

Factors Influencing Undergraduate Final Year Project Idea Selection: A Comprehensive Review for IT and CS Students

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Abstract: This study sought to identify and categorize factors influencing undergraduate students' Final Year Project (FYP) idea selection in Information Technology (IT) and Computer Science (CS) fields. The study adopted a systematic approach, analyzing relevant literature post-2010 from various databases. The review scrutinized factors under three primary categories: student, supervisor and environment. Eight articles were selected for analysis based on their relevance to IT and CS. Factors were categorized based on recurring themes and their frequencies were examined and presented in detailed tables. Student-centered factors (58.5%) prominently influenced project idea selection, with Student Interest, Future Ambition and Mastering English Language being noteworthy. Supervisor-centered factors (14.6%), such as Supervisor's Area of Interest and environment-centered factors (26.8%), including Availability of Literature influenced project selection. The study concludes that institutions should prioritize strategies to enhance student-centered factors, supporting interests, future ambitions and language proficiency.

Keywords: Information Communication Technology; Final Year Projects; Project Ideas; Information Technology; Computer Science; Literature Review.

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Introduction

In many Higher Learning Institutions (HLIs) across the world, students in the final academic year are required to conduct a project in one of areas of specialization in the given field. This is particularly common for Information Technology (IT), Information and Communication Technology (ICT) and Computer Science (CS). These Final Year Projects (FYPs) play a significant role in undergraduate education in the IT and computing field of study. Most of HLIs' departments and schools consider such projects as an essential contribution to their studies (Hassani et al., 2018). In some HLIs, a FYP counts as a double module in order to put more emphasis on its importance. For example, London Metropolitan University (2023) has The School of Computing and Digital Media which offers a FYP module with 30 credits instead of regular 15 credits. This highlights the significance of project work in developing research, problem-solving and technical skills in computing fields. Similarly, Nanyang Technological University (2023) in Singapore has the School of Information Technology which offers a FYP as a double-module with 8 Academic Units (AUs) instead of regular 3 or 4 AUs, where students embark on independent research projects under faculty supervision. This fosters critical thinking, research skills and in-depth exploration of specific IT domains.

Bouki (2007) stated that a FYP is the epitome not only of the knowledge students acquire during their studies but also of what they are able to do as computer scientists. This goes further than the mere knowledge of programming. It includes critical thinking, creativity, time management and communication skills. Berndtsson et al. (2002) describe FYPs as a tool for studying subjects in more depth, a stepping stone towards finding and securing challenging jobs by practicing skills on real-world problems and a stepping stone towards graduate studies by exploring research problems. In the process of conducting these projects, students are required to formulate an idea for the project and present it to supervisors or special panel for improvement and approval before proceeding with

the next steps, which are system analysis, design and implementation.

From the students' point of view, the process of selecting and formulating a project idea that is acceptable to the panel or supervisor has become a huge challenge and daunting task, which may result in a lower score and failure or extension of time in order to complete the project works as part of fulfillment of their undergraduate degree (Beins, 2013; Walliman, 2005). These challenges faced by students have called for researches to identify and analyze the factors that influence students when choosing and formulating their project ideas during the course of their studies. As the study of Suhaili and Haywood (2017) as well as Sharef et al. (2014) have shown, other researchers have tried to identify assessment criteria that supervisors or assessment panels in HLIs use before approving any student's project idea. Indeed, there are many factors that can influence a final year student of CS or IT as it was observed in the literature. In this study of global literature, several research articles related to the factors influencing students' project ideas were analyzed in order to comprehensively identify factors and their categories that significantly influence undergraduate level CS and IT students' project idea selection. This endeavor aims to enhance the understanding of the challenges students face in formulating project ideas and contribute valuable insights to educational institutions. By identifying and categorizing these factors, the study sought to pave the way for improved guidance and support systems, ultimately fostering an environment that empowers students in the successful selection and execution of their Final Year Projects.

Methodology

This section presents the methodology that guided the study. It includes the design, population and sampling, sources of data, validity and reliability, treatment of data and ethical considerations.

