The character of things

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People, as well as things, appear to have character—high-level attributes that help us understand and relate to them. A character is a coherent set of characteristics and attributes that apply to appearance and behaviour alike, cutting across different functions, situations and value systems—esthetical, technical, ethical—providing support for anticipation, interpretation and interaction. Consistency in character may become more important than ever in the increasingly complex artifacts of our computer-supported future. © 1997 Elsevier Science Ltd.

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'This is a reliable car,' the car salesman says to us, as he slams the door shut with an assuring thud. We are not particularly impressed by what he says, being well aware of the folklore on car salesmen. Yet, the man is claiming something and we do understand what, and something about the sound of the door closing seems to support the claim. However, what kind of property is that 'reliability'? It is of a different order than the data we get on brakes, engine, gearbox and upholstery. Yet, it seems to summarize some important aspects of many of those qualities of the car. If we take the salesman's word for it, we will have a number of specific expectations on this car and if there is substance to the claim of reliability, these expectations will help us in using and relating to the car in an appropriate manner.

The point of departure for this paper is the simple observation that people have a habit of thinking and talking of artifacts as having character, as a way of understanding them and remembering how to handle them. When people say things like 'this is a reliable car,' or 'this is a tedious word processor,' they do not refer to any specific function—they are rather making a high-level description of the artifact. Such characterizations may not be very precise and detailed, but they compensate by having a very wide range of applicability. They also seem to trigger various tactics and stra-
strategies for handling something of that character, which are there, ready to employ without any special training for this particular artifact. The ground for ascribing a certain character, furthermore, seems to be not just the functional aspects of the artifact’s behaviour, but as much its appearance and ‘demeanor’. That greatly helps to make character attribution really worthwhile: we may get an idea of the character just by a casual glance, rather than having to observe its operation carefully for an extended period of time.

The first objective of this paper is to make this vague talk concerning character and characteristic a little more exact. What is characteristic about a character? What is the point of using this conceptual device, what can it do and how does the process of character attribution work? The second objective is to begin an investigation of the possible consequences for computer artifacts. Can the concept of character improve our understanding of the design of computer artifacts? Are there special reasons to apply the character approach to computer artifacts? Let us begin by better anchoring the character concept in its everyday use.

1 The everyday use of character

People use characters as mental tools to handle a complex reality. A little child who happens to bump into a chair and get hurt may get angry with it and call it ‘mean.’ Meanness is the child’s way of explaining the (lack of) behaviour of the chair, a behaviour otherwise difficult to make sense of. To a child, even simple artifacts have character. Adults are less naive, but still do not mind characterizing pieces of furniture as ‘friendly,’ ‘haughty,’ ‘clumsy,’ ‘undependable,’ etc. When we encounter more complex artifacts, e.g. cars, boats and computer applications, we seem to be more dependent on characterization, and less willing to deal with their complexities exclusively in terms of pure function.

People’s propensity to ascribe character to artifacts is not a proof that they generally believe that artifacts literally have character. For some people and some artifacts, there may be genuine belief (and let us not judge whether they are right or wrong—it is beside the point), but more often they will think of it as convenient fiction, when they think about it at all. People may say or think: ‘this is a clever machine!’ and they do not just mean that whoever made the machine was clever. Furthermore, they probably do not think that the machine really is clever, but they still find it appropriate and convenient to ascribe cleverness to it. For that matter, how seriously should we even take the proposal that people have characters? There is a somewhat depressing history of what taking that proposal in the wrong way may lead to—phrenology and worse. Still, people actually go
on thinking of how people are and behave, with the help of such concepts, maybe as convenient fiction, maybe with a deeper commitment.

The attribution of character to an artifact can be based on different aspects of the artifact. Rounded forms and warm colours suggest that the car (or whatever) has a warm, friendly and protective character. We tend to assume a connection between the mere appearance of the artifact and its character, just as we are remarkably (and shockingly) quick to make assumptions whether a person is generous or stingy, kind or mean, intelligent or stupid, etc. merely on the basis of facial features\(^1\). The rationale is that physical appearance sometimes reveals important information about inner structure and the way the artifact will behave. First impressions may mislead, of course, but more often than not they are close enough to be of help.

