# Chapter 17
# Internet of Toys for Young Children:
## Educational Value or Threat?

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## ABSTRACT

*The internet of toys (IoToys) is a new technological innovation that regards toys connected to the internet, while some such toys can adapt to the actions of the users-children. The purpose of this chapter is to discuss potential benefits and risks/threats associated with young children's engagement with IoToys. Potential benefits include opportunities for personalized play and learning, ownership, creativity, digital skills, and new types of interactions. In parallel, an internet-connected toy usually collects information about the users, can be hacked, and there are risks about children's privacy, personal data safety and security, as well as social risks. Safe conclusions cannot be drawn as to whether IoToys' potential educational value outweighs potential risks or vice versa. Potential risks arise strongly and seem difficult to be counterbalanced by potential opportunities. The play affordances of the hybrid toys, which are both educational and entertaining, are expected to contribute to new understandings of children's (digital) play.*

## INTRODUCTION

The Internet of Toys (IoToys) or internet-connected toys is the latest technological innovation and constitutes part of the growing world of the Internet of Things (Mascheroni & Holloway, 2019). Such toys are software-enabled and can be programmable robots, teddy bears, dolls, dinosaurs and watches, and all have in common the facility to be connected to the internet, while some involve the possibility to adapt to the actions of the users-children. Internet-connected toys can record different types of data (such as sounds, images, movements and locality), while they are not necessarily smart. A major characteristic of IoToys is that they can be personalized (or individualized) as the content of a story/game can be tailored

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to an individual child (Kucirkova & Flewitt, 2020). The Internet of Toys is an emerging research area, in the context of edutainment, learning, or both contexts (Heljakka & Ihamäki, 2018, 2019a; Ihamäki & Heljakka, 2019).

With regard to young children's usage-engagement with IoToys, there is little research in informal or formal education settings (e.g., Holloway & Green, 2016; Heljakka & Ihamäki, 2018; Arnott et al., 2019; Kewalramani et al., 2020a, 2020b). Young children's engagement with IoToys can be of potential educational value, but also includes potential risks-threats. Internet connected toys can offer new opportunities for play, learning, and educational support (Mascheroni & Holloway, 2017; Marsh, 2019) but they also raise questions about safety, security, and privacy (Chaudron et al., 2017). For example, a child can interact with a toy-robot and can receive feedback on his/her actions (the feedback/response may come from the toy or from an adult/parent), while toys may record personal information regarding the child's personal data (name, date of birth, location etc.), and then use and share this data.

The purpose of this chapter is to discuss potential benefits-opportunities (educational value) and risks-threats associated with young children's engagement with Internet of Toys. This discussion takes into account research findings and claims. The chapter is structured as follows. Next section presents the background (common features-characteristics of IoToys and research findings regarding their usage by young children), followed by IoToys' potential benefits and risks. The last sections regard the conclusion and questions for future research. It is noted that although this chapter is not focused on the design of IoToys, some such studies are included, in order to describe features-characteristics of the IoToys that might be of educational value or risk.

## BACKGROUND

### Features: Characteristics of Internet of Toys

Internet-connected toys (IoToys) are internet-enabled devices with Wi-Fi, Bluetooth, or other capabilities built in, which may provide a more personalized play experience for children (through embedded software that can offer app integration, speech and/or image recognition, and web searching functions) (Wikipedia, 2020). IoToys are sometimes equipped with speech recognition and activation and appear to react to the words of the user, and they may also be controlled remotely across network infrastructure (e.g., via smartphones or tablets connected to the same network) (Mascheroni & Holloway, 2017). The Internet of Things (IoT) makes toys smarter and more communicative, as they can now interact with children by 'listening' to them and actively respond in real time (Haber, 2018).

IoToys are distinct from smart toys, and they are not necessarily smart (intelligent). Smart toys embed electronic features such as sensors, microphone, camera, and compass that enable them to interact with their users-children and adapt to their actions (these toys are not necessarily connected to the internet). For example, sensors like accelerometers and gyroscopes can collect the required motion tracking data; they can track the location of children using GPS features, store pictures/videos/audios and allow personal information exchanges through smartphone applications. IoToys can be connected to online platforms and to other toys through Wi-Fi, involve sensors and relate one-to-one to children (Holloway & Green, 2016). According to Holloway (2017) most IoToys and smart toys are 'hybrid' products. The physical object (the toy) is owned by the child, but data exchange is enabled between the child and the platform; the child and the parent; and the child and other data sharing recipients.