

Teaching Case
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AI in the Closure of Zillow Offers**

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Teaching Case

When Strength Turns Into Weakness: Exploring the Role of AI in the Closure of Zillow Offers

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ABSTRACT

Founded in 2006, Zillow established itself as the leading online real estate marketplace. In 2018, Zillow launched Zillow Offers, a new business that purchased and sold homes. Zillow Offers provided home sellers with a faster purchase process than traditional realtors by gathering data from sellers online and making offers immediately, a process known as “iBuying” (i.e., “Instant Buying”). Though new to iBuying, Zillow quickly established a goal of generating \$20 billion in annual revenue within three-to-five years. Zillow believed that its artificial intelligence/machine learning (AI/ML) platform for predicting home values, aka “Zestimate,” could be a competitive advantage in the iBuying marketplace. However, after losing \$421 million in its iBuying business during the third quarter of 2021, the company closed this once-promising business unit rather than risk further losses. CEO Rich Barton asserted that the AI’s inability to accurately predict home prices caused the failure of its iBuying business. This case study examines the trajectory of Zillow Offers and discusses several factors that contributed to its demise. After exploring the challenges of its home-price prediction algorithms within iBuying, we argue that the failure of Zillow Offers extends beyond the limitations of its initial AI/ML system. Zillow Offers’ focus on hypergrowth over profitability led to operational changes that failed to balance estimated price predictions and operational purchase price decisions. Through this analysis, we raise important questions for students and practitioners about the appropriate and effective use of data-driven AI/ML models for operational decision making.

Keywords: Zillow Offers, Artificial intelligence, Machine learning, iBuying, Zestimate

1. INTRODUCTION

1.1 Zillow and Its Traditional Business Model

Zillow is the leading digital media company focused on the real estate industry with more than 10.2 billion visits in 2021 and a database of 135 million U.S. homes (iProperty Management, 2021; Smith, 2022). In addition to information captured about the visitors to its website, the company collects data from various sources including Multiple Listing Services, county records, and other companies that it has acquired (Adams, 2020). Utilizing this data, Zillow provides a variety of services to homebuyers, sellers, renters, and real estate agents. Zillow generates revenue from advertising, mortgage, and closing services, and offers home-related services such as loans, titles, and escrow services (Zillow Group, 2021a).

1.2 The Zestimate: Zillow’s Home Value Estimator

One very popular feature of Zillow’s website is the Zestimate, a data-driven artificial intelligence/machine learning (AI/ML) system that produces an estimate of any given home’s market value. Launched in 2006, Zillow has sought to improve and enhance the accuracy of the Zestimate’s predictions over time. Most notably, in 2017 the company held a competition called the “Zillow Prize” that invited data scientists to propose improvements to its price prediction algorithms, attracting more than 3,800 teams from 91 countries. The winning team in the Zillow Prize competition developed a sophisticated neural network-based AI/ML algorithm that incorporated a deeper history of off-market property data, market trends, and home details (Zillow Group, 2021b).

As a result of these enhancements, the accuracy of the Zestimate has improved over time. Most recently, Zillow has reported the median error rate for its Zestimates is 7.49% for off-market homes and 2.4% for on-market homes (Zillow

Group, 2022). The Zestimate has become so popular that many home buyers and sellers confuse it with a more thorough and formal appraisal value (Kaysen, 2018) despite Zillow's advice and caveats.

1.3 Leveraging the Zestimate: The Zillow Offers Business

In 2018, Zillow introduced a new venture called Zillow Offers, specializing in direct home purchases and sales. The company aimed to provide a quicker buying experience for sellers by obtaining their information online and offering to purchase their homes instantly, known as "Instant Buying" or "iBuying." Zillow sought to grow this business aggressively, aiming to generate \$20 billion in annual revenue within three-to-five years (Levy, 2019). Zillow's ability to achieve these lofty goals was heavily dependent on its ability to utilize its Zestimates to value homes quickly and accurately to determine the purchase prices that it would offer to would-be home sellers.

Unfortunately for Zillow, its Zillow Offers business results fell far short of expectations. After Zillow Offers incurred a loss of \$421 million in Q3 2021, the company made the decision to shut down the business unit to prevent further losses of this scale (Zillow Group, 2021d). Upon announcing the decision to close Zillow Offers, Zillow CEO Rich Barton placed the blame for this business failure on the accuracy of the AI/ML models, concluding that "the unpredictability in forecasting home prices far exceeds what we anticipated" (Zillow Group, 2021c, p. 1).