A designer may try to exploit dependencies between appearances and perceived character. By manipulating the appearance, the designer hopes to evoke certain emotions or induce certain beliefs in the user. The idea that there are relatively stable relations between certain appearances and certain characteristics can lead to a complete character theory. Within the field of product semantics, different approaches build on various interpretations of the assumption that certain shapes, patterns and symbols create certain emotions and associations in the beholder. Such knowledge is obviously useful for architects and industrial designers. As an example, you can, as a matter of fact, make a coffee jug, or a building appear as either light or heavy (within some range delimited by the physical properties, of course) by just manipulating its shape, without any change in volume or weight. Appearance is not just visual, of course: the sound of the car door and the car engine are parts of the car's appearance, as are the smell and feel of the upholstery.

A smooth, almost majestic motion as you abruptly press the eject button of a cassette recorder, gives you an impression of cool precision and stable performance under stress, an impression that a jerky motion definitely would not give, even though there really is no functional difference in the behaviour. Will you feel safe (or not) to press the eject button without pressing the stop button first? The attribution of character to an artifact can also be based on its style of conduct, the way it moves, the way it performs its tasks, the way it reacts to your touch, etc.

There are some areas where we find a particularly frequent and explicit use of characters. One is theatre. Helped by certain distinct features, the audience will ascribe a certain character to an actor playing a part. The

\(^1\) Second, P F 'Facial features and inferential processes in interpersonal perception' in R Tagliati and L Petruito (eds) Person perception and interpersonal behavior Stanford University Press (1968)
director, as designer of the performance, will employ the physical appearance, as well as the behaviour of the actor (the way the actor moves, talks) in moulding the character. With the right kind of clues and cues the audience will form a deep and powerful, yet fairly simple and manageable picture of the personage. A mass of information is thus condensed and focused that otherwise would be very difficult to transfer to the audience. The theater makes frequent use of symbols that the audience should recognize and integrate into a rich and coherent character. However, in drama, the point is not only to create characters easy to recognize; the purpose may be to expand and complicate already known characters to shake the attitudes of the audience and break down their preconceptions.

Car design is another area where designers play with a repertoire of symbols that they know will signal certain things to the prospective buyer. To plant these symbols in the designed object is a very delicate task. The car designer who wants to convey the character of a smart, powerful and expensive sports car, has to be very careful not to unintentionally introduce some symbol that might clash with the desired overall character. Some small detail usually associated with the traditional family car could spoil the character or image the designer is striving to create.

Both theatre and car design rely on the idea that the audience (the buyers) recognize a certain number of established, standard characters. If you want to create characters never seen or experienced before, you are faced with a more difficult task. A common process, both in drama and in car design, is to start with a known character and then expand or change that character into something new and different. By such moves, our conception of characters keeps changing; the repertoire of characters we recognize constantly evolves and designers have to keep up with this development, on penalty of designing artifacts that unintentionally give the user the wrong signals (which is not so uncommon). All the time we change and adapt our relations to people and artifacts by constantly redesigning their characters.

To summarize, we believe that characters are important conceptual devices that reduce the mental effort involved in dealing with artifacts. In ascribing a certain character to an artifact we make a very simple, but powerful description that frequently will be accurate enough to help us to manage the task of handling the artifact and to appreciate the consequences of our interactions with it.

1.1 Computer artifacts

Computer artifacts are no exception. People are even more prone to apply character descriptions to computer artifacts than to ordinary artifacts. The
more complex the artifact, the more there is to gain by reducing the complexities, facilitating our interactions with it. The use of character ascription is not simply a substitute for knowledge, however, as one might have guessed. This is indicated by a study\(^2\) in which the most knowledgeable computer users also turned out to be the most advanced in applying characteristics to a computer artifact.

Many computer artifacts have a design that more or less invites anthropomorphizing—by the method of interaction (e.g. conversation) or by their function ('expert system', or other 'intelligent' features and functions), or by the application area (e.g. simulating organic or social processes). Such effects have been confirmed by many researchers. Recent studies by Nass \textit{et al.}\(^3\) indicate that well-known laws of social psychology often are preserved if the human counterpart is substituted by a computer artifact. As an example, users who are directly questioned by a computer to rate the performance of the program they are just running, tend to be polite and express a more positive opinion than if the questioning is done by a separate computer. The possible benefits of consciously exploiting a minimal concept of 'person' as a model for computer-artifact designs, have been examined by Janlert\(^4\). The recent surge of interest for intelligent agents, as well as experiments with 'humanoid' interaction methods (voice, face expression, body language) bring these issues to the fore again.

Laurel\(^5\) argues that people, in general, use their ability to communicate with other people in dealing with 'nonsentient beings and inanimate objects.' According to Laurel this mode of operating in the world has become a common way for us to approach objects in our daily lives. It is, e.g., not uncommon to compare different computers in terms of their 'personalities,' or to characterize software with adjectives based on a living-organism metaphor. Laurel notes that when 'agent-like activities already exist, they are often perceived as having character.'

