# A Persuasive Systems Education Program within an Information Systems Curriculum

Harri Oinas-Kukkonen [1], Pasi Karppinen [1], Piiastiina Tikka [1]

[1] *University of Oulu, Oulu, Finland*

**Abstract**

There are very few places where persuasive technology can be studied as the main subject but many more where it can be studied within an educational program. In this paper, we describe persuasive technology education which has been embedded in an information systems curriculum to the extent that a full study program can be provided without it being administratively called a master's program. The structure and idea behind of this will be explained. This is important as education of persuasive technology has been neglected largely by the persuasive technology research field.

**Keywords**

Persuasive technology, computer science, information systems science, master's degree, teaching, study program, curriculum.

## 1. Introduction

There are still only a few possibilities to focus solely on studying persuasive technology in master's level education. Yet, there are some universities, for instance Illinois Institute of Technology in the U.S., Technical University of Eindhoven and University of Twente in the Netherlands as well as University of Oulu in Finland, which offer educational programs that can be considered as such.

This paper describes the master's level persuasive technology educational program implemented as an integral part of a 2-year information systems program in the University of Oulu, Finland. This master's education is known as information processing science program (aka computer science program) with information systems orientation and persuasive systems design specialisation within it. A suitable bachelor's degree is required to get accepted into the program. Students from other educational programs also participate the courses, such as from business analytics, software engineering and information systems, computer science and engineering on a par with exchange students from various other educational programs. The master's degree from this program gives credentials for applying to a doctoral program, thus enabling to continue with persuasive systems and technology focus from bachelor's degree to doctoral degree.

This paper is structured as follows: section 2 discusses curricula in computer science and information systems; section 3 discusses specificities of persuasive systems and technology; section 4 describes persuasive technology education within an information system curriculum in the University of Oulu.

## 2. Competency-based approach in computer science and information systems curricula

In modern societies, nearly everyone uses different digital devices as part of their everyday lives, and this computing landscape offers many career opportunities for students. Calitz et al. [1] suggests that universities should link computing programs with specific career tracks that indicate needed

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EMAIL: harri.oinas-kukkonen@oulu.fi (H. Oinas-Kukkonen); pasi.karppinen@oulu.fi (P. Karppinen); piiastiina.tikka@oulu.fi (P. Tikka)

specialisation and knowledge. A recent master's level curriculum recommendation for Information Systems [2] uses profiles introduced in the CEN Workshop Agreement on European ICT (information and communication technology) Professional Profiles [3]. Topi et al. [2] underline that these profiles are merely examples, not intended to be exhaustive, and they expect that programs will adapt target profiles that fit their specific needs.

The computing curricula report CC2020 by the Joint ACM/AIS IS2020 Task Force [4] is using competency-based approach, which portraits a level of professional excellence that goes beyond having only knowledge in a field. Competencies include technical skills and human attributes to function in the workplace, and they provide a basis to the graduates' ability to perform appropriate tasks as professionals in computing. The overall aim for competency-based approach is to be able to compare computing disciplines and facilitate detailed comparisons. One of the seven disciplines for which computing curricula exist or are in the development process is information systems.

The discipline of information systems (IS) focuses on information, which can include numerous subthemes such as information capturing, storage, processing, and analysis. Common goal of information systems is that it helps data interpretation that supports decision making. As a field it relies on other computing disciplines, but it has much bigger emphasis on human, organisational and business aspects. Information processing can often turn into new organisational procedures, making an impact beyond technical solutions. On a broader picture the IS discipline studies, how computing can enable transformative change within domains of human activity [4].

Information systems degree programs usually include education in computing and information technology, but they also have vast interest to cover application areas such as business. IS professionals have often the role of being the bridge between customer and ICT developers, thus leadership skills and communication is emphasized more than in other disciplines in computing [4].

According to the Joint ACM/AIS IS2020 Task Force [4], there should be conscious and proactive effort to include ethics in every computing program. Also, global diversity is essential to address in every discipline since the computing field is diverse by definition. Interaction between computing professionals is highly international, and graduates of computing programs can benefit significantly by studying global customs and cultural differences of the people.

Criticism has also been directed towards 'curriculum thinking'. de Salas et al. [5] claim that it is often unclear whether degrees' career outcomes have been created for advertising purposes rather than via thorough curriculum development process. Changes in curriculum are often driven by budgetary constraints, outspoken individuals, or student demands rather than external curricula or academic merit [6]. Lack of an existing methodology to guide the process, time constrains, and poor commitment of senior management are important factors to challenge successful curriculum change [5].