Design

This study used the systematic approach to comprehensively explore factors influencing the selection of undergraduate final year project ideas

for IT and CS students. The methodology follows a structured process to ensure inclusivity and relevance in the selection and analysis of literature.

Population and Sampling

The inclusion criteria for articles was established to maintain currency and relevance. Articles considered were limited to those published after the year 2010 to align with recent advancements and practices in IT and CS education.

Sources of Data

Words listed in the keyword section were mainly used to search relevant articles from various websites for possible inclusion. A diverse range of academic databases were employed to gather relevant literature, including Google Scholar, Semantic Scholar, Taylor & Francis Online, Elsevier and Research Gate.

Validity and Reliability

Stringent criteria were applied to validate the relevance of each article. The review focused on scholarly sources directly or indirectly related to factors influencing undergraduate project idea selection for IT and CS students. Rigorous scrutiny of the chosen articles maintained the methodological integrity of the review process. The study scrutinized the relevance of the journal papers by evaluating the contents which are directly or indirectly about the factors influencing undergraduate project ideas for IT and CS students. Here the term “directly” means the article clearly stated that the factors are for IT or CS students while, the term “indirectly” means the article listed factors of all disciplines including IT and CS students. In case, the article was specifically about a certain discipline that is not IT or CS, it was discarded.

Analysis of Data

The extracted articles were subjected to a thorough examination to identify factors influencing undergraduate project ideas for IT and CS students. The analysis involved categorizing these factors into three primary categories: supervisor, student and environment. The factors were collected and organized based on recurring themes, consolidating similar concepts for uniformity and clarity. Specifically, the category of supervisor includes those factors which influence students' project idea selection through their interaction with a supervisor. The category of a student includes those factors which are student centered - meaning the influence on the project idea selection originated

from the student. The environment category includes those factors that their influence originates from the student's surroundings.

Ethical Considerations

Ethical considerations were observed throughout the review process. The study adhered to ethical standards in data collection and analysis. The inclusion criteria were applied consistently, and decisions regarding the selection and categorization of factors were made transparently after a deliberation among the authors.

Results and Discussion

Following a careful elimination process, this study identified eight articles that were relevant to the study. After analyzing the contents of the articles, the factors were extracted and placed into one of the three categories: supervisor, student, and environment. Subsequent subsections present explanation together with comprehensive tables for each category, comprising columns detailing factors, their respective sources or articles and the frequency of occurrence across the literature.

Student-Centered Factors

Table 1 presents the findings of student-centered factors that influence undergraduate students' final year project idea selection in the IT and CS fields. These factors are listed together with the source articles and their frequency (n) of occurrence in the literature. The most frequently cited factor is Student Interest (n=5), indicating that students are more likely to choose projects that align with their personal interests and academic goals. This finding is supported by Shrode (2013), Abdalla & Mohammed (2020), Cameron (2019) and Bosomtwe et al. (2021). There are three second most cited factors with a frequency of three, which are Future Ambition (n=3) indicating that students are motivated to select projects that contribute to their future career aspirations in the IT and CS fields as supported by Sellaheva and Samarasinghe (2021), Abdalla and Mohammed (2020) and Bosomtwe et al. (2021). Mastering English Language (n=3) is another significant factor as evidenced by Abdalla and Mohammed (2020), Sellaheva and Samarasinghe (2021) and Xie (2019) who emphasized that proficiency in English language facilitates research, communication and project documentation. furthermore, Perceived Ease of Doing Project (n=3) suggests that students tended to choose projects they perceived as manageable and achievable, based on their skills and knowledge

as evidenced by Shrode (2013), Wook et al. (2012) and Bosomtwe et al. (2021).

Other three factors had a frequency of two, and these included Ability to Program (n=2), indicating that programming skills and experience can influence project choice as described by Abdalla and Mohammed (2020) and Wook et al. (2012). This is consistent with the importance of technical skills in the IT and CS fields. Help from Others (n=2) highlighted that students may seek guidance and support from peers, mentors or supervisors in choosing a project idea as described by Abdalla and Mohammed (2020) and Bosomtwe et al. (2021). Self-Efficacy (n=2) was another factor as described by Sellahewa and Samarasinghe (2021) and Bosomtwe et al.(2021) as the behavior by students to believe in their abilities which eventually makes them more likely to choose challenging and innovative projects. The same literature insisted

that personal beliefs and perceived barriers to success play a significant role in students' choices of project ideas.