Interesting as this topic is, confirming people's general willingness to transfer attitudes and concepts used in dealing with human beings to computer artifacts, it is not the primary concern of this paper. Character attribution does not presume anything close to a complete personality, as the everyday examples show. Stolterman\(^6\) discusses character as a means to unify a user's experiences of a computer application. In this article we are trying to say something about character that is of interest for the design of any kind of computer artifact. The quality of character that we wish to bring out here does not primarily have to do with human qualities, abilities, emotions, but something different and more generally applicable: the quality of giving unity to a wide range of different manifestations of an entity.
That quality is also clearly useful when the entities are things and artifacts. Of course, pursued to its extreme, this line of investigation just might lead us closer to persons and human beings (suggesting a repaired version of the Chain of Being in which the human being is connected—not with nature but with culture and a universe of artifacts). The present article and suggested line of research do not depend on any such assumption, however.

2 Character and characteristics
To develop these ideas, we need to be more precise about the basic concept of character and the related concept of characteristic. The following definitions and explanations are inspired and enlightened by common usage, as well as by more technical usage, e.g. in the areas of drama and personality psychology. The discussion is primarily a philosophical, not psychological investigation into the human mind. Although the force of our arguments and proposals very much depends on keeping close to existing intuitions and common understandings, what follows is not intended to match exactly any previous notion: the definitions and explications are adapted to our particular purpose.

A character is a unity of characteristics. That is, one character combines several characteristics, not as a simple collection, but with related characteristics integrated into a relatively coherent whole. As an implication: knowing some, but not all, characteristics of a given character, we may be able to make plausible inferences about the remaining characteristics.

A characteristic is a higher-order attribute. Given an individual entity $E$ of some type $T$, a characteristic of $E$ (with respect to $T$) is an attribute which applies to $E$'s way of being and behaving, cutting across different capacities, behaviours, and other aspects of $E$'s being. A characteristic is stable, or changes only very slowly, for a particular $E$, but varies over the type $T$; i.e. we generally expect different individuals of a single type to have different characteristics and hence characters, whereas the particular characteristics and character of a single individual will pervade most of what that individual is and does: determining the way and the manner in which it does whatever it does, and the manner in which its other properties are manifested. Thus, a universal characteristic, applying to every individual of a certain type, would not be a genuine characteristic by our definition: a characteristic has to be selective. Sometimes it is useful to talk about characteristics or character of a type (e.g. ‘national character’), but then always with a broader type or a family of related types implicitly or explicitly as a contrasting background.

One way to further elaborate the point that characteristics vary across the type, would be to introduce characteristic dimensions, such that each indi-
individual has one and only one characteristic value along each characteristic dimension. We might, e.g. have a dimension speed, with values such as slow, medium and quick. There may be more problems than advantages with this increased precision, however. One problem is that it will be difficult to deal with characters ridden with internal conflict, where incompatible values compete and you may not reliably predict which one is going to rule in a given situation. Another problem is that, as a practical consequence of the stability requirement, what is only a temporary mood or mode of one individual, may be a characteristic of another. Some people seem to be light-hearted by character, some are light-hearted only passingly. A mood can be viewed as a kind of modifier of characteristics, to account for these more rapid changes in the way an entity is and behaves.

In our definition, a characteristic is interpreted as a qualifier of attributes — where ‘attribute’ is to be understood in a very wide sense as including all kinds of specification of an object. The attributes qualified by a characteristic, are not just ‘ordinary’ (manifest) properties such as colours and shapes, but also ‘dispositional properties’, e.g. being inflammable, ticklish or collapsible and extends further into properties that really are abilities and behaviours, e.g. being able to walk, driving a car, or correcting the spelling of a text. The concept of ‘dispositional properties’ can indeed be interpreted as a masked way of bringing action and interaction into the domain of standard philosophical analysis. There is not a very sharp border between manifest and dispositional properties, and any attribute, even actions, can be pressed into the ‘property’ format. In the present context, however, it is helpful to think explicitly of action and interaction as a special variety of attributes to an individual.

2.1 Completeness
A characteristic is thus a kind of higher-order attribute, a meta-attribute, that applies to attributes in the extended sense. The ideal characteristic would apply to all attributes of the individual, without exception. In the literature on the calculus of individuals, a ‘dissective predicate’ is defined as a predicate which is satisfied by every part of any individual that satisfies it. Analogously, a ‘characteristic predicate’ would be a predicate which is satisfied by every manifestation of any individual that satisfies it. (Of course, such a definition goes well beyond the scope of the calculus of individuals.)