1.4 A Critical Examination of the Zillow Offers Journey

Like Zillow, many firms today strive to utilize AI/ML models to create value from their data assets but capturing business value often proves to be elusive. Recent research shows that 75% of AI/ML projects fail to deliver positive business results (Balakrishnan et al., 2020). However, the reasons for these types of business failures are often not well understood or carefully examined.

In this case study, we examine the history of the Zillow Offers business and explore many factors that we believe contributed to its demise. First, we examine the trajectory of Zillow Offers from its ambitious launch to its eventual failure. Second, we identify several known limitations of Zillow's AI/ML-based Zestimate in terms of home price prediction accuracy with implications for its effectiveness within the context of the Zillow Offers business. Third, we describe other specific strategic and operational choices made within the Zillow Offers business and the potential impact on its business results.

2. THE ARC OF THE ZILLOW OFFERS STORY

2.1 Entering the iBuying Market

Instant Buying (more commonly referred to as "iBuying") refers to the process of purchasing homes directly from homeowners, typically through an online platform, without the need for a real estate agent. Companies in the iBuying industry use algorithms to make an instant cash offer for a home based on factors like location, condition, and recent comparable sales. The goal of iBuying is to make the process quicker, more convenient, and more efficient for sellers.

After piloting the iBuying concept in two markets in 2017, Zillow officially entered the iBuying market with the launch of Zillow Offers in April of 2018. At that time, there were already several early entrants in the iBuying market including

Opendoor (2014), Offerpad (2015), and RedfinNow (2017) (iBuyer.com, 2022).

Zillow's strengths mainly lie in their vast database of homes, superior data science, and technology-related advantages. Its entry into the iBuying market represented an attempt to utilize its AI/ML-based Zestimate price prediction models to create tangible business value.

However, the decision to enter the iBuying market also marked a major strategic shift in business strategy for Zillow. Prior to launching Zillow Offers, Zillow was a media company providing products and services to different players in the real estate industry. However, Zillow Offers was the company's first foray into the business of buying and selling homes which required additional operational expertise and significantly more financial capital.

2.2 New Leadership and Aggressive Growth Targets

The Zillow Offers business officially began in April of 2018 by initially purchasing homes in the Phoenix market during the second quarter. By the end of 2018, Zillow Offers was operating in five metro areas across the country, buying a total of 686 homes and generating a revenue of \$52 million (Zillow Group, 2019).

In February 2019, Zillow co-founder Rich Barton took over as the company's CEO and quickly sought to grow the Zillow Offers business. Under Barton's leadership, the company established a new goal for Zillow Offers of reaching \$20 billion in revenue in three-to-five years (Levy, 2019).

Pursuing this goal aggressively in 2019, Zillow Offers expanded its business from five metro areas to twenty-three and significantly increased the number of homes purchased. But Barton's goal of \$20 billion in annual revenue required the company to buy and sell roughly 15,000 homes per quarter, and its results for 2019 fell far short of this level. During 2019, Zillow Offers purchased 6,512 homes and sold 4,313 homes. The COVID-19 pandemic led Zillow Offers to pause its home purchasing briefly in early 2020, but the company quickly resumed operations. In 2020, Zillow Offers purchased 4,162 homes and sold 5,337 homes, still far below its stated objectives (Zillow Group, 2021c).

2.3 Increased Home Purchase Volumes, Staggering Losses, and Business Failure

Because Zillow Offers was not buying houses at the pace required to meet its goals, in early 2021 the company took several steps to make it easier for it to acquire houses more quickly. (This is discussed in more detail later in this case study). As a result, Zillow Offers significantly accelerated its home buying in the second quarter of 2021, acquiring 3,805 homes in this quarter (more than double the previous quarter's purchasing volume) while selling just 2,086 homes. Zillow Offers then bought 9,680 houses in the third quarter of 2021, more than the combined number of homes that it had purchased in the previous five quarters. But they only sold 3,032 homes in Q3, which resulted in an EBITDA (earnings before interest, taxes, depreciation, and amortization) loss of \$381 million (Zillow Group, 2021c) as well as a large amount of expensive inventory on its balance sheet.