## 3. Persuasive systems and education

The art of persuasion in itself is not a new field in practice nor in research, and it has been only natural that persuasion has become a natural part of interaction with and mediated by technology. A pivotal step in formalizing the core concepts and in documenting the ways in which technology can be used in persuasion was the seminal book by Fogg [7]. A key observation there was the increasing and the almost all-encompassing role computers have taken in everyday life from work to personal life (e.g. [8]).

Since Fogg's 2003 book, the field has progressed in leaps and bounds both in research as in practice. In research, there are process models (e.g. [9-11]), validated tools available such as the PSD model for analysis and design of persuasive systems [12], and various research instruments (e.g. [13, 14]). Application domains for persuasive technology cover a broad spectrum, comprising health and well-being (e.g. [15]), eco-behaviors and sustainability (e.g. [16, 17]), security and safety (e.g. [18]), education (e.g. [19]), and commerce (e.g. [20]), among others.

As so much of the field of information systems, also the research on persuasive technology is, by nature, heavily applied. The core theories and methods involve not only information systems and human-computer interaction, but the role of theories of behavior is central. Such theories of behavior hail largely from social and cognitive psychology. Prominent theories that have been applied in the development of persuasive technology include (but are not limited to) theory of planned behavior [21,

e.g. [22, 23]), self-determination theory [24-26], and transtheoretical model [27-29], and theories on social influence [30-33]. In addition, elaboration likelihood model of persuasion [34-37] has often been applied also to persuasive technology research.

The theories build the base for constructing the technology elements, the delivery. As an example, the PSD model [12] present four categories of possible system features that can be used when analyzing and selecting feasible means of influence in a system. These categories, primary task support, dialogue support, credibility support, and social support, all build on theories of behavior and behavior change. As such, the individual features in the categories, such as social learning or normative influence in social influence support category, have a recognisable theoretical base that allows researchers and developers to identify the grounds first of all for selecting these features, and secondly to know what to expect as an outcome of using them. A key element of using the PSD model is the context analysis to identify – before any selection of system features – who the persuader and persuade are, what is the context of use, and what would be the delivery strategy (central or peripheral) [12].

Certain key characteristics that prevail when considering how ICT can be used in persuasion include interactivity, persistence, ability to tailor content and interaction, availability of anonymity, ability to handle large volumes of data, making use of many modalities, scalability of systems, and ubiquitous computing [7]. Further perspective on the overall picture of what persuasive systems involve as basic characteristics were formulated as persuasive system postulates by Oinas-Kukkonen and Harjumaa [12] Where Fogg's list points out advantages computerized persuasion can have over a human agent, Oinas-Kukkonen and Harjumaa list key assumptions regarding the nature of information systems in persuasion, and also some expectations and goals for such systems, such as the call for openness and usability.

What distinguishes persuasive technology as a field of its own from "any" influence technology yields is the application of intent: a persuasive system is persuasive because it was designed to be so [7, 38]. Influence and outcomes of technology use can also be unintentional. An outcome of intentional influence is change, as persuasion supports or guides a person to do something differently from the usual patterns. In persuasive technology this intent is built into the system, meaning that it is endogenous, as Fogg [7] defines it. As regards behavior change, what change and what type of change has been described by Oinas-Kukkonen [38] as an outcome/change matrix (O/C matrix), where one axis indicates what the change is, i.e. is it the formation of a new behavior, reinforcement of an existing one, or alteration of a behavior. The other axis of the matrix describes the type of change, i.e., is it compliance to a request, change in behavior, or change in attitude.

In addition to intentional persuasion of the voluntary and open kind, and to unintended outcomes, there can also be persuasion where a system user is led to actions and decision-making with more covert and even deceptive methods. Such technology features can be referred to as dark patterns, and these can be found for example in some online sales and marketing [39]. Using dark patterns in sales can mean balancing between user satisfaction and increased sales [40, 411. Another area where such patterns have been used is gaming, where in-game purchasing, lootboxes, and engagement in itself are at times achieved using addictive features. In such cases, the result can be, for example, unsustainable spending through in-game purchases [42]. However, the definition applied already by Fogg in 2003 [7] for persuasive technology, and later by Oinas-Kukkonen [38] to what he defined as Behavior Change Support Systems (BCSS), persuasive technology involves building systems to support people in their efforts to change their behavior and doing so in an open manner, without deception or coercion.

As regards creation of persuasive technology, its availability in the information systems education curriculum is justified because of the need to learn and understand the applied fields as well as how to operationalize processes and models as ICT design. On top of this, any developed system should achieve an adequate outcome in terms of user experience and engagement. In other words, designing and implementing persuasive technology should involve understanding what persuasive content to use and how [38, 43]. Oinas-Kukkonen [38] referred to the so-called black box phenomenon in persuasive system development, where it is not possible to see on what basis a system is expected to be persuasive. More recently, an extensive review by Aldenaini, Oyebode and Orji [44] on mobile phone-based applications for physical activity and sedentary behaviour shows how a vast majority of applications are not identifiably based on any particular theoretical base. Such observations highlight the need for educating potential persuasive technology designers and developers in all aspects of applied research in this field.