In practice, such comprehensiveness may be rare and we must also consider less than ideal characteristics that apply to most or many attributes, to some significant special subclass of attributes, or within some other such limitation of scope. It may be that a characteristic does not make much
sense if we try to apply it to certain attributes; it may be that it makes sense but actually fails to apply. Characteristics that are very comprehensive, very close to the ideal, we may call 'complete'; characteristics with a lesser scope, we may call 'partial'.

Complete characteristics are cognitively powerful as concepts, but rare. Partial characteristics are easier to find, but they will lose some cognitive power by their partiality: they can not be used successfully beyond their limited scope and if the scope is unknown the outcome will generally be uncertain. That means that we have a trade-off between power and frequency. The assumed underlying purpose of cognitive economy seems to speak in favour of few but comprehensive characteristics: using many characteristics, each of limited scope, would be counterproductive. The cognitive power of a characteristic does not depend only on its comprehensiveness, of course, but also on how much restriction it imposes on the attributes it applies to. Complete characteristics can generally be expected to provide 'soft' expectations and predictions that are not very precise and detailed, but can yet be quite reliable. 'Hard' predictions and expectations, giving precise and detailed information, do not only require greater cognitive effort, they are also narrower in scope and tend to be more unreliable. Above all, the degree of hardness must match the purpose: there would not be much point in being able to foresee the exact time delay in microseconds as the user of a pocket calculator presses a button to find the square root of a particular number.

2.2 Context dependence, cross-over and coherence

The particular manifestation of a certain characteristic is context-dependent in at least three ways: it depends on the type of action or property concerned, it depends on the individual, and it depends on the situation. To give some examples: a relaxed reply is quite different from a relaxed posture; a mean child's manner of verbal abuse may be very different from a mean old man's; and a polite person's manner of asking for help will vary with the person approached—indeed, must differ in order to remain polite.

Not only do characteristics cut across different actions and types of attributes, e.g. simple properties, dispositions and actions—in doing this they may cross the borders of different value systems. In particular, they may apply to ethical, aesthetical, as well as technical aspects of an individual. Smets and co-workers\textsuperscript{8,9} relate some experiments with characteristics applying across different sense modalities and also across esthetical and functional aspects.

To give an example: a characteristic, e.g. aggressive (used on a person or car, for instance), may apply to the individual's mechanical behaviour,
attributing technical values to it; the same characteristics may also apply to its social and moral relation to its surroundings, attributing ethical values to the individual; and it may simultaneously apply to its looks, attributing aesthetical values. We are reminded of the sort of identifications made by Plato: the true, the good and the beautiful. However, we want to make clear that we are not making a moral or general, philosophical point here—we are primarily trying to identify a mechanism for the cognitive handling of attributes—not taking a stand whether in a deeper sense it is right or wrong to make such identifications across value systems.

Of particular practical interest for the design of an artifact, is the fact that a characteristic may link properties of its appearance (perceivable) with properties of its functions and potential (non-manifest) behaviour (hidden). This is a theme that will be developed further in the following sections. Certainly, there can also be a mismatch: Raymond Loewy designed a train that looked really fast, but it was not faster than other trains and in the following surge of streamlining even patently immobile artifacts, e.g. refrigerators, fell victim. Probably, in the process, the streamlined look came to be interpreted less as an expression of speed and more as expressing modernity, as signaling newness and a break with old traditions, but even then, many artifacts failed to live up to expectations. In the end, streamlined objects were symbols heralding that we live in a modern world, that science and technology is making great progress, and fantastic breakthroughs are around the corner. Such mismatches can go undetected for a while, but sooner or later they will show and of course, the trouble they cause will not stop just because the lack of correspondence between appearance and behaviour is well-known. A car that looks built to go fast and that looks and feels safe to drive, may tempt you to go too fast, jeopardizing your life, even as you are aware of the disproportionately large number of accidents with this make of car. Moreover, the amount of irritation, trouble and danger caused by such mismatches, increase with the complexity of the artifact, making the issue very urgent for the design of computer artifacts. To be sure, there are also character modelling processes going on all the time and what may have started out as a mismatch, can eventually become a match: people having adjusted their ways of judging appearances.