In a shareholder letter dated November 2, 2021, Rich Barton announced that the company was closing the Zillow Offers business and laying off about 25% of its workforce. While Barton mentioned a slew of causes for the demise of

Zillow Offers, he strongly suggested that the primary reason was the inability of their AI/ML algorithm to make accurate price predictions (Zillow Group, 2021c). In particular, he asserted that “we have been unable to forecast future home prices at different times” and that “this home price forecasting volatility has also contributed to significant capacity and demand planning challenges, exacerbated by a difficult labor and supply chain environment” (Zillow Group, 2021c, pp. 2-3). With that, Zillow exited the iBuying market less than four years after entering. That week, the company’s market capitalization fell by \$40 billion (over 37%) (Clark & Buhayar, 2022).

3. “WHAT WENT WRONG?” AN ANALYSIS OF ZILLOW OFFERS’ FAILURE

3.1 Overview of Analysis

In this section, we identify several different factors that contributed to the poor business results that led to Zillow Offers’ failure. These contributing factors include both challenges with home-price forecasting for purposes of supporting iBuying as well as a variety of operational management decisions and processes.

Specifically, while Zillow’s AI/ML algorithms for home price prediction clearly had several shortcomings, we argue that Zillow Offers’ failure was also a consequence of its inability to build an effective overall operational system for a fundamentally new line of business in which the company had essentially no previous operating experience. As a result of this inexperience, Zillow had much to learn, both about the price prediction algorithms and about the operating model for iBuying. Unfortunately, Zillow’s aggressive growth targets magnified many of the errors that took place during the learning process.

We also note that all firms in the iBuying marketplace faced similar external environmental conditions as Zillow Offers. However, these firms had more experience with iBuying than Zillow and none of them attempted to grow nearly as quickly as Zillow did during 2021. As such, none of them experienced the same poor financial results. Some of them are still active participants in the iBuying market today.

3.2 AI/ML Home Price Forecasting Challenges in the iBuying Market

At the time that Zillow made the decision to enter the iBuying market, Zillow considered its AI/ML-based Zestimate price prediction model a major strength. Indeed, Zestimates provide valuable information for market participants contemplating home sales and purchases. As such, the Zestimate has been very effective in driving traffic to Zillow’s media properties and building Zillow’s database and its brand as a real estate media company.

As a result of the company’s continuing investment in its price prediction algorithms, Zillow has for many years reported impressive levels of accuracy for its Zestimates. However, Zillow calculates their publicly presented price-prediction error metrics by comparing the actual price of a home sold with the Zestimate made for that home on the date of sale (Zillow Group, 2022).

While the Zestimate excelled in bringing traffic to Zillow’s existing advertising-based business model, the new business model for iBuying required a more sophisticated set of home valuations. In addition to understanding the current value of a

house at the time of purchase (which we refer to as A), the iBuying business model depends heavily on accurately estimating the future value of that same house at the point of its projected sale (which we refer to as B). In order to profit from a potential transaction, an iBuying firm’s offer to the seller at time A should reflect a house’s estimated value at time B. However, this future value may differ from the current value due to known attributes of the house itself plus external factors such as mortgage rates, macroeconomic changes, labor and material costs associated with renovation, and local economic factors affecting demand. Thus, the potential change in the value between A and B adds a significant level of cross-sectional complexity that historically was not part of the Zestimate (Schoemaker, 2004).

In addition, at the time of purchase, an iBuying firm does not know with any certainty when the house will sell. This uncertainty is called dynamic complexity which includes an additional random element of time in the forecasting process (Schoemaker, 2004). The duration of this random time interval between A and B can also vary based on a number of inputs that are hard to estimate at the time of purchase. Therefore, predicting the market value of a house at a random future point B adds even more uncertainty and complexity as the variability in market value increases with the length of time between the purchase date A and the sale date B.

All firms in the iBuying market strive to make good pricing decisions at the time of purchase. However, we believe that there are two primary explanations for why only Zillow Offers suffered such severe financial losses during 2021, a period of increasing home values. First, because Zillow had far less experience in the iBuying market, its pricing models for iBuying may have been less mature and less accurate in the presence of cross-sectional and dynamic complexity. More significantly, Zillow made several strategic and operational choices that proved very damaging financially. This is discussed in the next section.