The remaining four factors had a frequency of one. These included Consciousness (n=1) highlighting that ethical considerations and societal impact may influence project selection. This factor reflects students' awareness of the broader implications of their project choices as described by Sellahewa and Samarasinghe (2021). Creativity (n=1) is another factor as evidenced by Shrode (2013) who explained that students with a creative mindset may be drawn to projects that involve innovative ideas and solutions. Wook et al (2012) included Student Experience and Background (n=1) as another factor, explaining that students' prior experiences and academic background can influence their project idea selection.

Table 1: Student-Centered Factors

No.	Factor	Source	Frequency (n)
1	Student interest	Shrode (2013), Abdalla & Mohammed (2020) , Cameron (2019), Bosomtwe et al.(2021)*	5
2	Future ambition	Sellahewa & Samarasinghe (2021), Abdalla & Mohammed (2020), Bosomtwe et al.(2021)	3
3	Mastering English language	Abdalla & Mohammed (2020), Sellahewa & Samarasinghe (2021), Xie (2019)	3
4	Perceived ease of doing project	Shrode (2013), Wook et al.(2012), Bosomtwe et al.(2021)	3
5	Ability to program	Abdalla & Mohammed (2020), Wook et al.(2012)	2
6	Help from other sources	Abdalla & Mohammed (2020), Bosomtwe et al. (2021)	2
7	Self-efficacy	Sellahewa & Samarasinghe (2021), Bosomtwe et al.(2021)	2
8	Consciousness	Sellahewa & Samarasinghe (2021)	1
9	Creativity	Shrode (2013)	1
10	Student experience and background	Wook et al.(2012)	1
11	Time management ability	Sellahewa & Samarasinghe (2021)	1

*Bosomtwe et al. (2021) counted student interest twice, i.e. personal interest and academic interest

This factor underscores the diverse influences that shape students' project idea selection in these fields. The last factor in the student-centered

category is Time Management Ability (n=1) which was identified by Sellahewa and Samarasinghe (2021) as a crucial factor, emphasizing that students

often require extensive reading to solidify their project idea selection. However, some undergraduate students struggle to commit time to reading and other preparations due to poor time management skills.

Supervisor-Centered Factors

Table 2 presents supervisor-centered factors that influence the undergraduate project idea selection within the fields of IT and CS. The primary factor here which has a frequency of four is Area of interest (n=4) which appears across four studies (Shrode, 2013; Abdalla & Mohammed, 2020; Wook et al., 2012; Bosomtwe et al., 2021), signifying that students often incline towards projects aligned with

their supervisor's expertise and research interests. This alignment potentially enhances project cohesion and mentorship. The other factor, such as Issues with supervision (n=2), with a frequency of two, emerged as a notable concern in two studies (Sellaheewa & Samarasinghe, 2021; Abdalla & Mohammed, 2020), highlighting how inadequate supervision or guidance can detrimentally impact project selection, serving as a crucial predictor in students' decision-making process in selecting project ideas. These findings underscore the pivotal role of the supervisor in guiding and facilitating students' final year project endeavors.

Table 2: Supervisor-Centered Factors

No.	Factor	Source	Frequency (n)
1	Area of interest	Shrode (2013), Abdalla & Mohammed (2020) , Wook et al.(2012), Bosomtwe et al.(2021)	4
2	Issues with supervision	Sellaheewa & Samarasinghe (2021), Abdalla & Mohammed (2020)	2