A character is a unity of characteristics, in our definition. We believe that much of the usefulness of the character concept comes from frequent couplings of certain characteristics; e.g. ‘big’ is usually associated with ‘heavy’ and ‘slow,’ and with good reason, if we look to the terms’ physical interpretation. If we have learned that an individual is big (as a characteristic), we may infer that this individual will also be heavy and

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slow (as characteristics); or, if we think that ‘kind’ and ‘considerate’ go hand in hand, we may infer one from the other. The connections are not necessary, but have a certain plausibility. There may be a number of common character types, or perhaps smaller units of related characteristics, that are used as first approximations of character. We may search for candidates for such a common repertoire of character (stereotypical) types in various places; the ‘bad guy’ and the ‘good guy’ of Hollywood movies, Jungian archetypes, stereotypes from folk psychology and personality psychology.

2.3 Roles, values and beliefs
The character concept we have defined is distinct from the concept of role in sociology and social psychology. A role is primarily a functional specification, whereas a character is a meta-functional and meta-qualitative specification. Some roles may favour certain characteristics and characters—a nurse is expected to be gentle and a policeman should be honest—but the opposite is a possibility, and there is really no confusion between the role and character.

Character, as defined here, does not comprise values and beliefs. The stable personality dispositions that people attribute to other people, can be roughly sorted into three types: values, beliefs and traits. Of these types, the trait corresponds best with our characteristic. It is also possible to ascribe values and beliefs to artifacts, with some success. The shape of the user end of a hammer may be said to manifest beliefs inherent in the artifact about the user’s anatomy (which may be false, as when the user lacks a thumb). The design of the business end may be said to disclose values inherent in the artifact, e.g. a fast result is more important than avoiding dents in the material. Such attributions are somewhat less convincing as a part of a ‘folk artifact psychology,’ however. When talking openly about the beliefs of your teapot, people will raise their eyebrows, which is less likely to happen if you talk about its character.

Furthermore, the fact is that values and beliefs are harder to extrapolate, and are more selective predictors than characteristics; they do not have the same impact on a broad spectrum of behaviour and appearance. If someone believes in reincarnation, you will not expect to see it in his gait, or study the effects of this rather momentous belief in his way of playing cards. Using attributions of values and beliefs as tools for understanding artifacts, to be really worthwhile, requires artifacts designed to be rational and a more penetrating work of interpretation on the user’s part. Examples such as ‘I managed to raise the temperature in my room, by cooling the thermostat, thus making it think that it was actually cooler than it was,’ show that belief- (and value-) attributions may be used even with simple artifacts,

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10 Jones, E E Interpersonal perception Freeman, New York (1990)
however. In those cases where a stable belief or value actually does have a very broad impact, we are likely to find closely associated characteristics that will summarize. The practical difference between valuing forcefulness and having forcefulness as a characteristic, will diminish as the impact of the value on behaviour broadens and deepens.

2.4 Non-functional metaphor

An alternative approach to the kind of cognitive housekeeping we are now trying to explain in terms of character and characteristics, would be to focus on the notion of 'non-functional metaphors' or non-functional analogies. A functional metaphor or analogy relates the function and operation of one object to those of some other object; e.g. the typewriter has been used as a functional metaphor for the word processor. A non-functional metaphor or analogy does not relate to function or operation, but to some other features or aspects of the objects; e.g. someone might tell us that a certain word processor that we are about to use, is like a sports car. The purpose would obviously not be to point out cognitively useful similarities between the function and operation of a word processor and a sports car. The point would rather be to direct the attention to non-functional similarities between a sports car and this particular word processor; e.g. it is fast, quick to react, has high finish in the details, may not be the world's most safe and practical piece of software, and is perhaps not the right thing for very large jobs.

Just like a characteristic, a non-functional metaphor (or analogy) may say something very useful about the manner in which it does what it does and the manner in which we should behave in our interactions with it. However, non-functional metaphors are both more inclusive and less explicit, e.g. to say that your word processor is the heart of your office, is not to give the sort of information that characteristics may give. In comparing the word processor with a sports car it is open to interpretation whether this implies that good operating skills are a requisite, or not.

While such an approach would be more general and conceivably reach far beyond characteristics and characters, it also presents more difficulties because of its generality and the apparent lack of intuitions, and theories concerning a non-functional metaphor as cognitive support. In short, at this point character seems a better place to start.