3.3 Strategic and Operational Decisions

When Zillow Offers launched in 2018, Zillow moved into the iBuying market slowly, initially purchasing homes only in the Phoenix area and expanding into a total of only five markets by the end of the year. During 2018, Zillow Offers purchased a total of 686 homes and sold just 177, generating \$52 million in revenue and losing \$27.2 million (Zillow Group, 2019).

Zillow Offers’ initial approach to pricing decisions for home purchases also reflected a level of caution. After its AI/ML algorithm had generated an estimate for the value of a given home, Zillow’s pricing experts vetted the bid price and adjusted it based on their understanding of market conditions and trends. If a seller accepted this bid, Zillow’s renovation teams estimated the cost of needed repairs prior to selling the house and subtracted these costs from its final bid (Marquand, 2021).

However, when Rich Barton took over as Zillow’s CEO in early 2019, the company established a new strategic goal for Zillow Offers to reach \$20 billion in revenue in three-to-five years (Levy, 2019). Barton’s explicit motivation for this strategic shift was to compete with Opendoor, the first major player in the iBuying market. By mid-2019, Opendoor had a total of \$1.3 billion in venture capital (Lunden, 2019). Barton felt that iBuying was the future of the real estate industry and

believed that Opendoor and other iBuying competitors represented “an existential threat” to Zillow’s business.

Thus, immediately after Barton took over as CEO, Zillow Offers significantly increased its volume of transactions purchasing over 2,000 homes in the third quarter of 2019 alone. But this volume of transactions fell far short of the 15,000 homes per quarter needed to achieve its \$20 billion revenue target. In 2020, the COVID-19 pandemic resulted in Zillow Offers purchasing even fewer homes (Zillow Group, 2021c). Meanwhile, Opendoor went public in late 2020, at which time it was valued at nearly \$18 billion (Weinberg, 2020).

In addition to the internal \$20 billion annual revenue target, all of these strategic decisions led directly to several changes to operational processes intended to increase the speed at which Zillow Offers could purchase homes. This initiative, launched in early 2021, was known as “Project Ketchup.” As part of Project Ketchup, Zillow Offers began to explicitly use its Zestimate as its cash offer for certain qualifying homes. It also prevented its pricing experts from modifying the algorithm’s home value estimates and asked them to stop questioning the algorithm’s valuations. In addition, to maximize the chance of home sellers accepting Zillow’s offers, the company would sometimes raise its bid by many thousands of dollars above the algorithmically-generated price, a practice known within Zillow as “offer calibration.” To further strengthen its competitive position, Zillow Offers also lowered its convenience fees to 1%, far lower than the 5% charged by Opendoor (Parker & Putzier, 2021).

As expected, these changes had a significant impact on the number of houses that Zillow Offers could purchase. As shown in Figure 1, the company acquired 3,805 houses in the second quarter of 2021, more than double the volume from the previous quarter. This rapid increase in home purchases, however, created another operational challenge. Upon purchasing a house, the entire cost of that house was on Zillow’s balance sheet as a liability. For a variety of reasons, the company sold far fewer homes (2,086) in the third quarter of 2021 than it had purchased.

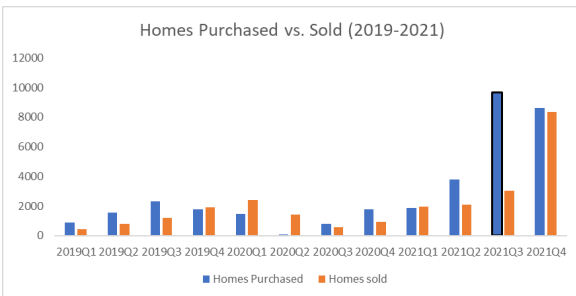


Figure 1. Zillow Offers Homes Purchased vs. Sold

One reason for the delay in sales may have been that Zillow Offers’ algorithms had suggested purchasing homes at prices that were too high, thus leading to asking prices that buyers perceived as too high (more on this below). In addition, for many houses, a key factor impacting the time of sale involved home repairs and/or renovations. In mid-2021 the entire country was suffering from a shortage of labor and skilled contractors were in high demand. This, combined with Zillow Offers’ rapid growth in its number of homes, strained the capacity of Zillow’s

network of independent contractors leading to delays in preparing houses for sale (Keith, 2020).