## 4. Structure of the persuasive systems education program

The persuasive technology program in the University of Oulu is composed of the following components, totalling 120 credit points equalling 2 years of studies:

a) Persuasive technology specialisation courses, including research and development (R&D) project, master's thesis project, project seminar and thesis seminar – 70 credit points
b) General courses – 10 credit points
c) Information systems orientation courses – 15 credit points
d) Elective courses – 25 credit points

Figure 1 illustrates the structure of studies for persuasive technologies as spread over the two-year degree program. An academic study year rolls from September to May in four consecutive periods of about 10 weeks each.

| P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|
| PT1 | PT2 | PT3 | PT4 | PT8 | PT8 | PT5 | PT7/PT9 |
| GE1 | IS1 | PT8 | PT8 | PT8 | PT8 | PT6 | PT6 |
| EC1 | EC2 | GE2 | EC3 | IS2 | EC4 | EC5 | IS3 |

**Figure 1.** Structure of studies for persuasive technologies. P1 to P8 refers to teaching periods, out of which P1-P4 in year 1 and P5-P8 in year 2.

## 4.1. Persuasive technology courses

There are 70 credit points of directly persuasive technology related coursework, comprising 25 credit points of specialization courses, and 45 credit points of R&D project, master's thesis, and corresponding seminars. These span over two years of time.

**Persuasive technology specialization.** Persuasive technology specialisation composes of five courses:

- PT1. Digitalisation and innovation [5 cp]
- PT2. Societal and individual impacts of information systems [5 cp]
- PT3. Persuasive systems design [5 cp]
- PT4. ICT and behavior change [5 cp]
- PT5. Creating domain value with data [5 cp]

Courses PT1 to PT4 are taught in four consecutive periods in year 1. Course PT1 is of intermediate studies type, whereas PT2 to PT5 are of advanced studies type. Course PT5 is taught in period 3 of year 2, but it can be taken (and is suggested to be taken) as an elective course during year 1. For the contents of the persuasive technology specialisation courses, see Table 1.

Some key selected materials of these key courses (possibly of interest to persuasive technology researchers) are listed in the list of references [1-10].

**Table 1.**
Persuasive technology specialisation courses.

| *Course* | *Learning outcomes* | *Content* |
|---|---|---|
| PT1. Digitalisation and innovation | After completing the course, the student will be able to:<br>[a] identify and describe what is digitalisation and why it is happening, | 1. What is digitalisation? Why digitalisation? What is digital transformation?<br>2. Information systems and digitalisation.<br>3. Organisational information systems. |

| | | |
|---|---|---|
| | [b] describe how information systems and digitalisation are connected,<br>[c] build an overview of organisational/enterprise information systems,<br>[d] describe the role of emerging technologies in the society,<br>[e] form an overview and describe how innovation takes place, particularly in IT, as well as<br>[f] identify opportunities and challenges of future technologies. | 4. The role of emerging technologies.<br>5. The quest for disruptive Zero-to-One innovation.<br>6. Core business values.<br>7. Innovation strategies and innovation ecosystems.<br>8. Opportunities and challenges of future technology. [E.g., 52, chapters 7-9. 11]. |
| PT2.<br>Societal and individual impacts of information systems | After completing the course, the student will be able to:<br>[a] understand and discuss the impact of the ICT in the society and changes that take place,<br>[b] understand how information systems transform ways of communication and interaction,<br>[c] form an overview of how human and societal traits and ICT co-exist, for example, through a series of paradoxes, as well as<br>[d] gain basic understanding of behaviour change, behaviour analysis and digital intervention design as regards ICT. | 1. Introduction to the course.<br>2. How ICT has changed the world (Example: the WWW).<br>3. The promise.<br>4. Information systems as a transformer.<br>5. The paradoxes of change.<br>6. Behaviour analysis and behaviour change.<br>7. Digital intervention design. 8. Ethical considerations. [E.g., 52, chapters 1-6. 10, 12]. |
| PT3.<br>Persuasive systems design | After passing the course a student will be able to:<br>[a] analyze methods and techniques employed by persuasive systems,<br>[b] apply such methods in an ethical manner as design guidelines for developing persuasive ICT solutions, as well as<br>[c] apply gamification as persuasive design principles for serious games and other similar solutions. | A growing number of information technology systems and services are being developed that aim at attitude or behaviour change. This course will address the process of designing and evaluating persuasive systems, the types of content and software functionality in such systems, the underlying assumptions behind these, methods for analysing the persuasion context, and principles for persuasive system design. The course also looks into the methods and techniques of gamification. The course is geared towards analysis and design tasks using the Persuasive Systems Design model as the main approach. [12, 38, 45-49] |
| PT4.<br>ICT and Behaviour change | After completing the course, the student will be able to:<br>[a] grasp the core theories of behaviour change and how they are/can be applied in goal-oriented behaviour change, | The focus of the course is role of ICT in supporting people with their endeavours to change their habits or lifestyles. The course introduces the main theories and models regarding behaviour change in order to provide students with a solid base |

