need to be systematically examined. The TeleScopia experience demonstrated that many different perspectives can be taken with respect to conflicts and problems confronting increased flexibility.

Conflicts from the perspective of the instructor

When the learner is given more choices, the instructor is increasingly required to respond rather than plan and deliver

"... flexibility, in turn, provides the tools to release the teacher from the traditional role of lecturer and lab instructor to become a leader, motivator, and facilitator of learning" (Glazer, 1984, 1).

In some ways this is liberating for the instructor: he or she can choose from a wider range of approaches, of material, of learning settings in order to make these options available in response to the wishes of different learners. In addition, instructors can alter their own times and places of work if they are not so much tied to set lecture times and office hours as before. Thus more-flexible learning for the learner brings more options to the instructor as well, although not always reflecting the instructor's choice but rather in reaction to the learner's choices. Moving to more-flexible scenarios will have an impact on the instructor's pedagogical patterns. This also means that the time burden on the instructor and support provider will become constraints on the goal of flexible support for the learner. More-tailored training can be more time and effort consuming than standardised approaches for the instructor. The more choices the learner has, the more demands and thus constraints there are on the instructor. Furthermore, flexibility options for the learner will have significant organisational impact on the course-delivery institution. And there will be conflicts from the point of view of course delivery and organisation.

Conflicts from the perspective of the individual learner

Flexibility in education and training is attractive to adult learners because it offers in theory broad possibilities to respond to their specific needs and aspirations (Bosworth, 1991; Whiting, 1988). This is particularly helpful when the adult learner, as an employee, can choose his or her own place and time of learning, and thus can learn at a distance from an educational institution. Obviously, this is attractive for employed learners because often they cannot attend classes at regular times and at places away from their workplace. Fleming however goes beyond time and place flexibility for the learner when he compares the learner in a flexible educational setting to a client in a supermarket system:

"Modular structures, credit accumulation schemes, independent learning and so on, can create a supermarket system in which students wander freely, picking up this course or that, having as little contact with lecturers as supermarket shoppers have with anything resembling the friendly village grocer. These changes may empower learners ..." (Fleming, 1993, 321).

However, such a cafeteria approach can also bring conflicts to the individual learner (Ligorio, 1995). For example, more flexibility brings with it more independence but also the need for more self-direction, more self-motivation. Flexible study locations and time can mean solitary study not comfortable for many learners. Giving learners their own choice of time, content, method, media, route, and pace will mean less chance of group interaction and peer-to-peer communication.

In addition, there are considerable difficulties relating to the assumption that employers and employees will accept "learning" in this less formal and more self-responsible

framework, given the long social and political development of the expectation of being paid for one's time and of expecting an expert to have taken responsibility for training decisions that governs many layers of the workplace. To continue the comparison with a supermarket:

"... when I go to the supermarket I already have a sort of plan. I have written down a note, or I know whether I am going to do shopping in order to make a dinner for a certain number of people, or if I just want a few everyday items. And also my competencies about shopping come from the fact that I went shopping first with somebody else (for example my mother). Back to a "flexible" student, ... he should have some sort of plans, goals, motivation already ..." (Ligorio, 1995, 1).

Not every individual can or will have this background or will want to make choices for him or herself; intrinsic problems in offering more learner-centred choice. Many learners will need or appreciate an expert making the choices for them.

Conflicts from the perspective of the companies/organisations who want training

From the employer's perspective, "just-in-time" flexibility also involves many issues and problems. For example, it means the employer cannot so easily plan for when the employee will be "away at a course" or what the quality control of the course experience will be. Sending an employee to a well-structured course, on the other hand, can be planned and budgeted for and its effects anticipated as systematically as possible.

"Conventional training tends to require blocks of time away from the job, or a regular commitment such as day release. Open learning allows training to take place when it suits the company; this can help if:

- production or services would be disrupted by releasing staff to attend training
- employees are on shift work
- employees are dispersed around the country or often on the move"

(Nedo Training Agency, 1995, 2).