Once Zillow Offers realized that it was overpaying for houses, reducing its profitability potential (iBuyerStats, 2021), the company responded by reducing the funding for planned renovations. Unfortunately, this reduction negatively impacted its relationship with contractors, many of whom also worked for other iBuying competitors who paid contractors more and were easier to work with than Zillow. Thus, many contractors chose to deprioritize their Zillow projects or terminate their relationship with Zillow Offers (Hahn, 2021) leading to longer lead times in getting houses ready for sale.

In terms of average profit per home, Zillow consistently lost money from the first quarter of 2019 to the third quarter of 2020. Although the average profit per home increased in the fourth quarter of 2020 and remained positive until the third quarter of 2021, this figure accounted only for the homes that were sold during a given quarter. Meanwhile, Zillow regularly possessed a large inventory of unsold homes (as shown in Figure 2).

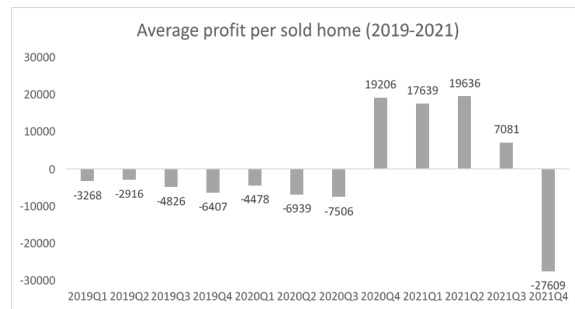


Figure 2. Zillow Offers Average Profit per Home Sold

In the third quarter of 2021, Zillow Offers acquired 9,680 houses, more houses than it had purchased in the past five quarters combined. Once again, it sold only a small fraction of those homes leading to disastrous financial results and the decision to shut down the Zillow Offers business (Zillow Group, 2021c). Upon announcing the shutdown of the Zillow Offers business in early November 2021 the company’s market capitalization fell by 80% in a single week (Clark & Buhayar, 2022).

4. DISCUSSION AND CONCLUSION

Zillow Offers’ poor financial performance was a consequence of price prediction challenges as well as strategic and operational mistakes. Prior to launching its iBuying business, Zillow’s only experience was as a media company focused on real estate. Thus, the company simply did not understand the dynamics of buying and selling homes nearly as well as its more experienced competitors in the iBuying market even as it aggressively scaled its transaction volumes to meet its ambitious internal targets. Indeed, the evidence suggests that Zillow’s focus on aggressive revenue growth led it to consistently overpay for houses between March and November 2021 (see Figure 3) (iBuyerStats, 2021). In addition, its inability to sell houses in a timely manner led to losses even while home prices rose, and its buy-to-list premiums (difference between purchase price and list prices) were far worse than its

competitors (see Figure 4) (DelPrete, 2021). Also, as Figure 5 illustrates, Zillow Offers' revenues rose steadily from 2018 to 2021, but so did its losses which soared to unprecedented levels in the same timeframe.

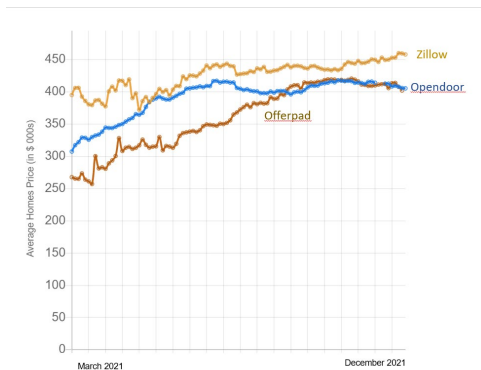


Figure 3. Zillow Overpaid for Homes (adapted from iBuyerStats, 2021)

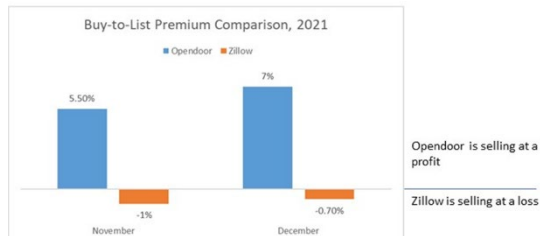


Figure 4. Comparison of Opendoor and Zillow Offers (adapted from DelPrete, 2021)