3 What is it good for? How does it work?

The beliefs or fictional beliefs that people have about the character of things may serve several purposes. They can be grouped under four general
3.1 Generating expectations

Characters can be used in anticipating the behaviour of artifacts. Characters have the peculiar property of being applicable to all kinds of functions and behaviours. If the character is known and the situation is known, then the behaviour can be predicted to some degree; e.g. ascribing the characteristic 'slow' to an artifact implies expectations that the artifact will be 'slow' in each of its doings. The combined characteristics of a character can increase the predictive power. Still, of course, the predictions are constraints and circumscriptions on a range of possible behaviours, rather than statements pinpointing definite actions. Depending on the situation and user's purpose, one characteristic can be more or less helpful in guiding interactions with the artifact. Being 'capricious' is a weak predictor if we want to know the next move from the artifact. However, if the issue is to which extent we can trust the artifact, the characteristic 'capricious' can deliver a good prediction of the behaviour and guide the user in choosing how to approach the artifact. Considering this, it might be more adequate to use the term 'expectation' instead of 'prediction.'

Characters can be viewed as rules of thumb for behaviour and capabilities. The expectations generated can be wide in scope and encourage the user to make quite bold assumptions, as in the following quite vague, but still useful examples of characterizations: 'this is a very robust, heavy-duty thing, so it will probably not crash or hurt anybody if I try out some pretty daring manoeuvres,' or 'this is a delicate precision-tool, best not to go too fast, or apply force,' or 'this is a secure and forgiving artifact, it will save me from disaster even if I push it beyond its limits' or 'this is a patient and inert thing, so nothing much will happen unless I initiate something' or 'this is something very active and spontaneous, so I had better watch and try to understand what is going on and see if I can join in at some point' and finally one of the most common uses, when we think of an artifact as a tool: 'this is a tool so it won't do anything on its own.' The reader may disagree with the particular conclusions of these examples; that, of course, may be taken as another indication that character ascription really works (but the reader makes different interpretations of the terms used or has different experiences and expectations).

The process of ascribing characteristics will also set up qualifiers on the user's part that are on the same meta-level, e.g. if you encounter an artifact that you characterize as 'inert,' then you would be 'persistent' in your actions, if you want something to happen. To be 'persistent' may have
different practical meanings in different situations and depending on the action: in practice it could mean that you must be sure to press a button for at least a few seconds, or apply sustained pressure on a lever, or repeat a command again and again. The user must know how to be 'persistent,' 'cautious,' 'gentle,' 'inventive,' etc. irrespective of the specific actions. The process of ascribing character is thus also a process of adjusting the character of the actions of the user.

3.2 Generating explanations
At the same time as character is a tool for prediction, anticipation and self-preparation, character can also be used to explain the behaviour of the artifact. Learning the functions and inner logic of a complex artifact takes time and effort, and then we may still lack in understanding. Even when we have the structural and functional knowledge, it may not be the most expedient means to generate explanations quickly and on a level that is useful in our practical dealings with the artifact.

Understanding behaviour is important in many situations and for many purposes: to help judge the acceptability of results, to assist in backtracking to the possible roots of an undesired, dubious or surprising outcome or manoeuver, to detect and infer possibly important information, to just feel comfortable with the artifact, etc.

3.3 Context for interpretation
A character does not prescribe functions and actions on a detailed level. Still, a character can be used as a context for interpreting the particulars of behaviour and appearance. This is possible since a character description can be applied to functions or appearances on any level of detail and abstraction. Even if the overall character is at a seemingly very abstract and high level, with broad characteristics like 'kind' and 'slow,' it may function as a context of interpretation of actions and functions at a very detailed level. 'Since this thing is fast, that it took so long implies that the task was big.' 'Since this is a friendly person, stretching out his hand towards me like that is an invitation, not a threat.' 'Since this is a reticent program, that I don't get any report on how it is doing, is normal and not a bad sign.' 'Since this is an hyperactive program, that I don't get any report on how it is doing, is really worrying.'

Designers of artifacts seldom recognize the user's desire and ability to maintain a certain character as a basis for interpretation at several levels of abstraction or in several 'modes.' Designers often conveniently assume that changes in the level of abstraction or changes of mode allow them to abandon certain characteristics of behaviour for other characteristics they
find to be more (locally) appropriate on the other level or in the other mode. However, the user will employ character modelling at cross-purposes with the designer’s wish for freedom to make local optimizations, and misinterpret what happens. The user will naturally strive to understand the artifact as a whole, as a characterizable unit, where their experiences of using one part of the artifact, or meeting with it in one type of situation, will be used in encounters with other parts, levels, modes or situations.