Table 3: Environment-Centered Factors

No.	Factor	Source	Frequency (n)
1	Availability of literature	Cameron (2019), Bosomtwe et al.(2021)	2
2	Software market	Abdalla & Mohammed (2020), Bosomtwe et al. (2021)	2
3	Controversial topics	Shrode (2013)	1
4	Cost of components	Sellaheewa & Samarasinghe (2021)	1
5	Epileptic power supply	Ifedili & Omiunu (2012)	1
6	Inadequate facilities	Ifedili & Omiunu (2012)	1
7	Over stressed lecturers	Ifedili & Omiunu (2012)	1
8	Poor accommodation	Ifedili & Omiunu (2012)	1
9	Trend in the field of study	Bosomtwe et al. (2021)	1

Environment-Centered Factors

Table 3 presents the environment-centered factors that influence the selection of undergraduate final year project ideas for IT and CS students. The first factor which has a frequency of two is Availability of literature (n=2), indicating that access to relevant literature emerges as a critical factor as evidenced by Cameron (2019) and Bosomtwe et al. (2021). This

showcases the influence of resource availability on project selection. Similarly, the factor Software Market (n=2) has a frequency of two, showing that software market's trends and advancements significantly impact project choices as observed in studies by Abdalla and Mohammed (2020) and Bosomtwe et al. (2021). This factor also underscore

a possible correlation between industry trends and project selection ideas for students.

Ethical and societal considerations also influence project idea selection, evident in Shrode's study (2013) with a factor termed as Controversial Topics (n=1), reflecting the cautious selection of project ideas. Financial limitations pose a constraint on certain project ideas, as highlighted by Sellahewa and Samarasinghe (2021) in a factor Cost of Components (n=1), suggesting that the cost influences the feasibility of project selection. Additionally, practical constraints such as Epileptic Power supply (n=1) and Inadequate Facilities (n=1) as noted by Ifedili and Omiunu (2012), indicate how environmental conditions can disrupt or facilitate project development which eventually influence the selection of project ideas. Moreover, factors like Over Stressed Lecturers (n=1) and Poor Accommodation (n=1) as mentioned by Ifedili and Omiunu (2012) and Trend in the Field of Study (n=1) as mentioned by Bosomtwe et al. (2021), each cited once in those studies, clarify the multifaceted influence of environmental circumstances on project idea selection within the IT and CS fields.

In this section, the themes extracted from the review of articles on factors influencing undergraduate students' final year project idea selection in the IT and CS fields are analyzed for clarity and understanding of factors and their categories.

Factor's Categories and Frequencies

The concept of categorizing factors influencing project idea selection for undergraduate students, as presented in this study, is a unique and valuable approach. The study asserts that this categorization offers meaningful insights into the decision-making process of students when selecting project ideas. Moreover, the proposed categorization serves as a practical tool for devising interventions and solutions to assist students facing challenges in idea selection, ultimately enhancing the overall process and supporting student success.

Thematic Analysis of Factors

Number of Factors:

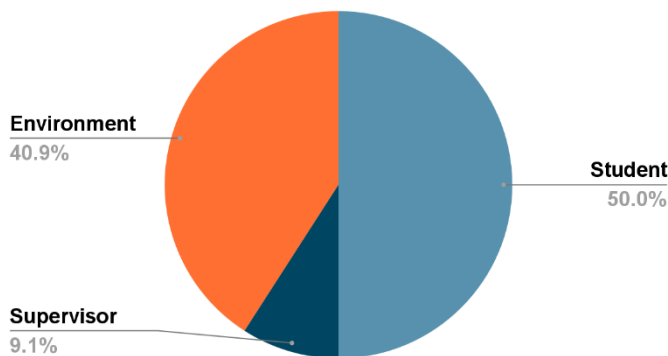


Figure 1. Number of Factors for each Category

In examining the factors influencing project idea selection, this study identified 11 (50%) Student Centered Factors, 2 (9.1%) Supervisor Centered Factors and 9 (40.9%) Environment Centered Factors (See Figure 1). While these numbers provide a basic overview, a more nuanced understanding emerges when considering the total frequencies of these factors across research papers.