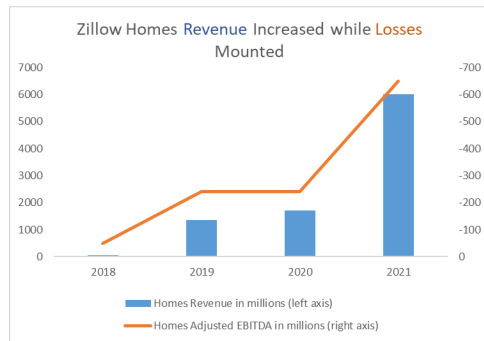


Figure 5. Zillow Revenues and Losses From 2018 to 2021

Zillow chose to prioritize growth at the expense of short-term profits. However, this strategy required strengthening its internal competencies, which we believe Zillow failed to do (Zhou & Park, 2020). We identify two main areas of weakness—its AI/ML-based algorithms for price prediction and its operational capabilities.

Zillow's Zestimate was successful in attracting visitors to their media platform, but it could not support its new iBuying business model. Wilson and Daugherty (2018) argue that AI alone is not enough to create value; it needs integration with

human expertise in a process they call "collaborative intelligence." We contend that Zillow did not develop this competency; instead, they tried to grow its volume and market share very quickly without respecting the important role of human experts as guardrails for its evolving price prediction algorithms. In addition, Zillow failed to match its ambitious growth strategy with its operational capabilities as the home-flipping business required different operational skills and resources than its core media business.

When AI-based business models fail, who is accountable? Zillow's CEO, Rich Barton, blamed the AI system's inaccurate predictions for the massive loss in their market value. This raises a crucial ethical question of whether an AI system can be liable for its actions (Constantinescu et al., 2022). Was Barton justified in shifting the blame from strategic and operational decisions made by humans to an AI system? Many investors do not believe so. Shareholders filed a class-action lawsuit (Barua vs. Zillow Group, Inc.) claiming that the executives deliberately concealed significant problems with Zillow Offers before shutting it down (Wallace, 2021).

Zillow Offers' failure illustrates the perils of relying on an unproven technology and underestimating the risk in a novel business model. Zillow's aggressive expansion goal led to a huge financial loss for itself and its shareholders. As firms aim to utilize AI/ML-algorithms to create and capture business value, we believe that lessons from this case study can help guide firms with managing and ultimately capitalizing on future AI projects.

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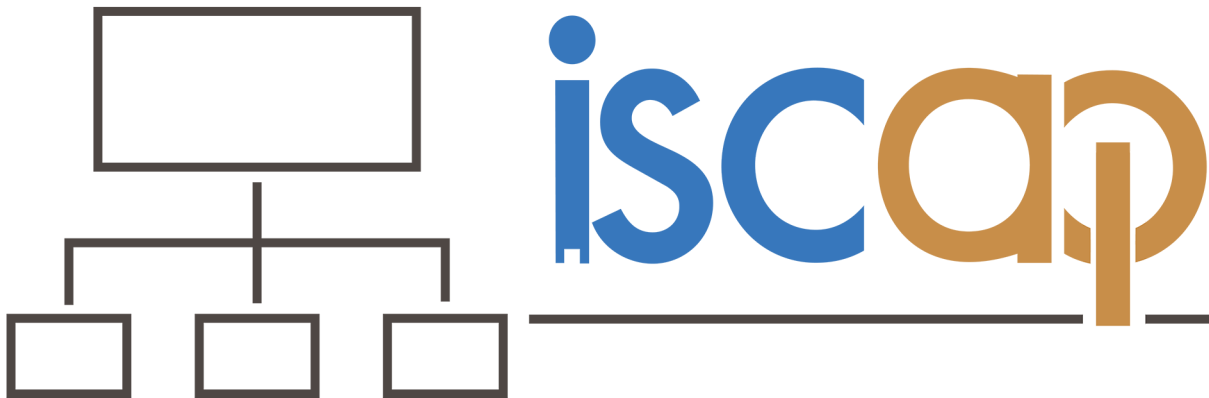


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