However, the more flexible the training, the more complex the situation for the employer and the employee in a number of ways, particularly relating to costs. These costs involve what is incurred by the home organisation of the employee to be trained as well as costs to the learner him or herself. A crucial issue to consider is the time involvement of the employee participating in the training: is the training within the regular working time of the employee? In this case, the majority of the costs are the burden of the organisation and often are directly noted. For example, an employee going away to a course for a week may have to be replaced and his or her travel financed; these costs are tangible. However, a conceptual difficulty comes in at two levels. The first level relates to the consequences of the employee being away, in terms of things going wrong or less well in his or her absence, many of which cannot be specifically measured in that they are not officially noted, or their consequences may not show up until the long term, or they are missed-opportunity costs that can never be identified. The first conceptual problem, therefore, is how to represent these costs. The second conceptual problem relates to the situation when the trainee follows training in his or her own time. The issue then is, as no money is involved from the organisational point of view, that the costs in terms of time are not being represented in a tangible way. Are these real costs or not? In the time that the employee is studying, he could be doing something else that would bring more direct benefit to him or he may be making himself overtired so that he is less productive

Table 2: Factors constraining learner flexibility

<i>Key constraints on learner flexibility</i>	<i>Key actors related to the constraints</i>
Learner flexibility is unmanageable ...	<p>— Tutors (instructors): Cannot handle what can amount to individualised instruction because of time and also cognitive constraints, if the number of learners increases</p> <p>— Course providers do not have the time or resources to anticipate the permutations of options that a learner may choose and have a cohesive, good-quality course available to reflect those options</p>
Learner flexibility is not acceptable ...	<p>The legitimising agency related to a course cannot handle a wide variety of course permutations in terms of recognition for the course</p> <p>— The culture of which the learner is a part is not oriented toward the idea of learner choice, but instead expects the course provider to be responsible for pre-specified decisions about the course offering</p>
Learner flexibility is not affordable ...	Each combination of options may require some “re-engineering” of the course; economy of scale is not likely to occur. Personnel and technical implications of many learner choices are much more costly than any course provider could support
Learner flexibility is not realistic ...	<p>Learner flexibility may require an imaginative and creative approach to course re-design that is outside the scope of many course providers (relatively few persons are innovators)</p> <p>— Some combinations of options are not compatible with each other by their very nature (if a learner prefers to work at an individual pace, choosing his own content and sequence of content, he cannot expect to also be having real-time interactivity via video-conferencing with “class mates”; if a learner chooses to work in his own language and it is a language that others in his course do not speak, he cannot insist on a stress on human-human interactivity, either real-time or asynchronous)</p>

(from: Collis, 1996)

during regular work times. The conceptual issue is if these kinds of costs should be considered or not, and if yes, how they should be measured or if it is possible to measure them.

Given the above considerations as well as the broader range of data from the TeleScopia Project, Table 2 summarises some of the major constraints confronting the desire to make training more flexible for the learner.

Applying the TeleScopia experience to European training

The TeleScopia experience can bring a number of benefits to future European training offerings. Through the many questions which were studied and through the opportunity to address these questions within the context of powerful technological support and platforms, the project has yielded insights and ideas which at the least have been helpful to the project partners. However, a major contribution of the project is that it has been able to synthesise a wide range of experiences around the common issue of flexibility and taking advantage of a wide range of technical services as a useful preliminary study relative to the yet-to-be-tested More Flexibility → More Productivity Hypothesis. Thus even while TeleScopia investigated its own research questions, it has made a contribution to the larger question of how (or even if) increased flexibility in training will yield increased European productivity. The majority of the TeleScopia partners are continuing to address variations of this question in two new (1996–8) projects sponsored by the Commission of the European Community: PLATO and FORUM.

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Note: This paper is based on various research reports of the TeleScopia Project. All TeleScopia Deliverables referenced in this article are available from: Ms I. Dremeau, Deutsche Telekom AG, Generaldirektion, Friedrich-Ebert-Allee 140, 53113 Bonn, Germany. The authors were members of the research component of the project.