Upon a closer examination, data reveals that Student Centered Factors exhibited a total frequency of 24, which is equivalent to 58.5%, Supervisor Centered Factors had a frequency of 6, which is 14.6%, and Environment Centered Factors were noted with a frequency of 11, which is 26.8% (See Figure 2). The difference between Figure 1 and Figure 2 is significant. Figure 1 provides a basic count of the number of factors for each category,

offering a preliminary overview that Student-centered factors dominate in numbers. In contrast, Figure 2 delves into a more detailed perspective by presenting the frequency distribution of these factors. This detailed analysis reveals that not only

do Student Centered Factors dominate in numbers, but their frequencies are notably more pronounced. This emphasizes the profound impact of Student Centered Factors in influencing undergraduate students' final year project idea selection.

Frequency of Factors:

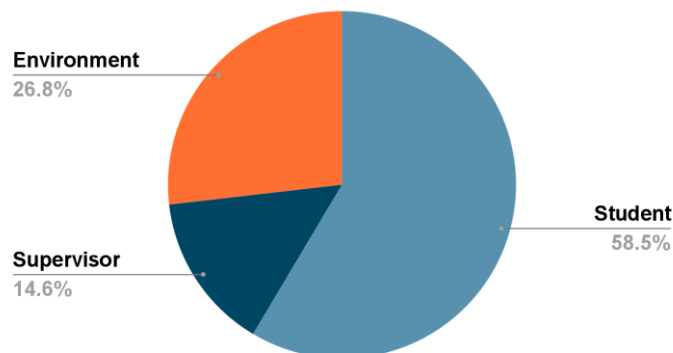


Figure 2. Frequency of Factors for each Category

Factors with Frequencies of 3 or above:

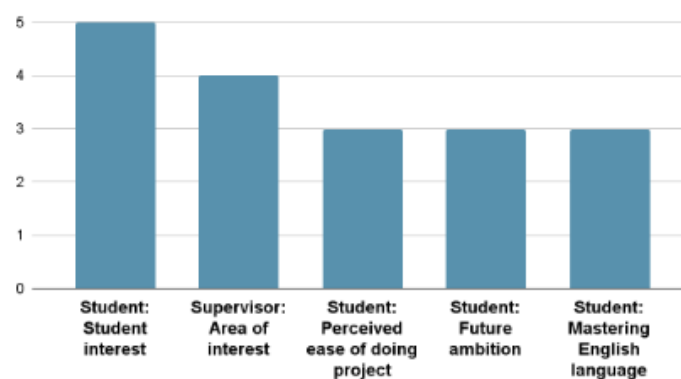


Figure 3. Factors with Frequency of 3 and Above

As illustrated in the pie charts (Figure 1 and Figure 2), it becomes evident that Student-Centered Factors outweigh the influence on idea selection. This suggests that the fate of undergraduate student project idea selection predominantly lies within the student's domains. The environment, representing the surroundings and external factors, follows as the second most influential category while Supervisor-Centered Factors emerge as the least impactful in selecting students' project ideas. In essence, findings underscore the pivotal role of students in the project idea selection process. Recognizing this dominance of student-centric factors emphasizes the importance of tailoring educational strategies and interventions that directly address and empower students in navigating the complexities of

final year project choices. Moreover, institutions should consider prioritizing initiatives that enhance the overall learning environment, acknowledging the role of external factors in shaping students' project experiences.

The study found it necessary to explore the frequencies of factors without being bound by categorization. To gain deeper insights, the authors identified factors with frequencies of 3 or more as it appears in Figure 3:

The noteworthy observation here is the dominance of factors from the Student category, with Student Interest taking the lead with a frequency of 5. Interestingly, there are no factors from the Environment category among the top factors. Out of

the top 5 factors, only one originates from the Supervisor category, emphasizing the influence of students in selecting project ideas.

Student Interest and Supervisors' Interest

Although the Supervisor category consists of only two factors, the Supervisor's Area of Interest factor stands out with a frequency of 4. This underscores the significance of a connection between student interest and the supervisor's area of interest. It becomes evident that when there is alignment between the interests of the student and the supervisor, the process of selecting a project idea becomes more straightforward.