3.4 Schema for normal functioning

A character is often used as a norm, as something that defines the normal state of an artifact. To behave ‘in character’ is the default behaviour of the artifact. The user of the artifact will relate the current behaviour of the artifact with the expected or normal behaviour implied by the artifact’s character. This way the user will detect unusual situations outside the artifact’s normal range of functioning. Detecting abnormal behaviour is also an important part of the continuing character modelling process, since it will force the user to reconsider their characterization of the artifact in the light of the unusual behaviour. It might lead to a remodelling of the character or it could lead to a redesign of the artifact.

That the artifact appears to behave out of character can obviously be a signal that something is wrong, either in the artifact (malfunction) or in our assessment of the situation: it may be a warning that we have seriously misjudged the actual situation, that there is information we are unaware of, or that we have misunderstood the nature of the task.

With a character as a relatively stable frame of reference, it is possible to discern subtler deviations from the normal state, to appreciate moods and less straightforward, complex relations between inner state and behaviour, e.g. implicatures, exaggerations, ellipses and jokes. Irony, e.g. will not work well on someone who does not know what kind of person you are.

With some characters and for some purposes, the implicated normal behaviour will make you less dependent on a continuous flow of confirmations and status reports defining a normal behaviour. You will be able to trust that you have an adequate grasp of the situation without constant checking and can concentrate on other things. The normal behaviour implied by some other types of characters—capricious, aggressive, fragile, etc.—will only make you more vigilant, of course.

3.5 The character modelling process

Our basic assumption is that people ascribe characteristics and character to things when, and as long as they find it, useful. Successes and failures
are fed back into a general process of character recognition or ascription, a 'character modelling process'.

More details on what this process might look like can be gathered from the psychological theory of interpersonal perception, where the corresponding process is called the 'attribution process'. The attribution process, according to Jones\(^{10}\), consists of a 'perceiver', 'situation' and 'target person' (corresponding to the target artifact in our character modelling process). In most cases it is probably not a conscious process. The perceiver is directed by 'interaction goals', forming the overall expectations governing the perceiver's actions and thoughts. At a more detailed level, these expectancies can be divided into different classes. 'Category-based expectancies' are 'certain presumptions about general groupings in our society and are not richly informed by individuating facts [about the target person]\(^{110}\). However, as the perceiver gets to know the target person better, category-based expectancies will be discarded in favour of 'target-based expectancies' that are tailored to the target person. The perceiver is also influenced by 'normative expectancies', that provide a framework of expectation for evaluating the behaviour of the person or artifact. The setting or situation constrains, and sets limits on the possible behaviour of the target person and the perceiver. Finally, there is the target person themselves with their appearance and behaviour. Research on interpersonal perception has established the importance of appearance in the attribution process. Indeed 'the importance of appearance cues is almost impossible to overestimate in a first-impression situation'\(^{110}\). Jones is here referring to the physical appearance of the target person, of course, whereas we have a much broader range of possible appearances to reckon with.

In interacting with an artifact we try to understand the behaviour of the artifact by ascribing appropriate attributes and characteristics to it. In the beginning, these characteristics do not form a consistent whole, i.e. a character. Characteristics are ascribed, based on specific and particular behaviours (not prima facie coherent with each other), and on various types of expectancies as discussed above. However, as the interaction process goes on the user faces new situations with new and different needs of understanding. As long as the user finds or invents new useful characteristics the character modelling process will continue.

The character modelling process raises some questions of importance to every designer of complex artifacts, e.g. when does the character modelling process begin? Is every artifact a possible object for the process? Is there a particular skill involved in the process? Can a designer facilitate the
character modelling process by providing the right kind of cues in the design?

4 Designing computer artifacts with character

What are the implications for the design of computer artifacts? We will focus on two general conclusions. The first is that we must pay more attention to the consistency and coherence of our artifacts on the level of characteristics and character, and that ‘interface’ consistency—in the sense of surface consistency—may not be that important after all. The second conclusion is that we must develop the design of adequate surface signs and signals for the characteristics and character of our computer artifacts; at this time all design effort and ingenuity seems to go into making the raw functions ‘transparent,’ i.e. spelling out loud and clear what the functions are and how they should be operated.

4.1 Pay more attention to character, and the completeness and coherence of characteristics

Consistency is a fairly well-established design principle for user interfaces. Yet there is little agreement on the exact meaning of the consistency principle and on how it should be applied. As Grudin\textsuperscript{11} points out, ‘recommending consistency as a design guide leaves designers free to look for consistency where they will.’ Many times, consistency between interface and internal system architecture is easier to see and appreciate for a designer with a background in computer science and engineering, than consistency between interface and user requirements, or between different parts and aspects of the interface. Clearly, it is not simply the amount of consistency that matters.