Appendix: Overview of the TeleScopia Project (1994–5):

Component 1

Component 1 focused on research and involved two streams of activities. The first focused on methodology: how to identify and address a set of key research questions, important to both the scientific framework of the project and the practical experiences of the course providers. The approach of a multiple case-study analysis was chosen, with each research partner responsible for studying one of the courses as a case, and also responsible for examining a particular research question across all the cases (see Collis and Vingerhoets, 1996). The stream of activity involved carrying out the methodology through the on-going analysis of the multimedia course-delivery cases employing a variety of perspectives, including those related to educational psychology, market analysis, cost-effectiveness, human-computer interaction, cognitive science, and cross-cultural comparative analyses, in order to address the key research questions (Köhler and Collis, 1995).

Component 2

To realise the telematics infrastructure for the TeleScopia courses, Component 2 involved offering the participating course providers a platform to support trans-European network learning that included the availability of interactive TV, interactive audio-video connections using ISDN, WWW sites, and a variety of other facilities involving communication technologies such as computer conferencing that did not require an ISDN connection. The technical platform for TeleScopia involved three different scenarios of which the course providers could choose various combinations used in conjunction with a wide range of learning media and learning activities:

- Scenarios involving interactive television sessions
- Scenarios involving ISDN video-conferencing and videophony
- Scenarios involving data communication via ISDN and PSDN

The following is a summary of the technical platform for TeleScopia, provided by the France Telecom as a partner in the project (1995):

Interactive Television Network (ITN)

The European television network available to the TeleScopia course providers was composed first of a television studio (the main centre) and second of interactive centres and receiver centres with trainees. The TV studio, located in France or in Germany, broadcasts interactive programmes all over Europe via satellite. These programmes are received in interactive centres or receiver centres located in the different European countries. Teachers, instructors, and content experts are located mainly in the TV studio where they can benefit from easy access to the various possibilities of audiovisual aids. Trainees are located in the different interactive centres and are able to communicate or intervene directly during live sessions with the main centre. This configuration makes it possible to recreate a "virtual classroom" as similar as possible to the usual training setting.

ISDN video-conferencing

The VisioCentre

The VisioCentre was used for two purposes, the first being live lectures to students in remote locations, and the second being for the recording of lectures. VisioCentre is a remote teaching system developed by ENIC and Citcom. A VisioCentre has the following components: a teacher's studio and an interactive classroom capable of seating 32 students. The interactive classroom allows each student to participate. It is equipped with a movable camera with remote drive and tables with request buttons. The teacher's studio is equipped with various cameras and other video sources. Each side is equipped with a codec which compresses picture and voice before transmission and decompresses them after reception. Those codecs are connected together through ISDN.

ISDN videophoning

Proshare was used as personal conferencing software. It runs on a point-to-point basis and uses the Windows user interface. It allows the user to see and to speak with the person at the other end of the line. The two partners can work together on a shared on-screen notebook. All documents installed on one of the personal computers are sharable. In addition to the "Proshare Personal Conferencing Video System 200", the Proshare Personal Conferencing Software called "Premier Version" was also available. The Proshare system enables users to exchange data and to share applications via a normal telephone line and a 9600 BPS Modem. Thus one variant of the Proshare Software offers all important features (except video and audio) to PC users in countries without access to ISDN Networks. Another variant supports full multimedia desktop conferencing.

Data communication tools

The most important tool was mail with its mailing-list possibilities. These allow question-and-answer exchanges in a group conferencing model with a moderator.

Exchanges were more efficient and faster with real-time simultaneous connections than with audioconferencing.

Multimedia

Some courses were integrated in a multimedia scenario. These scenarios involved different digitalised media, namely text, voice and video files. This integration was done by a World Wide Web server accessed by a browser client. The learner needed a PC workstation on which a suitable browser was installed in order to access the server.

For the computer conferencing service a multitasking computer and operating system were needed. This system may admit concurrent remote connections via the following communication supports: X25, modem, ISDN.

Component 3

In order to ensure the trans-European impact of the project, a variety of courses were delivered by six different course-providing institutions reaching client-learners in countries throughout Europe, using the service infrastructure provided by Component 2 of the project. The courses offered related to content in the fields of Technology, Business, Innovation Management, Environmental Issues, and Foreign Languages. The integration of these courses into a single Trans-European Training Network was to represent a major step toward the creation of a "common training market", involving universities, private training organisations, telecom operators, and broadcasters.