In summary, the findings emphasize the pivotal role of student-centric factors in the selection of project ideas, particularly highlighting the influence of student interest. The observed connection between student and supervisor interests further underscores the collaborative nature of the final year project process, where mutual interests contribute to a smoother and more informed selection of project ideas. Upon examining the remaining factors with frequencies of 3 or more, i.e. Student Perceived Ease of Doing Project, Student Future Ambition and Student Mastering English Language, the study derived significant insights into their influence on Final Year Project Idea Selection for IT and CS Students.

Student Perceived Ease of Doing Project

The frequency of Student Perceived Ease of Doing Project indicates that students often considered the perceived ease of a project as a crucial factor in their selection process. This suggests that students are inclined towards projects they believe are manageable or less challenging. Institutions and educators should therefore acknowledge the importance of addressing students' confidence levels, providing adequate support to enhance their ability to tackle more complex project ideas.

Student Future Ambition

The recurring frequency of Student Future Ambition highlights the significance of aligning project choices with students' long-term career goals. It implies that students are motivated to select project ideas that contribute to their future aspirations in the IT and CS fields. Recognizing and incorporating career-oriented project options into the curriculum can enhance student engagement and satisfaction.

Student Mastering English Language

The presence of Student Mastering English Language as a frequent factor underscores the importance of language proficiency in the project idea selection process. This suggests that English language mastery is a very important tool that helps the student to spread wings in finding study materials and to easily communicate project ideas through writing concept notes or project proposals that can be easily understood by the supervisors. Institutions should therefore consider providing language support or integrating language-related skills development into the academic curriculum.

The above three factors collectively indicate that beyond the technical aspects of project ideas, students are significantly influenced by considerations related to perceived ease of doing project, future career ambitions and language proficiency. Acknowledging and addressing these influences can contribute to a more student-centric approach in guiding IT and CS students through their Final Year Project Idea Selection process. Educators and institutions should therefore consider incorporating targeted interventions and support mechanisms to enhance students' confidence, align project options with future aspirations and address language-related considerations for a more comprehensive and effective project selection process.

Conclusions and Recommendations

Conclusions

The investigation into factors influencing the selection of Final Year Project (FYP) ideas for IT and CS students highlights several key themes. Despite the limited number of studies available in this domain, the review of eight journal papers offered valuable insights into the challenges and considerations that students face in this crucial phase of their academic journey. The scarcity of research in this area reveals a notable gap in the existing body of knowledge, emphasizing the need for more comprehensive studies to enhance the understanding of the factors influencing FYP idea selection. Within the constraints of the available literature, this study contributes meaningful conclusions that can guide future research endeavors. The comprehensive analysis categorizes factors into three dimensions: student-centered, supervisor-centered, and environment-centered. Among these, student-centered factors, particularly the influence of student interest, emerge as

prominent determinant of FYP idea selection. Recognizing the dominance of student-centric factors underscores the importance of tailoring educational strategies to empower students in navigating their project choices.

Recommendations

To enhance the overall effectiveness of the final year project process, the following recommendations are given:

Educational institutions should encourage an environment that nurtures students' creativity and self-efficacy. Providing platforms for innovative thinking can contribute to more meaningful and engaging project selections.

There is a need for to support students in developing effective time management skills. This includes guidance on planning and executing their FYPs efficiently to ensure successful project completion.

There is a need to address issues related to supervision by providing additional support and training to supervisors. Effective mentorship plays a crucial role in guiding students through their FYPs.

There is a need to ensure the availability of necessary resources for students. Access to literature, software and other essential components should be facilitated to enhance the feasibility of project ideas.

Finally, there is a need for aligning project options with students' career aspirations. This involves integrating practical and career-oriented project choices into the curriculum to increase student engagement and satisfaction.

Future Research

Future research should delve deeper into specific challenges associated with each identified factor. Exploring the subtle aspects of student-centered, supervisor-centered and environment-centered factors can provide a more comprehensive understanding of the dynamics influencing FYP idea selection. Targeted interventions and improvements based on these detailed insights can further contribute to the continuous enhancement of undergraduate education in IT and CS fields. This iterative approach ensures that the FYP process remains a valuable and meaningful component of students' academic journeys.

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