| | | |
|---|---|---|
| | [b] identify and discuss ethical concerns inherent in behaviour change and persuasive systems, and<br>[c] identify and discuss the possible negative effects of ICT use not only as regards persuasive systems, but also with social media and other use. | for understanding how behaviour change can also work through ICT. The course also introduces some of the more problematic topics in ICT and behaviour, such as the dark side of ICT use and ethics of persuasion. The course aims at providing existing knowledge and theoretical starting points to the development and use of persuasive systems. With such base, the student will be able to review the field from a broad perspective with the view to applying appropriate theories and approaches when analysing or developing persuasive systems. [12, 38, 50, 51] |
| PT5. Creating domain value with data | After the course the student will be able to:<br>[a] select appropriate data management technologies based on the needs of the domain,<br>[b] develop and implement organisational information management policies and processes,<br>[c] create an information architecture for an organization,<br>[d] integrate and prepare data captured from various sources for analytical use,<br>[e] identify appropriate data sources in a heterogeneous environment with multiple data types,<br>[f] select and use appropriate analytics methods,<br>[g] identify appropriate analytics methods for given tasks,<br>[h] use an analytics platform to perform basic analytics tasks,<br>[i] analyze data using advanced contemporary methods,<br>[j] select and apply advanced computational approaches to identify meaningful patterns and trends,<br>[k] build models to support decision-making activities, as well as<br>[l] design and implement architectures for organizational content management systems. | 1. Data management technologies based on the needs of the domain.<br>2. Organizational information management policies and processes. 3. Information architecture for an organization.<br>4. Heterogeneous environments with multiple data types.<br>5. Different analytics methods.<br>6. Analytics platforms.<br>7. Different computational approaches to identify meaningful patterns and trends.<br>8. Decision support models.<br>9. Architectures for organizational content management systems. |

**R&D project, master's thesis, and seminars.** The courses in this module include:

- PT6. Research and Development Project [10 cp, year 2]
- PT7. Project Seminar [3 cp, year 2]
- PT8. Master's Thesis [30 cp, year 2]
- PT9. Master's Thesis Seminar [2 cp, year 2]

The R&D project applies to persuasive technology. It is 10 credit points and spans over two periods. The master's thesis is carried on a topic related to persuasive technology. It is a big major part of the studies composing of 30 credit points and spanning over three periods. At the end of R&D project and master's thesis project, there are seminars in which students present their work and evaluate other students' or projects' work.

## 4.2. Other required courses [50 cp]

**General courses [10 cp]**

These courses are compulsory courses related to skills to carry out the studies in the program:

- GE1. Preparatory Course for MSc Studies [5 cp]
- GE2. Research Methods [5 cp]

**Information systems orientation [15 cp]**

These courses are compulsory courses related to more general IS and HCI topics.

- IS1. Servitisation, Co-Creation and Business Development [5 cp]
- IS2. User Experience Design and Management [5 cp]
- IS3. Information Systems Strategy and Leadership [5 cp]

**Elective courses [25 cp]**

These courses can be freely chosen from the information processing curriculum, which means they are either information systems (IS) or software engineering (SE) courses. Key special facets within those two include, for instance, human-computer interaction (HCI) information security or digital health. Other than information processing courses can also be elected when well argued for. These have been marked as EC1-EC5 in Figure 1.

## 5. Final remarks

The overall result analysis has shown a neutral comment from the participants. Students may have felt a sense of connectedness with the supervisors (more competency and relatedness level) than the working colleagues. This may be due to the knowledge and expertise of the supervisors in the same field students are researching. While on the other hand, working colleagues do not have similar tasks (as students work on their own research topics separate from others).

## 6. Conclusions

This paper described one persuasive technology education program within an information system curriculum in a research university. The aim was to discuss the underestimated role of persuasive tech in education curricula with the hope that it would stir interest to look at the question also in other universities. Indeed, few such programs exist. The coursework organization and curriculum presented may perhaps help develop educational programs also at other universities.

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