In the absence of a clear meaning, the principle of consistency easily becomes a rule of uniformity. All menus should look the same, all document icons should have this or that particular shape, every costly, irreversible operation should be confirmed by the user. However, in the everyday world people tend to get bored by too much uniformity and consistency; these are standards that fit machines better than human beings.

We believe that what good designers more or less consciously strive for, rather, is the consistency of character, i.e. the existence of a coherent unity of characteristics, each of which is a meta-property that applies across different functions and qualities of the artifact. Character does not imply uniformity on the level of behaviour and appearance, and may sometimes be in conflict with uniformity requirements; e.g. attentiveness is not characterized by sameness of response. The breakfast conversation with all too consistent responses from behind the morning paper eventually leads to

\textsuperscript{11} Grudin, J. 'The case against user interface consistency' CACM, 1989, 32(10), 1164–1173.
the question: are you really listening to what I’m saying? People make
mistakes when things become monotonous. The one time you really wanted
to say ‘No!’ to the very consistent ‘Are you sure?’ question, you are likely
to find that you have already routinely answered ‘Yes!’ and caused irre-
versible damage to your work. A fixed uniform response time would not
be characteristic of a fast application: a big task should obviously take
longer time than a small task (in this example, the right design often comes
naturally) and a fast display of an information sheet should take longer
time than a fast deletion of an object.

Some examples of research questions: How coherent are user characteriza-
tions? When and how do users really experience consistency? What is the
relation between consistency and uniformity? In computer artifacts judged
as consistent, what are the typical characteristics and characters experi-
cenced by users? Are there typically ‘male’ and ‘female’ characteristics?
Are there differences in appearance and ‘demeanor’ that make a difference
to how male and female users view the artifact, feel comfortable with it,
and use it efficiently?

4.2 Develop the design of ‘characteristic features’ to
bring out the (true) character of the computer artifact

Regarding the relation between function and surface appearance, the most
common view seems to be that the main design objectives are: (1) to dis-
play as clearly as possible the available functions and (2) to display as
clearly as possible the proper way to operate those functions. An often
professed design ideal is that of transparency. Transparency sometimes
seems to mean the subjective disappearance of a tool (as in Heidegger’s
analysis). Sometimes it seems to mean that you can see right through to
the heart of the thing, understanding what it really is and can do, and how
you should operate it.

We suspect that these design objectives—transparency of function and
operation—may, paradoxically, become a secondary concern when the
functional complexity of the artifacts reaches a certain threshold. Beyond
this threshold, they can no longer be handled strictly by detailed, explicit
functional control, alone. We believe that there already are examples of
artifacts that have passed the threshold.

Complex artifacts—or, more exactly, artifacts with a low usage/complexity
ratio—may have to be handled differently. Confronted with very complex
artifacts, people tend to develop and rely on, an overall feeling about the
artifact, and a certain attitude to the artifact. High-level, non-functional
expectations and high-level, non-functional constraints on our actions, can
couple function to context and situation in a cognitively more efficient way. We believe that the relevant measure of complexity here is not primarily the mechanical or structural complexity. Rather it is the complexity of the relation between the qualities of the product or outcome in the use of the artifact, and the available techniques of interaction. In this interpretation of artifact complexity, a violin is a highly complex artifact, even though mechanically it is quite simple.

The important objective for computer-artifact design, regarding the relation between function and surface appearance, would then be to support character-guided interaction, by displaying the characteristics of the artifact as clearly as possible.

Some examples of research questions: is any kind of superficial, perceivable property likely to get projected as a potential characteristic? Or is there some special class of characteristic markers, other surface properties not being used or usable as character cues? Can the ‘product semantics’ developed in industrial design be used to support the design of character cueing? Would it be a good idea (or not) to exploit surface signals with a more devious relation to character—like hyperbole, caricature, and irony?

5 Conclusion

The complexities of our new, computer-supported world of artifacts, be they material or ‘virtual,’ seem overwhelming. What strategies should we adopt to cope?

We believe that we must learn to better exploit the basic abilities human beings have evolved in dealing with each other and with things in their environment. One of these abilities is the use of characters. We propose that in the design of computer artifacts: (1) more attention should be paid to character, and the completeness and coherence of characteristics; and (2) the design of characteristic features should be developed to better bring out the (true) character of computer artifacts.